
Aware IM

Version 8.4

User Guide



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Aware IM Documentation Structure

Aware IM documentation consists of the following documents:

1. Aware IM Installation Guide
2. Aware IM Getting Started
3. Aware IM User Guide (this document)
4. Aware IM Rule Language Reference
5. Aware IM Programmer's Reference
6. Aware IM How To
7. Aware IM for Mobile Devices

Aware IM Installation Guide contains instructions on the installation, deployment and start-up of the **Aware IM** software.

Aware IM Getting Started contains a brief introduction into configuring and running applications with **Aware IM**.

Aware IM User Guide is the main document in the set, which explains how to use **Aware IM** software to configure powerful and flexible web applications.

Aware IM Rule Language Reference contains the description of the Aware IM Rule Language used in business rules.

Aware IM Programmer's Reference describes how to add programming extensions to **Aware IM**.

Aware IM How To contains answers to some frequently asked questions and describes how to perform certain common tasks in **Aware IM**.

Aware IM for Mobile Devices contains guidelines on how to develop **Aware IM** Applications for mobile devices, such as iPhone, iPad, Android, Windows phone or Blackberry.

Introduction

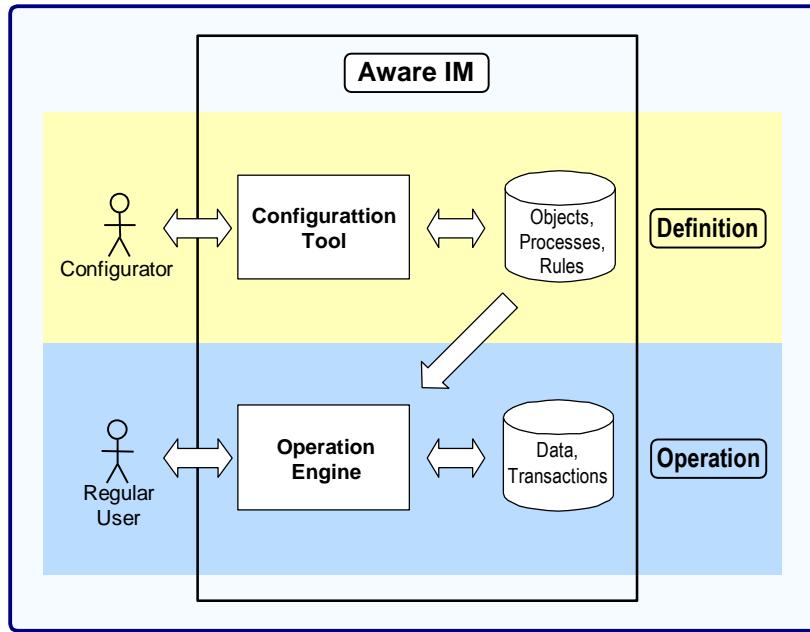
Aware IM is a software tool that was created to help organizations address many of their data processing needs. The main design goal for **Aware IM** was to substantially reduce the technical complexity of managing information and give non-technical people much greater control over the process. As a result the information management task becomes easier, more intuitive, predictable, manageable, and ultimately less expensive.

With **Aware IM** one can automate the organization's policies, procedures, guidelines, checklists, document handling, form input validation, event registration, decision making, e-mail notifications, data tracking, report generation, task scheduling, periodic processing, information sharing, bulk data exchange, and many other tasks in a flexible and cost-efficient manner. It can help to increase awareness, enforce standards, improve quality control, lift compliance level, simplify communication, and save time and efforts across the organization.

Aware IM is configurable information management software that can be adjusted by users without special computer skills to manage their specific information. In a simple intuitive way users can specify the information they want to manage and the rules on how to process the information. **Aware IM** automatically performs all the technical work required to manage information such as storage, retrieval, calculation, security, sharing, presentation, communication, etc.

Aware IM works in two modes: the *configuration* mode and the *operation* mode. The configuration mode allows the configurator, that is, a person configuring an information management system, to specify the contents and behaviour of the system. Once the definition work is finished the configurator makes the system operational. In the operation mode **Aware IM** analyses the system configuration and manages the information according to the instructions provided by the configurator. Regular users access the system in the operation mode in the course of conducting their day-to-day business activities.

The following picture illustrates the two modes of **Aware IM**:



The configuration of an information system, as defined by the configurator, can be exported out of **Aware IM** and saved in a file on a computer disk, just like any other electronic document. Similarly, a configuration can be imported into **Aware IM** from a file. This allows people to share configurations they create so that other people can adapt existing configurations for their own needs or reuse some parts of such configurations to incorporate into their own information systems.

Aware IM can be installed on a personal computer. If such a computer is a part of an office computer network the people in the office can use the system from their computers using a standard Internet browser. People outside of the office can also access the system as long as the computer on which **Aware IM** is installed is connected to the Internet. Alternatively **Aware IM** can be installed on a computer managed by an Internet hosting service provider so that users can access the information system via the Internet.

Aware IM Concepts

The following section describes how to use **Aware IM** to configure and operate applications that manage business information. The section is divided into several parts. The first part identifies the main generic aspects of essentially any information management application, describes how these generic aspects can be implemented in **Aware IM** and the specifics of the **Aware IM** approach to this implementation. The

second part identifies other features that most applications are likely to require and describes how they can be implemented in **Aware IM**. Finally the last part provides an overview of the configuration process and lists the productivity features of the **Aware IM** Configuration Tool that help configurators create flexible and powerful applications.

See also:

[Aspects of Information Management System](#)

[Basic Concepts](#)

[User Interface](#)

[Data Entry and Editing](#)

[Data Storage](#)

[Data Retrieval](#)

[Data Presentation](#)

[Data Processing](#)

[Productivity Features](#)

[Configuration Process](#)

Aspects of Information Management System

Aware IM is a software tool that allows creation of essentially any data management system. Therefore by nature it is very generic. It is built on the assumption that most data management applications have many common aspects such as:

- Data entry
- Data storage
- Data retrieval
- Data editing
- Data processing
- User Interface

Essentially any application would require some data to be entered and stored somewhere (usually in a database), it would also require the data to be found, retrieved and edited and it would offer some user interface to perform all these operations. Most applications would also perform some processing of this data according to certain rules (this is also often referred to as “business logic” of an application) – for example, car insurance policies would need their premium to be calculated, banking applications would need to calculate daily interest rates etc.

Apart from these main generic aspects most applications would also need to do the following:

- Take care of security issues
- Manage documents
- Generate data reports
- Communicate with other software systems and hardware devices

We will explain in detail how **Aware IM** deals with all these issues in the following sections of the document.

See also:

[Basic Concepts](#)

[User Interface](#)

[Data Entry and Editing](#)

[Data Storage](#)

[Data Retrieval](#)

[Data Presentation](#)

[Data Processing](#)

[Productivity Features](#)

Basic Concepts

See:

[Business Objects as Carriers of Data](#)

[Business Rules as Carriers of Business Logic](#)

[Processes as Links between User Interface and Business Logic](#)

[Business Space](#)

[Business Object Groups](#)

Business Objects as Carriers of Data

In **Aware IM** the world of data management application consists of business objects. Business objects encapsulate the data that needs to be entered, retrieved, edited and processed.

In fact, *there is no data in an Aware IM-configured system that exists outside of some business object.*

In a way this model very closely reflects the real world. Business objects exist in every business - customers, accounts, orders, payments etc. The data that a business object encapsulates is represented as *attributes* of a business object. For example, an order may have the placement date, customer, line items, shipment address, shipment date, shipment number, delivery instructions, order status, etc.

Attributes of a business object may be of different types – text, number, date, document etc (see [Adding/Editing Attributes](#) for a complete list of attribute types).

One of the most important attribute types is a *reference* attribute type. Reference attribute type (or simply reference) reflects the fact that business objects may be linked

with other related objects. For example, an order may be linked to its order line items. References are explained in detail in the [Reference Attributes](#) section.

Given that business objects encapsulate the data in a data management application, the main aspects of the system related to data entry, storage, retrieval and processing boil down to the following:

- Data entry is the process of entering of the attributes values of some business object
- Data storage is the storage of attribute values
- Data retrieval is finding instances of business object(s) that match a certain criteria
- Data editing is the process of changing values of of a business object's attributes
- Data processing is using attribute values of business objects to create instances of other business objects and/or modify the existing attribute values.

 **NOTE:** In the [Configuration Mode](#) one can configure *definitions* of business objects and their attributes. In the [Operation Mode](#) one can create *actual* objects filling their attributes with specific data and linking them with other objects. While there is a single definition describing a business object in the Configuration Mode, there may be many *instances* in the Operation Mode representing the same business object. For example, you can configure a `Customer` object and then create many instances of a `Customer` objects in the Operation Mode, each representing a different customer. A formal way of making the distinction between objects in the two modes is to refer to the configuration-mode object as *object definition* and to the operation-mode objects as *object instances*. This document uses the formal notation when it is necessary to avoid confusion between the two modes. When it is clear which mode is being described, the term *object* is used.

Configuration of business objects is described in detail in the [Adding/Editing Business Objects](#) section.

Business Rules as Carriers of Business Logic

In **Aware IM** data processing (or business logic) is encapsulated in *business rules*. A rule specifies one or more actions that should be executed when the rule conditions are met. Conditions are optional and if none are specified the actions are executed unconditionally. In other words a rule states what should happen and when.

Here are some examples of rules:

1. If `Account.Holder.Age < 16` Then
REPORT ERROR 'Account holder must be 16 years old or over'
2. `LineItem.Total = LineItem.Price * LineItem.Quantity`
3. If `Reservation.Status` WAS CHANGED TO 'Offered' Then SEND
`ReservaitonOfferEmail` TO `Reservation.Member`

4. REQUEST SERVICE ProcessPayment OF PaymentProcessingSystem

5. If Fee.Status='Applied' Then PROTECT Fee.Amount FROM ALL

Actions of business rules can perform a variety of tasks. Most importantly they can create and modify business objects, i.e. perform data processing. They can also perform calculations, create or print documents, display information, exchange data with other software, etc.

Evaluation of rules is triggered when certain events happen inside the system. Most importantly rules are triggered when data is entered or edited or, in **Aware IM** terms, when business objects are created or modified.

When a value of an attribute changes **Aware IM** considers all rules related to the object and executes the actions of those rules for which the conditions are met. Note that execution of actions may have a ripple effect because an action may change values of other attributes which may in turn cause evaluation of other rules and so on. **Aware IM** continues this process of rule evaluation until there are no more actions to execute. This process is described in detail in the [Rule Evaluation](#) section.

There are also other events apart from the modification of a business object that may trigger rule evaluation and action execution – a full list of these events is provided in the [Rule Evaluation](#) section.

Configuration of business rules is explained in detail in [Adding/Editing Rules](#), details of rule conditions and actions syntax is provided in the [Rule Language](#) section and the “Aware IM Rule Language Reference” document.

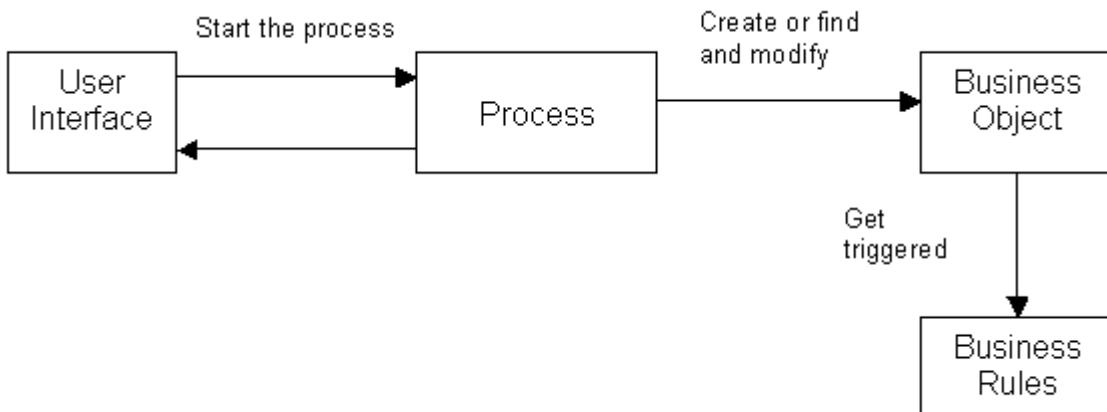
Processes as Links between User Interface and Business Logic

As we said in the [Business Rules as Carriers of Business Logic](#) section business logic of an application **Aware IM** is encapsulated in business rules, which get triggered whenever business objects are created or modified. Let us now have a look at when these creations and modifications take place.

The initial trigger that leads to the creation or modification of a business object is almost always some external request to the system usually from a user who sends this request via the system's User Interface. The user can perform this request in two ways – she can explicitly ask the system to create a new instance of a business object or edit an existing instance. More often though a user asks the system to start a *process*, which will then create or modify a business object(s).

A process usually consists of actions that are executed in a pre-defined order. These actions usually create business objects or find the existing business object and modify it. As a result business rules are triggered. These rules may start a chain reaction of other modifications, which take place until there are no more actions to execute. After data processing has been completed the process usually communicates the results back to the user.

Therefore a process represents a link between the User Interface and business rules – it triggers business rules in response to the request from the User Interface by performing initial creation or modification of a business object and then communicates the result back to the User Interface. This is shown on the diagram below:



NOTE: Even though a process itself usually consists of rules it is not supposed to implement any business logic other than triggering the initial change as described above.

NOTE: A process may be started not just by the User Interface but also by other forms of external requests – for example, a request from other software system through a service (see [Communication with Other Systems](#))

The illustration below shows the make up of a process transferring funds between two accounts.

Name	Rule
Display funds transfer form	ENTER NEW FundsTransfer
Check for transfer success	If FundsTransfer.State = 'FAILED' Then REPORT ERROR FundsTransfer.FailureReason
Ask if receipt is required	DISPLAY QUESTION 'Print receipt?'
Display receipt	If Question.Reply = 'Yes' Then DISPLAY DOCUMENT TransferReceipt
Display client details	VIEW Customer

Note that the process is very small and is mainly concerned with allowing the user to enter necessary details and presenting the results of the operation to the user. All the business logic behind the funds transfer operation (such as checking whether there are

sufficient funds in the source account, calculation of fees for the transfer operation etc) is expressed in business rules related to the object FundsTransfer (they are not shown here). **Aware IM** evaluates these rules as soon as the user enters the data for the FundsTransfer object (between “Display funds transfer form” and “Check for transfer success” operations).

Configuration of processes is discussed in detail in the [Adding/Editing Processes](#) section.

Reference Attributes

Attributes that refer to other business objects are called *reference attributes* or simply *references*. References represent relationships between business objects. For example, the Account business object may contain a reference to a list of account transactions (represented by the Transaction business object) or the Employee business object may have a reference to the Company business object.

The relationships between objects represented by reference attributes may be of several types:

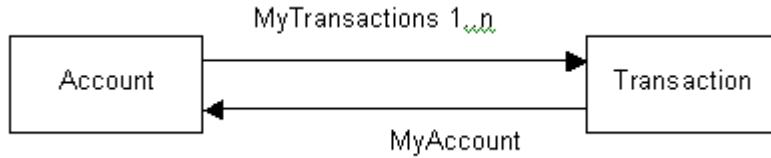
- Relationships can be single or multiple
- Relationships can be *matching* or *non-matching*
- Relationships can be *peer*, *parent* or *child*.

Single and multiple relationships.

“Single” relationship indicates that a business object may only refer to a single instance of another business object through this relationship (for example, the Employee object may refer to only one instance of the Company object). “Multiple” relationship indicates that a business object may refer to one or more instances of another business object through this relationship (for example, the Account object may refer to multiple instances of the Transaction object).

Matching and non-matching relationships

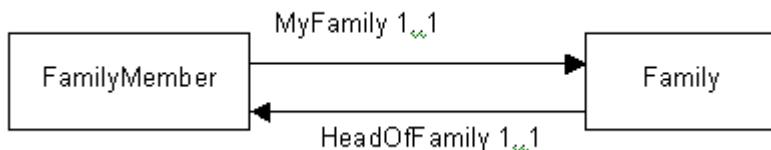
With matching relationships if an attribute of one business object refers to another business object there is a reference attribute in this other object (matching attribute) that refers to the first object. For example, if the Account object refers to the Transaction object through an attribute with the name MyTransactions there may be a matching attribute in the Transaction object called MyAccount that refers to the Account object. This is shown on the picture below:



Note that the `MyTransactions` attribute on the `Account` business object represents a “multiple” relationship (account may have multiple transactions) whereas the matching `MyAccount` attribute in the `Transaction` object represents a “single” relationship (transactions belong only to one account). Generally speaking, any combinations of single and multiple references are possible within the matching relationship.

Matching relationships are very convenient as far as navigation between objects is concerned. In the example above once an instance of the `Account` object has been added to a particular `Transaction` in the Operation Mode the added `Account` will automatically have the `Transaction` in its list of transactions and vice versa – if an instance of a `Transaction` has been added to the list of transactions on the `Account`, the `Account` is also automatically attached to the `Transaction`. The corresponding forms of both the `Account` and `Transaction` objects will automatically allow navigation to the referred instances (unless presentation options are explicitly specified not to allow this – see [Presentation Options for References](#)).

With non-matching relationships there are no matching attributes on the referred object. Consequently if an instance of the second object is added to the first object in the Operation Mode only the first object will know that it has references to the instance of the second object – the instance of the second object will not know that some instance of the first object refers to it. Thus navigation from the instance of the second object directly to the instance of the first object will not be possible. Note that if the reference attribute on the first object has no matching attribute in the second object it does not mean that the second object may not refer to the first object at all through its own reference (matching or non-matching). If such reference does exist it is a completely different relationship. This is shown in the example below (`FamilyMember` object has a non-matching single relationship to its `Family` and the `Family` object has independent non-matching single relationship to the `FamilyMember` object – `HeadOfFamily`):



Peer, Parent and Child relationships

Peer relationships represent relationships when instances of both business objects participating in the relationship can exist on their own. With parent (“owner”) and child

(“owned”) relationship on the other hand, instances of the business object representing the “child” part of the relationship cannot exist without the instance of its “parent” business object. For example, the instance of a `Transaction` does not make sense if it is not attached to some account, so we could say that the `Account` and `Transaction` are related via a parent-child relationship where `Account` is parent and `Transaction` is child.

The following applies for parent-child relationships:

1. If an instance of the parent business object is deleted instances of all “child” business objects attached to the “parent” are automatically deleted as well
2. If an instance of a “child” object is removed from the instance of its “parent” object it is automatically deleted.

The above behaviour saves the trouble of configuring rules to delete child instances explicitly.

See also: [Working with References in the Operation Mode](#).

Business Space

One can think of a *business space* as a place where **Aware IM** keeps both configuration definitions of an application (such as business objects, processes, business rules etc) and its operational data (data created by the end users of the application). Therefore, business space encapsulates everything related to a data management system in a business.

Business space is secure. Only the parties registered with the business space can get access to the information in the business space, whether in the Configuration or the Operation modes. **Aware IM** can manage multiple business spaces on the same computer, but it keeps such business spaces completely separate from each other. It is impossible to directly access operational data of one business space from another business space¹. When configuring multiple applications it is possible, however, to re-use configuration information used in one business space and copy it into another business space – see [Copying Elements](#).

Since a business space is designed to cover all information management needs of an organization, most users will only need to manage a single business space. However, some users may need to maintain multiple business spaces, for example if they do it for, or on behalf of, multiple unrelated organizations.

¹ It is possible, however, to call services of one business space from another business space – see [Business Space as Intelligent Business Object](#).

 **NOTE:** **Aware IM** keeps configuration data completely separate from operational data, which makes it very easy to provide a new version of the configuration data without affecting the operational data.

Business Object Groups

Business object groups in Aware IM offer you a simple and convenient way to handle similar yet different data.

Let us consider an application that registers client communication history, such as meetings, phone calls, letters, e-mails, etc. A summary of the history should be presented as a chronological list on the client form. The user should be able to see full details of any list item on a separate form.

Some details are common across all communications, like the contact time, summary or description. Other details are specific to a particular communication type, like the status of an outgoing e-mail can be Sent or Unsent, and the user should be able to prepare and send an e-mail, say by clicking a button. The status of an incoming e-mail can be Read or Unread. Phone conversations do not have any status at all. Letters should have a letter document attached to them, etc.

How would we represent communication details in our application? One way would be to combine the details of all communication types in a single business object called, say, Communications. The problem with the single business object is that depending on the communication type we would have to hide non-applicable details and operations from the data form or dynamically manipulate the values of the same attribute (like Status for incoming and outgoing e-mails). Alternatively, we could make several forms specific to each communication type. Then we would have to add some logic to all places where a communication form is displayed, like from the history list on the client form, to check the type and display an appropriate form. We would have to do the same check in all other places where the user can navigate to the communication form, like in a search result table.

Another way of going about it could be to create separate business objects for different communication types, like Outgoing Emails, Incoming Emails, Outgoing Letters, etc. Each of these objects would have its own data form. The trouble with separate objects is that it would be very difficult (if not impossible) to show records from separate objects in a single chronologically sorted list, say on a client form, or do a search across multiple objects.

With the solution that **Aware IM** offers you would create separate business objects for different communication types, like OutgoingEmail, IncomingEmail, OutgoingLetter, then create a business object group, say, called Communication, and include all the specific objects as its members. This is all it takes.

Each member of a group usually contains attributes common to all other members. In the example above the common attributes would be the date when the communication was sent or received and the state of the communication. Each member would also have some specific attributes not found in other group members, for example, telephone number for telephone communication; e-mail address for e-mail communication etc.

Business object groups are treated in the same way as regular business objects - they can be used in business rules, queries, document templates, and they also appear in the list of available attribute types. So, we would simply add a [multiple reference attribute](#) ContactHistory of type Communication to Client to display a list of communication records on the client form. When the user clicks on an item in the list, a form for the specific record will be automatically shown to the user.

Business object groups are useful in the following scenarios:

1. Business object groups can be used in queries to search the system for objects of different types based on the criteria that use common attributes of the group – see [Data Retrieval](#).
2. Business object groups can be referred to by reference attributes as shown in the above example – the ContactHistory attribute on the Client object refers to a group rather than to a particular object.
3. Business object groups can be used in business rules – again in this case rules may only use common attributes of the group. For example consider the following rules:

```
FIND Communication WHERE Communication.SentDate = CURRENT_DATE  
Communication.State = 'SENT'
```

Here the second rule would set the value of the state attribute of any communication object found by a query irrespective of its type.

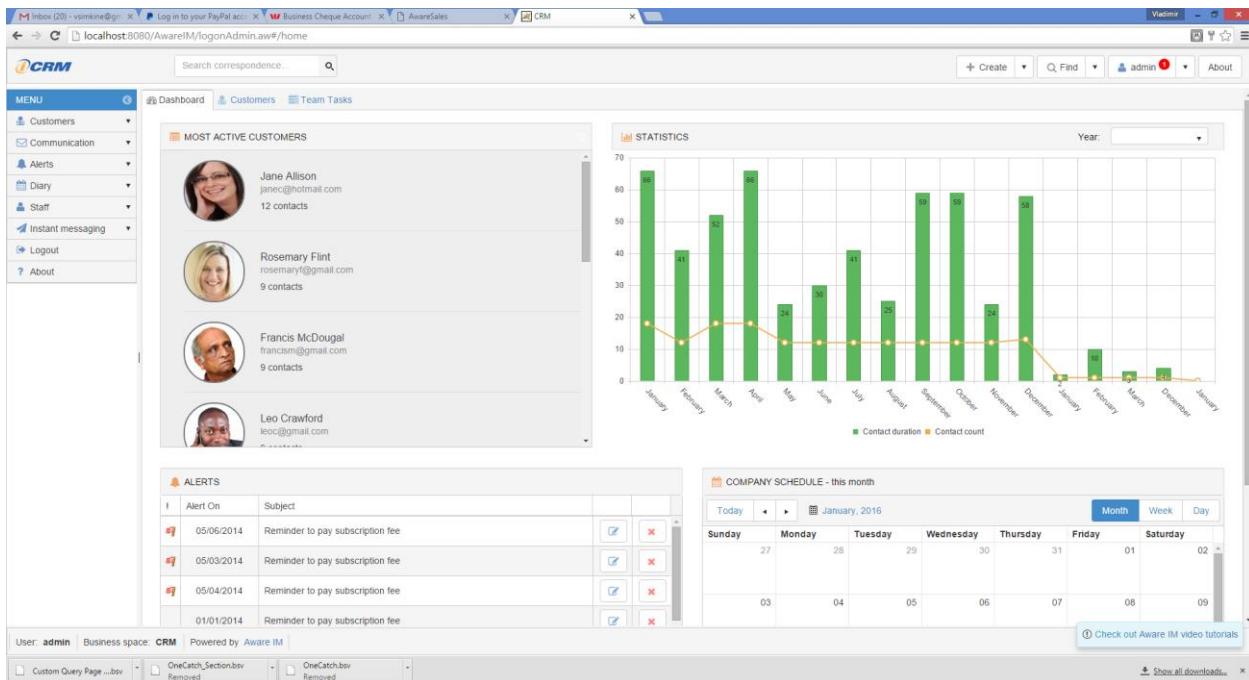
 **TIP:** If business rules attached to different members of a group are exactly the same it is better to use group names in the rules rather than names of a particular group member. In this case changes made to a rule attached to one member will be automatically transferred to the equivalent rules attached to other members – see also [Adding/Editing Rules](#).

Configuration of business object groups is explained in the [Adding/Editing Business Object Groups](#) section.

User Interface

We can now explain in greater detail how the generic aspects of a data management application are implemented in **Aware IM**. We will start with the User Interface.

Applications configured by **Aware IM** have HTML-based user interface that can be viewed by any web browser such as Google Chrome, Internet Explorer or Firefox. After a user logs into the system **Aware IM** displays the screen similar to the one shown below (this shows screen layout for the CRM application):



In **Aware IM** the screen is divided into several areas:

- The optional area at the top is called the *banner* (not shown on the picture above)
- The leftmost area if defined may contains the *menu* of the system (as on the picture above) or some other information
- The optional toolbar area at the top of the screen may have an additional menu (as on the picture above)
- The main central area is called the *main page* and it contains a number of panels showing data list and calendar (called *content panels*)
- The optional area at the bottom is called the *status bar*

The banner area at the top of the screen usually contains the logo of the system and possibly some advertisements. The menu always contains the main operations that can be performed by the user. The main page is the working area of the screen that displays data forms, data search results etc. The status bar if present shows the name of the currently logged in user and the name of the business space. You can also allocate

special areas to the left, right and underneath the main page, that usually contain static controls (like in the example above), news, advertisements etc.

Whether each of these areas (also called *frames*) will be shown as well as the contents of each area can be specified in the application configuration. The following section explains how this is done.

See also:

[Visual Perspective](#)
[Operations](#)

Visual Perspective

The **Aware IM** concept of the screen layout is called a *visual perspective*. The visual perspective defines the look and feel of an application. **Aware IM** always generates the default visual perspective, but in most cases configurators will change the default perspective to provide their own layout.

Visual perspectives allow configurators to define the following:

- Names of menu items as well as operations that they invoke (see [Operations](#))
- Frames that will be present
- Initial layout of the main page
- Layouts of each frame. You can display several pages (tabs) within a frame. A user will be able to switch between pages. Each page can be further split up into several content panels. Every content panel can show an HTML page or show the results of a menu command (for example, run a [query](#) or a [process](#)).
- Color/font scheme (“theme”)

Configuration of a visual perspective is described in detail in the [Adding/Editing Visual Perspectives](#) section.

It is possible to define several visual perspectives for an application and switch between them when necessary. This may be useful if the application contains several relatively independent functional areas that need to look different to the user and/or offer different sets of menu operations. For example, there may be an area that provides management of forums and another area that handles orders and purchases. Switching visual perspectives is achieved by configuring a special type of a menu operation called “Change Perspective” (see [Setting Menu Item Properties](#)) – when a user selects the menu item of this type **Aware IM** shows the visual perspective configured for this menu item.

Operations

The screen layout would be rather worthless if it did not allow invoking operations. Most operations are invoked from the main menu that is configured as part of a visual perspective (see [Visual Perspective](#)).

The content of the main menu is entirely up to the configurator to define. The menu consists of menu items that can be arranged in a hierarchical structure. Some menu items (folder items) may only contain other items whereas other menu items (leaf items) may actually perform a particular operation. Configurators define the name of the menu item as well as the type of the operation that it invokes. There are a number of operation types that **Aware IM** offers. Arguably the most important ones are those that initiate data creation, editing, retrieval and processing. These are the following operation types:

Create Object

When a user selects a menu item of this type **Aware IM** shows the form that allows entering attribute values of a new instance of the specified business object (see [Business Objects as Carriers of Data](#)). When the user submits the form the new instance of the object with the entered values is created (see [Data Entry and Editing](#)). For example, the “New Account” menu item may be configured to create a new instance of the `Account` business object.

Run Query

When a user selects a menu item of this type **Aware IM** runs the specified query and shows the business objects found (see [Data Retrieval](#) and [Data Presentation](#)). For example, the “Expired Policies” menu item may be configured to run a query that looks for instances of a `Policy` business object with the value of `State` attribute equal to “Expired”.

Start Process

When a user selects a menu item of this type **Aware IM** starts the specified process (see [Processes as Links between User Interface and Business Logic](#)). For example, the “Transfer Funds” menu item may be configured to start the “TransferFunds” process that displays the appropriate form for the creation of `FundsTransfer` business object and prints out the receipt after the object has been created (and the funds have been transferred by the business rules attached to this object).

Other types of operations allow building a query dynamically, generating a report, exporting and importing business objects etc. The complete list of operation types supported by **Aware IM** via the main menu is available in the [Setting Menu Item Properties](#) section.

 **NOTE:** Operations of an application may be invoked not only from the main menu but also from business object forms (see [Form Caption and Form Operations](#)), from the standard query results screen (see [Standard Form of Query Results](#)) and from the hyperlinks defined in business object presentations (see [Hyperlinks](#)).

Data Entry and Editing

As described in the [Business Objects as Carriers of Data](#) section, data entry and editing in **Aware IM** is achieved by creating and updating instances of business objects.

Instances of business objects can be created either explicitly by the user when she selects a menu item of the “Create Object” type (see [Operations](#)) or by a process when it executes the [ENTER NEW](#) action of the Rule Language².

In both cases **Aware IM** displays a form that allows the user to enter values of the attributes of the business object. When the user submits the form the new instance of the business object is created (this triggers evaluation of business rules, if there are any, attached to this business object – see [Business Rules as Carriers of Business Logic](#)). If the form was displayed by the [ENTER NEW](#) action of a process, the process continues its execution after the business rules attached to the object have been evaluated.

Editing of business object instances occurs either when a user presses the “Edit” button on the query results screen (see [Data Presentation](#)) or when a process executes the [EDIT](#) action of the Rule Language³. Again in both cases **Aware IM** displays a form that allows a user to modify the values of the attributes of the business object. When the user submits the form the existing instance of the business object is replaced with the changed values (this triggers evaluation of business rules attached to this business object – see [Business Rules as Carriers of Business Logic](#)). If the form was displayed by the [EDIT](#) action from a process, the process continues its execution after the business rules attached to the object have been evaluated.

See also: [Business Object Forms](#)

Business Object Forms

As we saw in the [Data Entry and Editing](#) section whenever data entry and editing occurs **Aware IM** displays a form that allows a user to enter or modify the values of the attributes of a business object. In this section we will look at this process in greater detail.

² The instance of a business object may also be created from a process or business rule by executing the [CREATE](#) action of the Rule Language, but we will not be considering this possibility in this section because it does not involve data entry as in this case the object is created with either default and/or specified attribute values.

³ Business objects may also be modified by business rules that change attribute values, but again we do not consider this possibility in this section, as it does not involve data editing.

The form that **Aware IM** displays during data entry or editing may be defined as part of the business object's configuration. When the configurator provides a definition of a business object **Aware IM** generates the default form. This default form is used for data entry/editing unless the configurator defines a different form. The default form contains input controls for each attribute defined in the business object. The type of the input control corresponds to the type of the attribute – for example, text and numbers are represented by a simple text box, input fields for document attributes are represented by a text box with the Browse button next to it (the button allows choosing the document); reference attributes are represented by a reference table. For a complete list of attribute types and their default representation on the business object form see [Adding/Editing Attributes](#). The input controls on the default form are laid out in a top-down fashion – every subsequent input control is placed underneath the previous one. An example of the default form is shown on the picture below:

The screenshot shows the 'Alert' configuration form. It includes fields for Importance (set to Critical), Alert On (05/06/2014), Subject (Reminder to pay subscription fee), Description (Send reminder e-mail to the customer to pay for product subscription), Emailed On (05/06/2014), Days Between Emails (1), and an '@ Email To' section with a communication grid. The grid shows columns for First Name, Last Name, and Job Title, with a message 'No items to display'. At the bottom are Save and Close buttons.

Alert

Importance: * Critical

Alert On: * 05/06/2014

Subject: * Reminder to pay subscription fee

Description: Send reminder e-mail to the customer to pay for product subscription

Emailed On: 05/06/2014

Days Between Emails: 1

@ Email To Communication

First Name	Last Name	Job Title
No items to display		

Save Close

It is possible to change the default form and specify which attributes will be shown on the form and in which order, or specify different type of an input control for a particular attribute. It is also possible to provide a completely customized layout of the form.

One can also define more than one form for a business object. For example, one form may be used when a new instance of a business object is created and another one – when an existing instance is modified. This may be useful if some attributes are only relevant when the object is being modified and irrelevant when a new instance is being created or vice versa. Certain forms may be used on special occasions only – for example, when clients register themselves as new system users or when the form is displayed by a particular process only (the name of the form may be explicitly specified in the [ENTER NEW](#), [EDIT](#) or [VIEW](#) actions). Certain forms may also be used only for certain categories of users – see [Access Control](#)).

Configuration of forms is described in detail in the [Defining Forms](#) section.

Form Sections

Certain business objects may have quite a large number of attributes so putting them all on one form may not be practical. **Aware IM** allows breaking the form up into smaller chunks called *form sections*. Each form section may contain only a subset of attributes of the business object. In the Operation Mode such form sections are either displayed as tabs (each tab showing the name of the form section) so the user can access each form section in a random order or the form sections are displayed in a strictly defined order – one after the other. The following picture shows different form sections for the Customer business object (form sections are Main, Communication, Alerts and Signature; the currently open form section is Main)

Jane Allison

Main	Communication	Alerts	Signature
Number:	000001		
First Name:*	Jane		
Last Name:*	Allison		
Date Of Birth:*	12/10/1973	<input type="button" value="Calendar"/>	MM/dd/yyyy
Gender:*	<input type="radio"/> Male	<input checked="" type="radio"/> Female	
Email Address:	janec@hotmail.com		
Address:	321 Ninth Street Gadsden AL 35903-1618		
Phone:	(555) 555-5555	(999) 999-9999	



[@ New email](#)
[New letter](#)
[New note](#)
[New alert](#)
[Delete](#)

Aware IM creates a layout of a form section automatically whenever there is a request to show the form section in the Operation Mode. By default the attributes defined for the form section are generated in a top-down fashion using input controls corresponding to the attribute types (it is possible to change the default top-down layout and place attributes in a single row – see [Adding/Editing Form Sections](#)). If a definition of a business object changes so that new attributes are added or existing attributes are deleted or modified, the layout of the form section is automatically re-generated in the Operation Mode to reflect the changes. The picture showing form sections of the Customer business object above is an example of a form section.

Navigation Style

There are two ways a user can navigate between the form sections of a form (these ways of navigation are called *navigation styles*) – *random* and *wizard-like*.

With random navigation style the names of the form sections are displayed as tabs. A user can click on any tab at any time and **Aware IM** will show the layout of the corresponding form section. The order of form sections defined in the Configuration Mode only determines the order in which tabs are displayed and does not affect the order of navigation. The users may freely switch between different form sections and enter or change the attribute values as they wish. The form may be submitted from any of the form sections.

With wizard-like navigation form sections are displayed in the order that they are defined on the form – to navigate to the last section a user has to go through all the previous sections. The form may be submitted only from the last section. Wizard-like navigation may be very useful when input of a business object is performed in logical steps where

one step can only be performed once the previous step has been accomplished (this is a very popular style in the Internet-based systems).

 **NOTE:** sometimes the information displayed on the next form section may depend on the information entered on the previous form sections. For example, there may be a business rule that calculates the value of an attribute based on the values of other attributes. **Aware IM** performs all necessary calculations during the transition between form sections and displays the correct value when the next form section is displayed.

 **NOTE:** an attribute of a business object may be shown on more than one form section. In this case the value of the attribute is retained when a user switches between the form sections. This applies both to random and wizard-like navigation styles.

Form Operations

A form of a business object can be associated with particular operations that can be invoked for this object. The list of these operations can be configured as part of the form definition and they appear as a toolbar above and/or underneath the form. Unlike operations invoked from the main menu (see [Operations](#)) the operations invoked from the form usually have something to do with the instance of the business object being edited.

Data Storage

Any data management application needs to store data. The data in **Aware IM** is encapsulated in business objects (see [Business Objects as Carriers of Data](#)) and so **Aware IM** needs to store instances of business objects.

In **Aware IM** most business objects are stored in a database. Database management systems (DBMS) are complex software and development of applications using traditional methods requires a lot of effort dedicated to the implementation of database-related issues, such as a thorough design of database tables that includes relationships between the tables; interface to database management software and database transactions.

Aware IM takes care of the database-related issues automatically.

Aware IM performs database-related tasks automatically behind the scenes. When configurators define business objects, attributes, queries, etc they do not need to worry about database tables and relationships between them. **Aware IM** automatically creates database tables when new business objects are defined and automatically alters them when object definitions change. When object definitions do change **Aware IM** makes every effort to preserve the existing data whenever possible. For example, when a new attribute is added to a business object the existing data for this business object is not affected in any way or when the attribute type is changed from Number to Plain Text the

existing numbers are automatically converted to text. Obviously when an attribute is deleted from a business object the existing data for the attribute is deleted as well. In any event, if the existing data is going to be affected **Aware IM** warns the configurator about the possibility of the data loss and indicates which configuration changes will affect the data (see also [Publishing Business Space Version](#)).

In the Operation Mode when users create or modify instances of the business objects **Aware IM** performs all the database-related tasks behind the scenes creating and modifying rows of data as required.

Aware IM supports different data types.

Aware IM supports most data types including images and documents, small and large text, dates, numbers, binary data etc. Again configurators need not be concerned with the actual representation of these data types in a specific DBMS – **Aware IM** takes care of all these issues.

Aware IM is designed to be DBMS independent.

Aware IM is designed to be independent of a particular database management system used by its clients. Due to quite significant differences in capabilities and functionality of different DBMS implementations **Aware IM** does include the code specific to a particular DBMS. This code however is well isolated and supporting more database vendors is just a matter of time. At the moment **Aware IM** has been tested with IBM Cloudscape/Derby, MySQL, Microsoft SQL Server/SQL Server Express/Azure, Oracle, PostgreSQL and Maria DB. More database systems will be supported in the near future.

Aware IM is designed to support different data storage media.

Database is not the only place where business objects can be stored in **Aware IM**. **Aware IM** abstracts the concept of the data storage so in principle business objects may be stored in other types of data storage media, such as memory or LDAP. At the moment persistence in memory only is supported (apart from persistence in a database). Memory persistence can be useful when business objects are created for temporary purposes only and are not stored permanently in the system. For example, an instance of a business object may be created only to trigger business rules that perform some calculations attached to this object (see [Business Rules as Carriers of Business Logic](#)). Configuration of a persistence type for a business object is described in the [Specifying General Properties](#) section.

Aware IM takes care of transactions and data integrity issues.

Aware IM makes every effort to preserve the integrity of data – for example, when an instance of a business object is deleted, all references to this instance in other business objects (if any exist) are deleted as well. Also if some data operation fails all data operations that occurred prior to the failed operation within one logical request are automatically rolled back, so the data stays consistent. For example, if money is transferred from one account to another one in two steps (withdrawal and deposit) and the deposit step fails for whatever reason, withdrawal is rolled back as well. This multi-

step operation is called a *transaction* in database systems. For more details on how **Aware IM** handles transactions see [Rules and Transactions](#).

Data Retrieval

Retrieval of data in **Aware IM** is achieved by means of a *data query* (or simply a *query*). A query goes through all data in the system and compares it against some criteria. The data that matches the criteria is retrieved. Since data in **Aware IM** is encapsulated in business objects (see [Business Objects as Carriers of Data](#)) a query looks for the instances of a business object that match the criteria of the query.

Data may be retrieved not only explicitly by a user but also by processes and business rules. This is achieved by executing the [FIND](#), [PICK FROM](#) or [DISPLAY](#) actions of the Rule Language. Executing this action is equivalent to running a query – in fact, almost any query (other than very specific queries in SQL form) may be represented as a FIND action.

See also:

[Configuring Queries](#)

[Running Queries in the Operation Mode](#)

[Building Queries in the Operation Mode](#)

[Searching for Data using Forms](#)

Configuring Queries

Queries can be defined at the configuration stage - a user can run such pre-configured queries in the Operation Mode. Pre-configured queries can also be referenced by rules (see [FIND](#) action).

When defining a query the configurator has to indicate the business object, (or [business object group](#)) the instances of which the query will be searching. Then the configurator has to indicate the conditions of search – only those instances of the business object that have attribute values matching the specified conditions will be retrieved by the query (if conditions are not specified all instances of the business object will be retrieved). For example, if a query is to retrieve accounts of John Smith, the query has to include a condition that compares the value of the `OwnerName` attribute with 'John Smith':

```
FIND Account WHERE Account.OwnerName = 'John Smith'
```

One can define multiple conditions for a query – the conditions may be linked with the AND or OR keywords.

Note that query conditions allow specifying not only attributes of the business object that the query will be searching, but also attributes of the related objects. For example, if

account owner is a Customer object related to the Account object via the Owner reference attribute, the above query could be specified as follows:

```
FIND Account WHERE Account.Owner.Name = 'John Smith'
```

It is also possible to indicate attributes of objects related to the related objects, for example, Account.Owner.Company.Name. There is no limit on the level of nesting of the related objects.

The configurator may indicate that instances of a business object found by a query should be sorted by a particular attribute(s) in a particular order and also indicate how these instances should be displayed in the Operation Mode – see [Data Presentation](#).

Configuration of queries is described in more detail in the [Adding/Editing Queries](#) section.

 **NOTE:** If a query searches for instances of business objects belonging to a business object group, the conditions of the query may only use attributes common to all members of the group (see [Business Object Groups](#)). When the results of such a query are presented to the user the presentation is only allowed to show common attributes of the group (see [Data Presentation](#)).

 **NOTE:** It is possible to define a query with conditions that use attributes of a business object that the query is not searching for (they are also called *dynamically resolved* attributes or simply *dynamic* attributes). Consider the following query as an example:

```
FIND Account WHERE Account.OwnerName = Customer.Name
```

The business object `Customer` used in a query condition is not the object that the query is searching for. **Aware IM** replaces references to such attributes with the actual values at run time – just before the search is performed. For example, if the value of the `Name` attribute of the `Customer` object is ‘John Smith’ the actual query performed by **Aware IM** is:

```
FIND Account WHERE Account.OwnerName = 'John Smith'
```

Where does **Aware IM** find the instance of the `Customer` object and what happens if there are no instances of this object or if there are more than one instance? The answer to the first part of the question is that the instance is taken from the Context (this is explained in the [Other Usages of Context](#) section); the answer to the second part is that if **Aware IM** cannot find the instance of the object in the Context it logs a run-time error and the query is not run. The queries using dynamic attributes should only be used in situations where such attributes can be unambiguously resolved.

See also [Queries that Require User Input](#)

Queries that Require User Input

Quite often a value that a query should use in its conditions must be entered by a user at run time rather than pre-configured. For example, consider a query that finds the owner’s accounts after the owner’s name has been entered by the user. **Aware IM** allows configuring such a query – the configurator will need to specify the business object that the query should be looking for as well as the attributes and criteria participating in the query condition(s). However, instead of specifying a particular value of the attribute(s) in the condition(s) the configurator will need to indicate that the value should be entered at run time. When the user runs such a query in the Operation Mode **Aware IM** automatically generates a form where the user enters the required value(s) (in the above example - the name of the owner that the query will be looking for). After the required value has been entered **Aware IM** performs the search and displays the results.

A query may require several values to be specified by the user (for example, a query that finds accounts of owners with the names that start with the specified value and with balances that are greater than the specified amount). In this case **Aware IM** generates a form that prompts for the values of every attribute that requires input from the user.

It is possible to mix conditions that check for pre-configured values with conditions that require input from the user within a single query.

 **NOTE:** If the user does not provide any value, the corresponding condition is not considered at all when the search is performed. For example, if the user does not provide a value of the owner's name in a query that looks for accounts of the specified owners, the query will find all existing accounts. If the user does not provide the value of the account balance in a query that looks for the accounts of the specified owners with balances greater than the specified amount, but provides the name of the owner the query will find the accounts of the specified owner. If the user provides the balance amount but not the owner's name, the accounts with a balance greater than the specified amount will be found. Finally, if the user does not provide values for both the owner's name and the balance all existing accounts will be found. This capability may be quite useful in those types of searches where users only enter values for those criteria that they are interested in.

Running Queries in the Operation Mode

Usually the user would run a query by selecting an item of the “Run Query” type from the main menu, provided that such an item has been configured in the visual perspective – see [Operations](#). The user may not even realize that selecting a particular menu item will run a pre-configured query. For example, the configurator can define a query that finds accounts with balances larger than a certain amount and configure a menu item in a visual perspective called “Large Balances”. When the user selects this menu item in the Operation Mode the system will display the accounts with a large balance as expected and the user would not even be aware of the invocation of a query mechanism behind the scenes.

Note that as explained in [Operations](#) a query can also be implicitly invoked from the hyperlink of the business object presentation (see [Hyperlinks](#)) or from a business object form (see [Form Caption and Form Operations](#)). Again in both cases the user may not be aware of the existence of queries in the system.

There is also another way of running queries in the Operation Mode – that is, selecting a menu item of the “Search Objects” type (provided that one has been configured). An operation of this type shows the screen where the user can select a specific query that she wants to run from a list of all queries configured in the system. Note that since the user selects a particular query from a list of all available queries she should be well aware of the existence of queries in the system. Normally an operation of this type should be used by system administrators only.

Building Queries in the Operation Mode

In certain systems it may be necessary for the users to build and run their own queries rather than run pre-configured queries. The functionality of building queries dynamically in the Operation Mode is available from operations of the “Manage Queries” and “Run User Defined Queries” types – see [Operations](#).

The process of building a query in the Operation Mode is divided into several steps. For each step **Aware IM** shows the appropriate screen. It is possible to move forward and backwards between the steps. The parameters of a query that need to be specified during these steps are very similar to those specified when a query is defined in the Configuration Mode – see [Adding/Editing Queries](#). After all steps have been accomplished the built query is run and the found instances of the business objects are displayed.

Note that the query built in this way does not become part of the system configuration – however, it is accessible to end users of the system. Usually a system administrator would build such queries before other users start working with the system.

Searching for Data using Forms

Another way of retrieving data in the Operation Mode is using forms to search for business objects (see [Business Object Forms](#)). The idea is that the user is presented with a blank form of a business object. She can enter values in any field of the form, and when the form is submitted **Aware IM** will search for instances of this business object using the entered data. To do this **Aware IM** automatically builds and runs a query. When building a query **Aware IM** constructs a query condition for every value entered by a user and connects them using the “AND” operator. Blank fields are ignored.

For example, let's say we have a `Customer` business object with the following attributes: `FirstName`, `LastName`, `DOB`, `Address` and `TelephoneNo`. If the user enters “John” in the “`FirstName`” field of the form and “Smith” in the “`LastName`” field **Aware IM** will find all customers with the first name “John” and the last name “Smith”.

It is also possible for a more advanced user to enter not only simple values into the fields of a form but also expressions. The following table lists all possible keywords that can be entered into a field:

Keyword	Aware IM search behaviour
Literal value (string, number, date, timestamp)	For Plain Text attributes Aware IM will search for objects the attribute values of which contain the specified value; for all other attribute types – that are equal to the specified value
<	All objects with attribute values less than the specified value, for example: “<5”

>	All objects with attribute values greater than the specified value, for example: ">5"
<=	All objects with attribute values less or equal than the specified value, for example: "<=5"
>=	All objects with attribute values greater or equal than the specified value, for example: ">=5"
<>	All objects with attribute values not equal to the specified value, for example: "<>5"
=	All objects with attribute values equal to the specified value, for example: "=John Smith"
CONTAINS	All objects with attribute values that contain the specified value, for example: "CONTAINS 25"
STARTSWITH	All objects with attribute values that starts with the specified value, for example: "STARTSWITH 'John'"
ENDSWITH	All objects with attribute values that ends with the specified value, for example: "ENDSWITH 'ith'"
BETWEEN, AND	All objects with attribute values that are in the specified range, for example "BETWEEN 5 AND 10"
AND	Both conditions are included, for example "<5 AND >20"
OR	Either of the conditions is included, for example "<5 OR >20"

 **NOTE:** If the user enters data into the field of a [reference attribute](#) Aware IM will search through the related instances.

To configure an operation that will invoke a search using forms as explained above the configurator has to tick the “Using form” checkbox on the query property editor – see [Adding/Editing Queries](#).

 **NOTE:** When you use form-based queries it is also possible to specify query conditions when defining a query. These conditions will be used as *extra* conditions and will be automatically added to the query after the user enters data into the query form.

Advantages and disadvantages of using form-based search versus defining queries that require user input.

If you want users to be able to enter their search criteria dynamically at run time, you have two configuration options at your disposal – configure [queries requiring user input](#) or using [business object forms to search for data](#). Which one is better? There are advantages and disadvantages of using either method:

- Using forms often requires less configuration effort, as you don't need to configure a query (in some cases, however, you may want to configure a special form)

- Using forms may be more flexible as it offers a large number of attributes to the user to search by. However, it may be confusing to some users as some of the attributes may not be relevant to a particular search.
- Forms offer the power of expressions to advanced users, however, for users who do not want or cannot use expressions it is better to offer a simple way of entering a value only.
- Even though forms allow entering expressions, not all queries can be expressed with forms.

Data Presentation

After data has been retrieved from the system it needs to be presented to the user so that she can inspect and modify it if necessary. As explained in the [Data Retrieval](#) section data is retrieved by a query. The following section describes how **Aware IM** presents instances of business objects found by a query to the user. (Data may also be presented by generating a document or report – see [Working with Documents and Reports](#))

Business object instances found by a query may be presented in a *standard* or *custom* manner. Unless the configurator defines the query to use a presentation of the business object to display its results, the results of the query execution are displayed in the standard manner. This is explained in more detail in the following sections.

See:

[Standard Form of Query Results](#)
[Custom Form of Query Results](#)
[Calendar Form of Query Results](#)

Standard Form of Query Results

The standard form of query results is generated by **Aware IM** automatically. The standard form displays query results as a table. Every instance of a business object occupies a row in this table. Columns of the table display values of certain attributes of the business object. This is illustrated on the picture below:

	Number	First Name	Last Name	Date Of Birth	Address	
<input type="checkbox"/>	000001	Jane	Allison	12/10/1973	321 Ninth Street G...	
<input type="checkbox"/>	000007	James	Blake	08/08/1966	15731 Gilbert Cha...	
<input type="checkbox"/>	000020	Robert	Broom	06/06/1972	624 Prairie St Aug...	
<input type="checkbox"/>	000002	William	Cooper	12/12/1971	401 Willow Oaks D...	
<input type="checkbox"/>	000009	Leo	Crawford	07/10/1970	1742 Gremlin Way ...	
		1 - 25 of 27 items				

The attributes shown in the columns are specified when a query is configured. If they are not defined, **Aware IM** picks attributes to display at random.

The rightmost columns of every row in the table show the operations that can be performed with an instance represented by the row (in the above example there is the “Edit” and “Delete” operations). When defining a query it is possible to configure which operations will be available – see [Adding/Editing Queries](#).

The leftmost column of every row in the table may have a checkbox that allows selecting multiple instances of a business object to perform operations with.

If the number of instances found by a query is large only a limited number of these instances is displayed on one page (this number is 20 by default and can also be specified when a query is configured). To navigate between pages a user can press one of the navigation buttons located in the bottom left corner of the list and traverse to the start or end of the list and to the previous or next page or go directly to a particular page.

Clicking on a particular column allows sorting the list by the value of the column.

Custom Form of Query Results

The custom form of query results shows instances of a business object found by a query according to a custom HTML template or a *presentation* defined for this business object. This may be useful if the configurator wants to provide a more customized layout of the query results than the one offered by the standard form and/or include different visual effects not supported by the standard layout, such as foreground or background images.

The screenshot shows a presentation slide titled "TEAM MEMBERS". It features three horizontal cards, each containing a circular profile picture and the name and title of a team member. The first card for Andrew Fuller has a green header. The second card for Anne Dodsworth and the third card for Janet Leverling both have grey headers.

Team Member	Title
Andrew Fuller	VICE PRESIDENT, SALES
Anne Dodsworth	SALES REPRESENTATIVE
Janet Leverling	SALES REPRESENTATIVE

On the picture above each instance of the Customer object is represented by an HTML fragment that shows the Name, Title and Photo attributes of the customer.

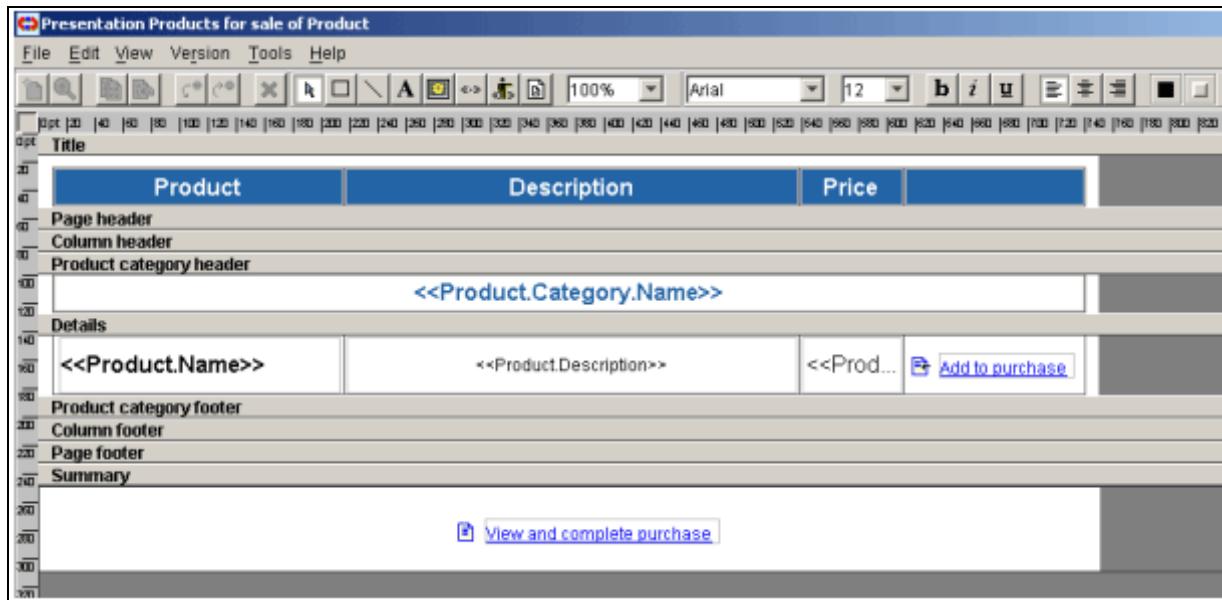
See:

[Business Object Presentation](#)

[Hyperlinks](#)

Business Object Presentation

Presentation of a business object is defined as part of the business object configuration (see [Defining Presentations](#)) and is designated to display the results of a particular [query](#) in a non-standard fashion (see [Custom Form of Query Results](#)). The layout of a presentation is created using the Report/Presentation Designer in the Configuration Tool. The following picture shows an example of a presentation defined for a business object Product.



If such a presentation is designated to display results of a query that finds all available products, running such a query in the Operation Mode will produce the following:

Product	Description	Price	
Professional market products			
Product upgrade	Upgrade to an advanced product	400.00	Add to purchase
Base product	This is a base level product	300.00	Add to purchase
Home market products			
Base product	This is a base product level for this category	500.00	Add to purchase
Advanced Product	This is an advanced product level for this category	400.00	Add to purchase
View and complete purchase			

The presentation layout consists of different sections called *bands*. Each band has its own purpose in the generation of the final output. Each band may contain design elements. There are several types of design elements, such as static texts, tags, images, rectangles, lines, conditional elements and sub-presentations. Probably the most frequently used design element is the tag element, which may refer to attributes of a business object and also contain arithmetic expressions with these attributes. Most of these elements are explained in detail in [Working with Documents and Reports](#).

The Report/Presentation Designer is a powerful tool that allows creating flexible and comprehensive layouts for reports and presentations. Some of the functionality of the Report/Presentation Designer may be familiar to those who used to work with report

generators before (such as, for example, Crystal Reports). In a way a presentation is similar to a report (see [Working with Documents and Reports](#)) in that it allows providing a title and summary, break the data into groups, display headers and footers for each group etc. Unlike reports presentations may include hyperlinks that invoke different operations – start processes, run queries, view other presentations etc – see [Hyperlinks](#).

Presentations can be displayed not only from the query results screen but also from operations invoked on a business object form (see [Form Caption and Form Operations](#)), from hyperlinks of some other presentation (see [Hyperlinks](#)) and from processes (using the [VIEW](#) action). In all these cases there is an instance of a business object, which owns the presentation that is being viewed. If the presentation is viewed from a business object form this instance is the instance of the object that the form displays; if it is viewed from a hyperlink this is the instance of the object that the hyperlink is associated with. If a presentation is viewed from a process this is the instance of the object in the [Context](#). Also in all these cases only a single instance of a business object is displayed by a presentation unlike the situation when a presentation shows query results where in most cases multiple instances are displayed. When designing the layout of a presentation it is important to remember whether the presentation will be used to display a single or multiple instances of a business object. Some presentations should only be used to display query results (i.e. showing multiple instances) while others should only be used from forms, hyperlinks or processes (i.e. showing single instances).

Hyperlinks

Hyperlinks invoke operations from a presentation. They are defined using the Report/Presentation Designer as part of the presentation layout (see [Setting Hyperlink Properties](#)).

Hyperlinks can be optionally attached to text, tag and image design elements. When defining a hyperlink the configurator has to specify the type of operation that the hyperlink invokes if clicked on by the user in the Operation Mode. These operations can start a process, run a query, display a form or presentation of a business object or navigate to a particular URL. The full list of operation types is described in the [Setting Hyperlink Properties](#) section.

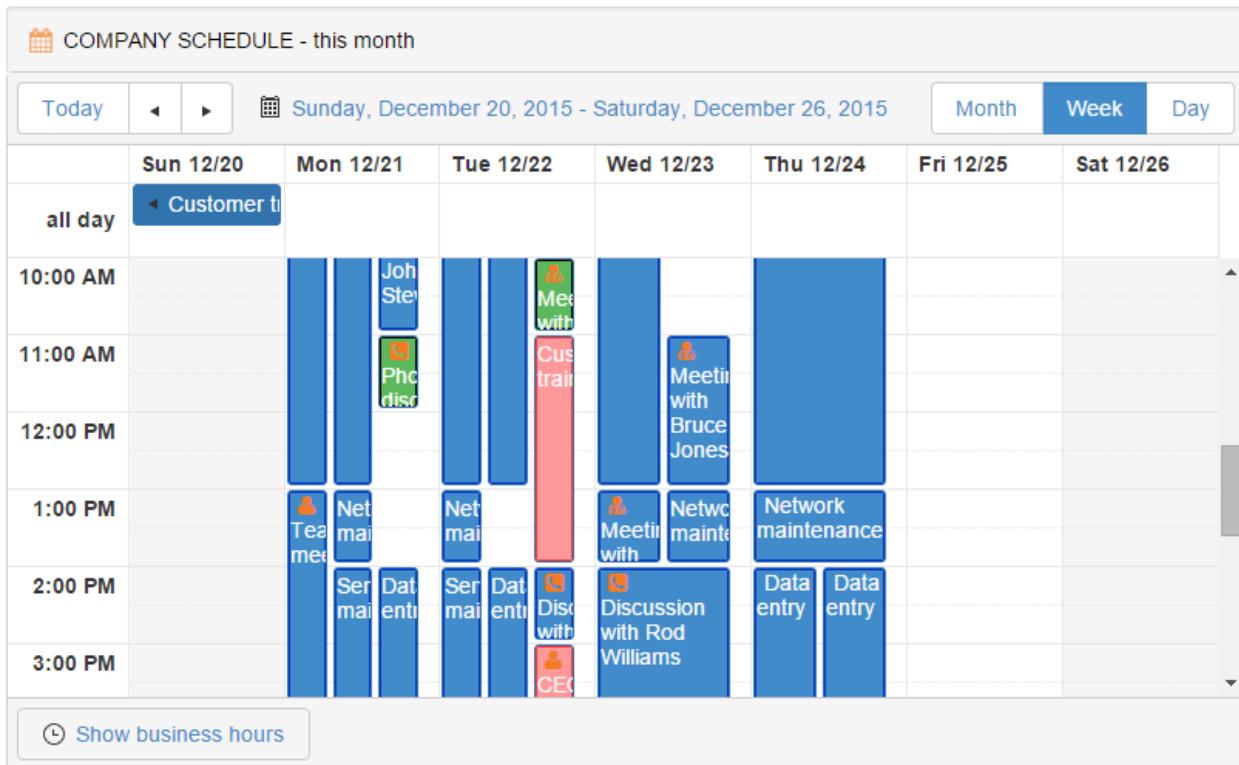
In the Operation Mode a hyperlink is most often associated with a particular instance of a business object. If a presentation where the hyperlink is defined shows one instance of a business object (see [Business Object Presentation](#)) this is the instance that the hyperlink is associated with. If the presentation shows multiple instances and the hyperlink is defined in the Details band of the presentation there will be as many hyperlinks as there are instances of the business object – each hyperlink will be associated with its own instance.

When an operation that a hyperlink invokes starts, the instance of a business object that the hyperlink is associated with becomes available as [context](#) for this operation. If the operation starts a process this instance may be used by rules of the process ([process](#))

[input](#)); if the operation runs a query this instance may be used by the query for attributes resolved dynamically (see [Configuring Queries](#)); if the operation displays the form for editing this instance is the one that gets edited.

Calendar Form of Query Results

Calendar form of query results can be used to show business objects of the Appointment type in a calendar style layout (see picture below).



Users can switch between different calendar views (daily, weekly, monthly etc), create and modify appointments, set priority of appointments. See also [Adding Appointment Objects](#).

Data Processing

As explained in the [Business Rules as Carriers of Business Logic](#) section in **Aware IM** data processing logic (or business logic) is configurable and centralized. It is expressed in the form of business rules rather than in a more traditional programming or scripting language. Implementation of this business logic is based on the fact that business rules get evaluated and their actions are executed as soon as the rule conditions are met.

This section explains in detail how this happens – how rule conditions are evaluated and what happens when rule actions are triggered.

See also:

[Rule Evaluation](#)
[Rules and Transactions](#)
[Execution Log](#)
[Configuration of Rules](#)

Rule Evaluation

In **Aware IM** rules are evaluated if either of the following happens:

- An instance of a business object is created (provided that there are rules attached to this business object)
- Value of an attribute of a business object instance is modified (provided that there are rules attached to this business object)
- A process implemented by rules is started
- **Aware IM** receives a [notification](#) (provided that there are rules associated with this event)
- A notification is created (provided that there are rules associated with this event)
- Scheduling rules are triggered by a timer event – see [Scheduling](#)

So what exactly do we mean by saying that “rules are evaluated”? Essentially this means that **Aware IM** starts checking whether rule conditions are met and if so begins execution of the corresponding actions. Before we explain how this happens for a number of rules, let us have a look first at the evaluation of a single rule.

See also:

[Context](#)
[Action Execution](#)
[Evaluation of Rule Collections](#)
[Evaluation of Unordered Rule Collections](#)
[Context of Rule Execution](#)
[Evaluation of Rules Containing WAS CHANGED Expressions](#)
[Initialization Rules](#)
[Summary of Rule Execution](#)

Context

When evaluating a rule **Aware IM** checks if rule conditions are met and if so executes the action specified by the rule⁴.

⁴ Strictly speaking this is not necessarily true. For un-ordered rule collections an action is not executed immediately but is placed on the agenda first. An action on the agenda may or may not be executed – see [Initialization Rules](#)

Let us consider the following rule as an example (taken from an application that manages car insurance policies – the rule itself may or may not be very realistic, but it does not matter for the purposes of this example):

```
IF Driver.Age > 70 Then INCREASE Policy.Excess BY 100
```

According to this rule the system is supposed to evaluate whether the age of the driver is greater than 70 and if so, increase the excess of the policy by 100 dollars. The question is – which driver and which policy? The system may have details about thousands of drivers and thousands of policies in its database – so, which ones are we talking about? If you ask a businessperson this question, she will probably answer something along the lines of “Of course, I know what I am talking about – the driver here is the person who has asked for a quote and the policy is the policy we are calculating for her”. Judging from this imaginary but quite possible answer, one can draw a conclusion that a businessperson always has a certain context in mind when she talks about business rules. In the example above this context is the fact that someone asked for a quote already - the business rule is therefore evaluated within this context and so “the driver” and “the policy” have a very specific meaning.

The concept of *Context* therefore is the key to rule evaluation and action execution – when deciding which instances of the business objects to consider when checking rule conditions and executing actions, **Aware IM** looks for such instances in the Context (with one exception that we will consider later). The Context can be regarded as a special place within **Aware IM** where it keeps “relevant” instances of the business objects and notifications. Still the question is how this Context is formed – how does **Aware IM** know which instances are relevant and which ones are not?

There are certain formal events within **Aware IM** that affect the contents of the Context. The full list of such events is described in the [Data Processing](#) section. Here we only mention two of them:

- If an instance of a business object is created by the [ENTER NEW](#) or [CREATE](#) actions, it is placed in the Context.
- If rules attached to a business object are being evaluated the instance of the business object, for which rules are being evaluated, is placed in the Context.

Now let us go back to our rule – to get a full picture of what is going on when it is being evaluated we must consider what was happening before and restore the context of rule evaluation. We assume here that the software calculates the details of the requested policy after someone has asked for a quote. It is therefore quite reasonable to assume that there is some process that displays the form with the driver’s details to be filled out by a user and after the form has been filled out calculates the details of the policy. The rules of the process might look something like this:

[Evaluation of Unordered Rule Collections](#). In this section, however, we will assume for simplicity that actions are always executed

ENTER NEW Driver
CREATE Policy

We assume here that the `Driver` and the `Policy` business objects are defined and that the `Policy` business object has our rule attached to it as well as other rules that calculate all the details of the policy. The first action displays the form of the `Driver` business object on the user's screen. As soon as the user enters all the details the instance of the `Driver` object is created and is placed in the Context (if there are any rules attached to the `Driver` object they are evaluated as well). Then the instance of the `Policy` object is created and placed in the Context and the rules attached to the `Policy` business object (including our rule) are evaluated. Therefore when our rule is being evaluated the appropriate instances of the `Driver` and `Policy` business objects will have been already made available in the Context and the system uses the values of the attributes of these objects to check the rule conditions and execute actions. By the time the system finishes the creation of the `Policy` object all the details of the policy will have been calculated!

More detailed information about the Context is given in the [Context of Rule Execution](#) section.

Aggregate Operations

In the [Context](#) section we have mentioned that there is one exception to the fact that **Aware IM** looks for instances of the business objects to work with in the Context. This exception applies to *aggregate operations*. Aggregate operations are those rule expressions that start with keywords `EXISTS`, `COUNT`, `SUM`, `MIN`, `MAX`, `AVG` (see [EXISTS Expression](#) and [Aggregate Calculations](#)). When such an expression is encountered **Aware IM** always looks at all data available in the database and considers all instances in the database that match the conditions of the aggregate operation, not only instances in the Context. For example,

```
IF EXISTS Policy WHERE Policy.Excess > 1000 Then DoSomething
```

Here **Aware IM** looks at all existing policies in the database to find out if there is any policy with excess greater than one thousand dollars.

Let us now have a look at what happens when the conditions of a rule have been met and the corresponding action(s) are triggered. See [Action Execution](#).

Action Execution

Before an action triggered by a rule is executed the system's data is assumed to be in a stable state. The "data" here means the entire collection of data available— all instances

of all business objects stored in the database or in some other storage media known to **Aware IM**. A stable state means that all the data is consistent and nothing is happening – the state of the system is “fixed” at this moment in time⁵.

An action may disturb the stable state of the system by doing one of the following:

- Creating a new instance of some business object
- Modifying the existing instance of some business object

After the disturbance occurs **Aware IM** starts checking if there are rules defined anywhere in the system that react to the creation or modification of the business object instance. If that is the case **Aware IM** starts evaluation of such rules. These rules in turn may create or modify other instances of business objects and cause other disturbances and so on – thus starting a chain reaction that stops only when there are no rules to evaluate any more, in which case the system moves to a stable state again (but this state is different from the previous state as the the data is probably different).

We said above that if there are rules anywhere in the system that react to the creation or modification of the business object instance, they are evaluated. What does “anywhere in the system” mean here? It means the following:

1. Rules attached to a business object the instance of which has been created or modified.⁶
2. Rules attached to other business objects that refer to the business object instance that has been created or modified.

The first set of rules has already been mentioned before – whenever a new instance of a business object is being created or the existing instance is being modified, and there are rules attached to this business object, they are evaluated. In the example of the previous section rules attached to the `Driver` business object are evaluated after the form has been filled out (this is when the instance of the `Driver` object is created in the system). Rules attached to the `Policy` business object are evaluated immediately after the `CREATE` action creates a new instance of the `Policy` object. Let us suppose now that we modify our process to add an action that sets the state of the policy after it has been created, so the process now looks like this:

```
ENTER NEW Driver
CREATE Policy
Policy.State='Calculated'
```

⁵ This may not be true if the action was triggered in the middle of the evaluation of an un-ordered collection of rules – see [Evaluation of Unordered Rule Collections](#). In this section, however, we will assume for simplicity that the state of the system is always stable prior to the execution of an action.

⁶ This does not apply to the instance of a business object the rules of which are already being evaluated as part of an un-ordered collection of rules - see [Evaluation of Unordered Rule Collections](#). We will ignore this case for purposes of the current discussion.

The action in the third rule unconditionally modifies the attribute of the `Policy` object – this causes the rules attached to the `Policy` object to be evaluated again.

The second set of rules (those rules that refer to the instance of the business object that has been created or modified) is called *cross-reference rules*. An explanation of what these are, are given in the [Cross-reference Rules](#) section.

Cross-reference Rules

Cross-reference rules are rules that refer to a particular instance of a business object through the [reference attribute](#) of another object. For example, let us assume that our `Policy` business object has a reference attribute declared – this reference is to the `Driver` for which the policy is made. Let us assume that the name of this attribute is `MyDriver`. Our age rule should now be written like this:

```
IF Policy.MyDriver.Age > 70 Then INCREASE Policy.Excess BY 100
```

We should also make modifications to the process that enters the details of the driver and calculates the policy to initialize the `MyDriver` attribute of the `Policy` object appropriately:

```
ENTER NEW Driver  
CREATE Policy WITH Policy.MyDriver=Driver
```

The age rule written in the above form refers to the instance of the `Driver` object through the reference of the `Policy` object (`Policy.MyDriver.Age`). This rule therefore is a cross-reference rule.

Cross-reference rules are evaluated whenever the instance of the object they refer to is changed. Consider what happens if a policy for some driver has been calculated but then the user realizes that she had made a mistake and entered the wrong age of the driver. She brings up a form for the driver and changes the value of the `Age` attribute. Let us see what happens when the changes are submitted. The particular instance of a `Driver` object is modified and therefore if there are any rules attached to the `Driver` object they are evaluated. Let us assume for simplicity that there are no such rules. There is however a rule that refers to the `Driver` object – this is our age rule. **Aware IM** automatically finds the instance of the `Policy` object that refers to the instance of the modified `Driver` object and starts evaluating the cross-reference rule. Thus the system guarantees that the excess is correctly calculated no matter where the change that affects its calculation happens! If the age value entered first was 70 and the correct age is 71 then the excess will be re-calculated as soon as the correct age of 71 is submitted.

Note that **Aware IM** will re-calculate cross-reference rules only for those instances of business objects that refer to the modified instances – in our example, only the `Policy`

instance that refers to the modified `Driver` object will be re-calculated; all other policies will not be considered.

There is a flag in the Configuration Tool that allows you to explicitly turn off the cross-reference rule mechanism for a particular rule (see [Advanced Rule Options](#)). When this flag is turned off for a rule the rule is never recognized as a cross-reference rule, so if any attributes referred to by this rule are modified the rule is not evaluated. Turning off this flag may be useful if evaluation of a cross-reference rule as a result of an attribute change leads to modification of a large number of business object instances. For example, let us say that our `Policy` object refers to a `StampDuty` object in a rule that calculates commission of the policy:

```
Policy.Commission = Policy.Value/20 + Policy.StampDuty.Rate/100
```

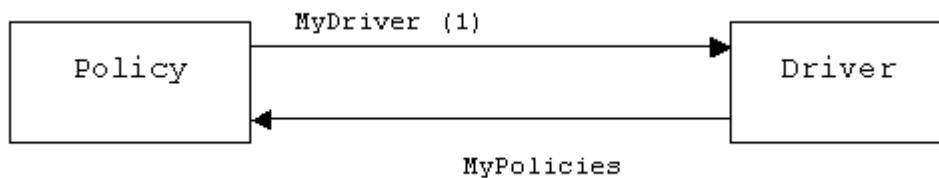
If rate of the `StampDuty` object changes this change will cause re-calculation of all policies in the system through the above rule, which is normally interpreted as a cross-reference rule. If there are a large number of policies in the system their re-calculation may take up significant time. You may want to warn the user about the effect of such change or even defer the execution of the change until nighttime. In this case you would like to configure a process that would control the changes to critical attributes of the system and turn off automatic recognition of cross-reference rules.

Other Points Related to Action Execution

There are also a couple of other interesting points worth mentioning when describing execution of actions.

- a) When a reference attribute of some object is modified and this reference attribute has matching attribute on the referred object, the referred object is modified as well and its rules (if any) are evaluated (see [Reference Attributes](#) for the explanation of what matching attribute is).

For example, let us assume that the `Policy` object has a reference to the `Driver` object like in the previous example. Let us also assume that this attribute has a matching reference on the `Driver` object called `MyPolicies`, which refers to all the policies of a driver. The relationships between objects are illustrated in the following diagram:



Let us also assume that there is a rule somewhere that sets the reference of some instance of the `Policy` object to some instance of the `Driver` object:

```
Policy.MyDriver=Driver
```

This action modifies the instance of the `Policy` object and so any rules attached to the `Policy` are evaluated. This is not the only thing that happens, however. Because the `MyDriver` attribute of the `Policy` object has a matching attribute in the `Driver` object (`MyPolicies`), the instance of the `Driver` object that is set into the `Policy` is modified as well – the instance of the `Policy` object appears in its list of policies. Consequently if there are any rules attached to the `Driver` object they are evaluated as well.

- b) The rules that check whether the existing member has been changed in a list are considered to be cross-reference rules.

Let us assume hypothetically that the `Driver` object has the attribute `TotalExcess` that is supposed to store the cumulative excess across all policies of a particular driver. Consider the following rule attached to the `Driver` object, which re-calculates the value of total premium whenever one of its policies changes in any way:

```
IF Policy FROM Driver.MyPolicies WAS CHANGED Then  
Driver.TotalPremium = SUM Policy.Excess WHERE Policy IN  
Driver.MyPolicies
```

Even though there is no attribute of some business object that is referred to through a reference of another business object in this rule, the rule is still considered to be a cross-reference rule. So if a user modifies attributes of some `Policy` object the rules of the related instance of the `Driver` object are automatically evaluated as well and the total premium is re-calculated.

Evaluation of Rule Collections

We had a look at how **Aware IM** identifies instances of the business objects to work with and also what happens when actions are executed. Let us now look in more detail at how rules are evaluated. In the [Rule Evaluation](#) section we have provided the list of events that trigger rule evaluation. When any of these events occur there is a number of rules that are considered for evaluation – if a process has been started these are the rules that implement the process, if an instance of a business object is created or modified, these are the rules attached to the business object and so on. We will call these sets of rules *rule collections*.

Rule collections can be *ordered* or *un-ordered*. Ordered rule collections are evaluated one-by-one in exactly the same order that they appear in the rule collection. The only example of an ordered rule collection is a process implemented by rules, which has the

“Maintain rule order” flag turned on – see [Adding/Editing Processes](#). When such a process is started its first rule is evaluated and the actions are executed if rule conditions are met. If actions create any instances of the business objects they are placed in the Context as described in the [Context](#) section. If actions create or modify instances of business objects the rules attached to these business objects (if there are any) are evaluated, cross-reference rules (if there are any) get evaluated as well – as described in [Action Execution](#). When action(s) of the first rule finish their execution, the second rule of the ordered rule collection of the process is examined – its conditions are evaluated and if they are met the corresponding actions are executed. This cycle is repeated until the last rule in the collection has been evaluated.

Evaluation of un-ordered rule collection is very different. So different in fact that an entire section in this document is dedicated to the evaluation of un-ordered rule collections. See [Evaluation of Unordered Rule Collections](#).

Evaluation of Unordered Rule Collections

Evaluation of an un-ordered rule collection in **Aware IM** is implemented by a rule engine, so the terminology used in this section will probably be familiar to those who used to work with rule-based systems before and knows the theory behind the algorithms employed by rule engines.

See also:

[Overview of Rule Engine Framework](#)

[Example of Rule Engine Execution](#)

[“While” Semantics](#)

[Did it Change?](#)

[Rule Priorities](#)

Overview of the Rule Engine Framework

Most rule collections in **Aware IM** are un-ordered, such as rule collections attached to business objects and notifications as well as processes that have the “Maintain rule order” flag turned off. From the name of the rule collection it is clear that the order of rules in the collection does not matter. So how does the rule engine in **Aware IM** decide which rules to evaluate first, second and so on?

The answer is that when the rule engine starts evaluating an un-ordered rule collection it evaluates *all* rules of the collection at once. Actions for those rules for which conditions have been met are stored in a separate container called the *agenda*. The fact that there are actions on the agenda does not mean that all these actions are immediately executed – the actions are waiting until they are taken off the agenda and are executed. Actions are stored on the agenda in *blocks*. Action block corresponds to exactly one rule that triggers the actions of the block in the first place. Usually an action block contains

just one action, however, if a rule triggers several actions the block contains several actions.

So what happens after all rules have been evaluated and placed on the agenda? The first action block is taken off the agenda and is executed. Which action block is first? The answer to this question is undefined. It is impossible to predict which action block will be executed first - the action block is taken off the agenda at random⁷.

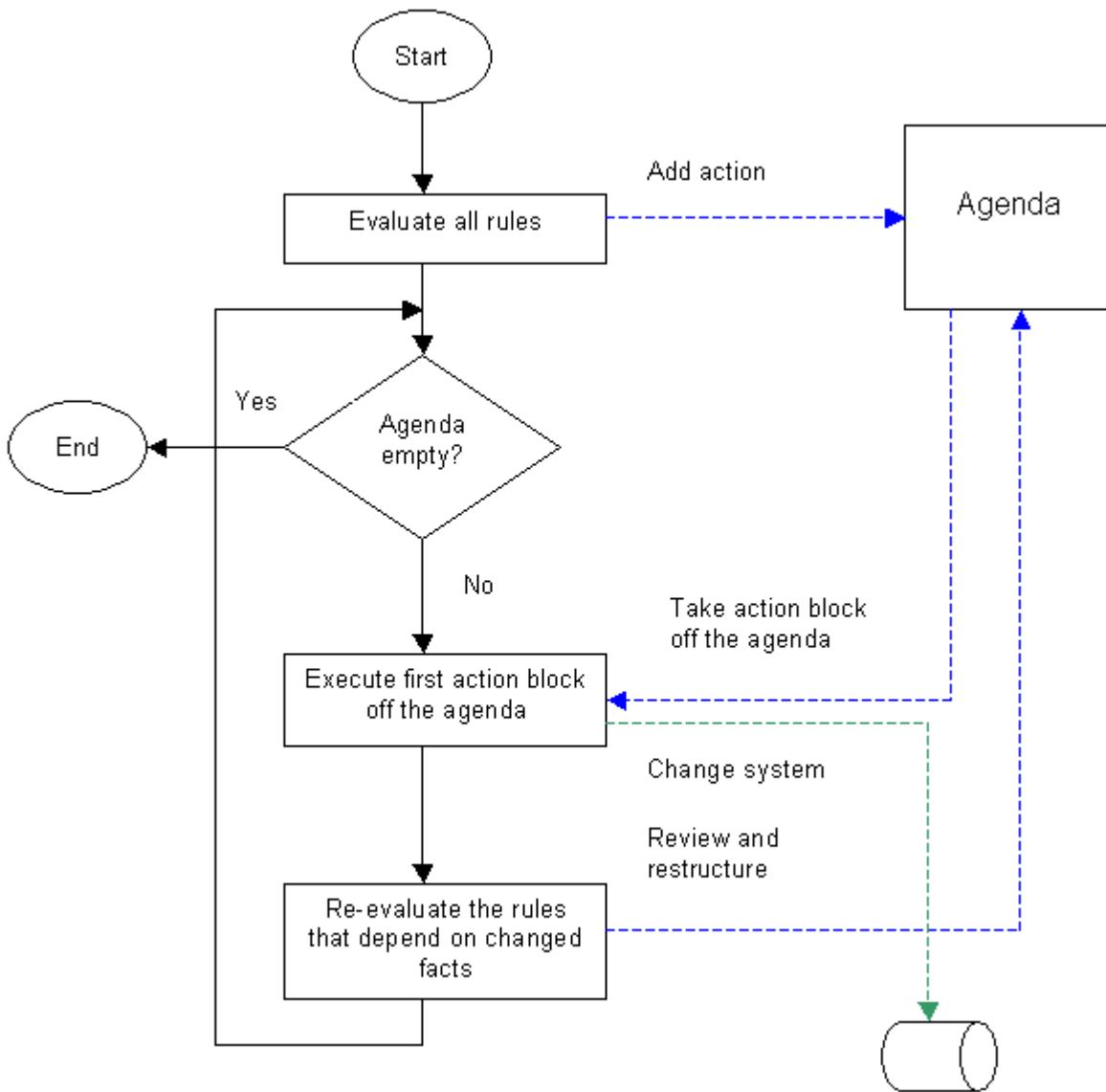
What happens next? The actions of the first block randomly taken off the agenda are executed. What happens during execution of such actions is described in [Action Execution](#). The only difference is that if the un-ordered rule collection represents rules attached to a business object and the actions modify some attribute of the same business object, then the entire collection of rules does not get re-executed again, since it is already being executed.

After the first action block has finished execution the rule engine starts to re-evaluate conditions of the rules, since the actions could have changed the state of the system (represented by values of attributes of business objects that are in the rule engine terminology called *facts*). Note that only those rules that depend on the facts changed by the action(s) are re-evaluated. The agenda is reviewed as well – those action blocks that represent rules with the conditions that no longer hold are removed from the agenda and the new action blocks representing rules for which the conditions hold are placed on the agenda.

After the agenda has been re-structured another action block is randomly taken off the agenda and executed. The cycle is repeated until there are no more action blocks on the agenda.

This algorithm can be summarized by the following flowchart:

⁷ In fact the order is random only for action blocks that have equal priority – see priorities later in this section. In the current discussion we assume for simplicity that the order is completely random.



Example of Rule Engine Execution

To better illustrate how the rule engine works let us consider the following example. Suppose that our `Policy` object has the following rules defined (again it does not matter whether this example is very realistic):

1. Rule 1 (initialization of `State` attribute):

```
IF Policy.State IS UNDEFINED Then Policy.State = 'NEW'
```

2. Rule 2 (initialization of `Excess`):

```
IF Policy.Excess IS UNDEFINED Then Policy.Excess = 0
```

3. Rule 3 (calculation of excess for young drivers)

```
IF Policy.State = 'NEW' AND Policy.MyDriver.Age < 70 Then
Policy.Excess = 100
```

4. Rule 4 (calculation of excess for elderly drivers)

```
IF Policy.State = 'NEW' AND Policy.MyDriver.Age >= 70 Then
Policy.Excess = 200
```

5. Rule 5 (calculation of final state)

```
IF Policy.Excess > 0 Then Policy.State = 'CALCULATED'
```

Let us assume that an instance of the `Policy` object is being created, `Policy` is initialized with a reference to the `Driver`, whose age is 30 and all other attributes of the `Policy` object are initially undefined. Now let us see what happens when the rule engine starts evaluating the rules for this new instance of the `Policy` object.

Scenario 1:

Step 1: all rules are evaluated. The conditions are met for Rule 1 (`State` is initially undefined) and Rule 2 (`Excess` is initially undefined) only. Conditions of Rule 3 and Rule 4 are not met because the `State` is not 'NEW'; conditions of Rule 5 are not met because the `Excess` is undefined. The agenda is formed and it initially contains actions blocks of Rule 1 and Rule 2 (each action block has one action):

Agenda:

- `Policy.State = 'New'` (from Rule 1)
- `Policy.Excess = 0` (from Rule 2)

Step 2: an action block is randomly taken off the agenda. Let us assume that it is the action block from Rule 2. After it is executed the value of `Excess` attribute becomes 0. The agenda now only has the action block from Rule 1.

Agenda:

- `Policy.State = 'New'` (from Rule 1)

Step 3: Rules that depend on the changed attribute `Excess` are re-evaluated. Rule 2 and Rule 5 only depend on the value of `Excess` attribute (Rule 3 and Rule 4 set this value but do not depend on it). The conditions of Rule 2 and Rule 5 are re-evaluated. Both conditions are not met (`Excess` is defined and equal to 0). Therefore their actions are not placed on the agenda. Existing agenda is reviewed as well – its only action is from Rule 1, which does not depend on the changed attribute and so is left intact. The agenda therefore still has one action block from Rule 1.

Agenda:

- Policy.State = 'New' (from Rule 1)

Step 4: an action block is randomly taken off the agenda. There is only one action block on the agenda so it is executed. The value of the State attribute becomes 'NEW'

Agenda: (empty)

Step 5: Rules that depend on the changed attribute are re-evaluated. Rule 1, Rule 3 and Rule 4 depend on the value of the State attribute, so their conditions are re-evaluated. Only conditions of Rule 3 are met because the State is now defined and the age of the driver is 30. So the action of Rule 3 is placed on the agenda.

Agenda:

- Policy.Excess = 100 (from Rule 3)

Step 6: the only action block is taken off the agenda and is executed. The value of excess becomes 100.

Agenda: (empty)

Step 7: The conditions of Rule 2 and Rule 5 that depend on the Excess attribute are re-evaluated. The condition of Rule 5 is met and the corresponding action is placed on the agenda.

Agenda:

- Policy.State = 'CALCULATED' (from Rule 5)

Step 8: the only action block is taken off the agenda and is executed. The value of state is now CALCULATED.

Agenda: (empty)

Step 9: The conditions of Rule 1, Rule 3 and Rule 4 that depend on the State attribute are re-evaluated. Neither condition is met; nothing is placed on the agenda.

Agenda: (empty)

Step 10: The agenda is empty; the algorithm finishes. The value of Excess is 100, the value of State is CALCULATED

Agenda: (empty)

Let us see now what would happen if a different action block was taken off the agenda at Step 2.

Scenario 2:

Step 1 is the same as before.

Step 1: all rules are evaluated. The conditions are met for Rule 1 (State is initially undefined) and Rule 2 (Excess is initially undefined) only. The agenda has the corresponding actions

Agenda:

- Policy.State = 'New' (from Rule 1)
- Policy.Excess = 0 (from Rule 2)

Now we take the action from Rule 1 off the agenda.

Step 2: The action block from Rule 1 is taken off the agenda. It is executed and the value of State attribute becomes 'NEW'. The agenda now only has the action block from Rule 2.

Agenda:

- Policy.Excess = 0 (from Rule 2)

Step 3: The conditions of Rule 1, Rule 3 and Rule 4 are re-evaluated because they depend on the value of the changed attribute State. The condition of Rule 3 only is met (state is 'NEW' and driver age is 30) so its action is placed on the agenda. The agenda is reviewed as well – the rule of its existing action block does not depend on the State attribute and so the action is left intact. The agenda now has 2 actions.

Agenda:

- Policy.Excess = 0 (from Rule 2)
- Policy.Excess = 100 (from Rule 3)

Step 4: an action block is randomly taken off the agenda. Let us assume that it is the action block from Rule 3. After it is executed the value of the Excess attribute becomes 100. The agenda now only has the action block from Rule 2.

Agenda:

- Policy.Excess = 0 (from Rule 2)

Step 5: The conditions of Rule 2 and Rule 5 are re-evaluated because they depend on the value of the changed attribute Excess. The condition of Rule 5 only is met so its action (Policy.State = 'CALCULATED') is placed on the agenda. The existing action on the agenda is reviewed as well. The action comes from Rule 2 that depends on the changed attribute so the condition is re-evaluated – it no longer holds (Policy.Excess is no longer undefined as its value is now 100)! This means that the action is removed from the agenda! Therefore the only action that remains on the agenda is the action from Rule 5.

Agenda:

- Policy.State = 'CALCULATED' (from Rule 5)

Further steps are equivalent to steps 8, 9 and 10 in the previous scenario. At the end of the algorithm we will also have the value of State='CALCULATED' and the value of Excess=100.

Finally let us consider what would have happened if a different action was taken off the agenda at step 4 of the second scenario.

Scenario 3:

The first 3 steps are the same:

Step 1: all rules are evaluated. The conditions are met for Rule 1 (State is initially undefined) and Rule 2 (Excess is initially undefined) only. The agenda has the corresponding actions

Agenda:

- Policy.State = 'New' (from Rule 1)
- Policy.Excess = 0 (from Rule 2)

Step 2: The action block from Rule 1 is taken off the agenda. After it is executed the value of the State attribute becomes 'NEW'. The agenda now only has the action block from Rule 2.

Agenda:

- Policy.Excess = 0 (from Rule 2)

Step 3: The conditions of Rule 1, Rule 3 and Rule 4 get re-evaluated because they depend on the value of the changed attribute State. The condition of Rule 3 only is met (state is 'NEW' and driver age is 30) so its action is placed on the agenda. The agenda is reviewed as well – the rule of its action does not depend on the State attribute and so the action is left intact. So the agenda now has 2 actions.

Agenda:

- Policy.Excess = 0 (from Rule 2)
- Policy.Excess = 100 (from Rule 3)

Now we take the action from Rule 2 off the agenda.

Step 4: The action block from Rule 2 is taken off the agenda. After it is executed the value of the Excess attribute becomes 0. The agenda now only has action block from Rule 3.

Agenda:

- Policy.Excess = 100 (from Rule 3)

Step 5: The conditions of Rule 2 and Rule 5 are re-evaluated because these rules depend on the changed attribute Excess. The conditions of neither rule are met (Excess is defined and is equal to 0). The existing action on the agenda is reviewed as well – its rule depends on the changed attribute, but its conditions still hold, so the action remains on the agenda.

Agenda:

- Policy.Excess = 100 (from Rule 3)

Step 6: the only action block is taken off the agenda and is executed. The value of `Excess` is now 100.

Agenda: (empty)

Step 7: The conditions of Rule 2 and Rule 5 are re-evaluated because they depend on the value of the changed attribute `Excess`. The condition of Rule 5 only is met so its action is placed on the agenda.

Agenda:

- `Policy.State = 'CALCULATED'` (from Rule 5)

Further steps are equivalent to steps 8, 9 and 10 of the scenario 1. At the end of the algorithm we get the value of `State='CALCULATED'` and the value of `Excess=100` again.

Interestingly, no matter in which order we take the actions off the agenda the end result is the same! This is only possible, though, if every single rule in the un-ordered collection of rules is self-contained (independent of how and when other rules are evaluated) and consistent (makes sense from the business point of view) and this is what business rules are supposed to be! This is worth stressing again – **business rules must be self-contained and consistent!**

“While” Semantics

Normally when the rule engine finishes execution of an action it starts re-evaluating rules that depend on changed facts only. However, generally speaking, it must also re-evaluate conditions of the rule that triggered the last action irrespective of whether the rule depends on the changed facts or not. The rationale behind this is that if conditions of a rule are met its actions must be executed. There is no guarantee that the action that has just been executed had changed anything that could have affected its conditions, so the engine must evaluate the rule again⁸.

This behaviour means that the same rule may be evaluated over and over again provided that its conditions still hold. Thus a rule may encapsulate the semantics of the “while” statement – instead of defining a rule as “IF something is true then do something” we might as well define it as “WHILE something is true then do something”.

The only problem with the above behaviour is that the subtlety of the “while” semantics is easy to overlook. Anyone defining business rules must be very careful as the incorrect usage of rules may cause infinite loops (the rule engine will eventually time out and abort if an infinite loop does occur). Consider the following rule:

⁸ There is a guarantee that conditions of other rules, which do not depend on changed facts and which actions are not on the agenda, do not hold (otherwise they would have been on the agenda) – this is the reason the algorithm does not consider them after execution of an action.

```
IF Glass.State <> 'FULL' Then INCREASE Glass.WaterLevel BY 10
```

The rule is supposed to add some water to a glass if it is not full already. If we only have this single rule defined for a Glass object and we evaluate it for a glass with the State attribute not FULL initially, the rule will keep executing the INCREASE action until the engine times out. However, if we add the following rule to the Glass object everything will be fine:

```
IF Glass.WaterLevel = 100 Then Glass.State = 'FULL'
```

Aware IM supports a special flag that makes it possible to turn off the “while” semantics behaviour for a rule (see [Advanced Rule Options](#)). If this flag is turned off the rule engine will not evaluate the rule that triggered the execution of the last action block taken off the agenda (unless the conditions of the rule depend on the values of attributes that the action of the rule changes). For example, if the flag for the rule

```
IF Glass.State <> 'FULL' Then INCREASE Glass.WaterLevel BY 10
```

is turned off, the rule will be evaluated initially and its action will be executed (if state is not FULL), but it will not be executed immediately again. Other actions (if there are any) will get executed and if those actions do not change the value of the State attribute our rule will not be re-evaluated again. However, if our rule were written like this:

```
IF Glass.WaterLevel <> 100 Then INCREASE Glass.WaterLevel BY 10
```

it would be re-evaluated repeatedly after the execution of the INCREASE action irrespective of the value of the “while semantics” flag. This is because the INCREASE action changes the value of the WaterLevel attribute and the rule condition depends on this value.

Did it Change?

The subtle issue described in this section is related to a stage in the rule engine algorithm where it detects which rules depend on the changes made by the previously executed action. The subtle point here is that even though the action has been executed it may not have changed the state of the system, even if it had attempted to modify the value of some attribute. This happens, for example, if an action sets the value of the attribute that is equal to its current value. This situation is considered to be a non-event from the rule engine point of view and the rule engine simply ignores the fact that the action has been executed. Consequently it does not re-evaluate the rules and review the existing agenda even for a rule that triggered the last action.

This behaviour helps to avoid infinite loops in certain rules even if they support “while” semantics. Consider the following rule, for example:

```
If Policy.Driver.Age > 70 Then Policy.Excess = 200
```

If a rule supports the semantics of a “while” statement (see [While Semantics](#)) the rule can be interpreted as “while driver’s age is greater than 70 set excess to 200”. The driver’s age will never change here and so we might think that this rule would cause an infinite loop. This does not happen, however. After the action has been executed for the first time and the new value has been set to 200, all subsequent executions of the action would not change the value of the attribute and so the rule is not evaluated again.

 **NOTE:** the rule engine will not execute unconditional rules over and over again if the action keeps changing the value of some attribute, since such action guarantees to cause infinite loop. For example, the following rule with no conditions:

```
INCREASE Policy.Excess BY 100
```

will only be executed once.

Rule Priorities

When describing the rule engine algorithm in the [Overview of the Rule Engine Framework](#) section we said that action blocks are taken off the agenda at random. This is not quite true - the order of action blocks on the agenda is not completely random, but arranged according to rule priorities. The higher the priority of the rule corresponding to the action block the sooner it will be executed. The rule engine guarantees that action blocks corresponding to rules with higher priority are always executed before action blocks corresponding to rules with lower priority – whatever actions exist on the agenda are sorted according to the priorities of their rules and are taken off the agenda in that order.

It is important to stress, though, that if priorities of the rules are the same, the order of the corresponding action blocks *is* random. Most often action blocks on the agenda correspond to rules that have the same priority – that is why we ignored rule priorities when describing the rule engine algorithm.

So when are priorities important? First of all, when we are dealing with rules that invoke actions that do not modify the value of some attribute, but call predefined system operations, such as [REPORT ERROR](#), [SEND](#) etc. By default **Aware IM** assigns lower priorities to such rules than the priorities of rules invoking actions that modify attributes. The rationale is that unlike modification of an attribute, the predefined system operations are one-off actions that usually have drastic effects that cannot be undone. For example, the REPORT ERROR action immediately aborts the execution of the rule engine without giving it a chance to change anything (unless [process failure rules](#) are defined). Consider the following rules:

Rule 1: If Policy.State IS UNDEFINED Then REPORT ERROR 'State must always be defined'

Rule 2: If Policy.State IS UNDEFINED Then Policy.State = 'NEW'

If priorities of these rules were equal there is a chance that Rule1 is executed before Rule 2. If this happened the engine would be immediately aborted without being able to change the value of the Policy.State to NEW and by doing so avoid execution of Rule 1. This does not happen as **Aware IM** assigns lower priority to Rule 1 than to Rule 2 or any other “modify attribute” rule. Therefore validation rules like Rule 1 are only evaluated after the values of all attributes have “stabilized”.

Another type of rule that is prioritised by **Aware IM** by default is a rule that has an action, which generates documents from document templates (see [Document Generation](#)). Again documents should only be generated after values of all attributes have stabilized and so such a rule has low priority.

It is relatively rare that someone might need to prioritize rules explicitly. One such need may arise from the necessity to specify the default action to be taken if all else fails. For example, there may be a situation when we enumerate possible options and take action in each case: “If condition1 then do something”; “If condition2 then do something else”; “If condition 3 then do something else again” and so on. Finally we may want to take a default action that is executed if neither of the conditions holds. We could write a rule that would negate all the conditions: “If NOT condition1 and NOT condition2 and NOT condition3 ... then take default action”. If there are many conditions it may be quite tedious and impractical to negate them all. An alternative would be to assign lower priority to the rule that takes the default action compared to the rules that check conditions.

Context of Rule Execution

In the [Context](#) section we have introduced the concept of Context and explained where **Aware IM** looks for instances of business objects and notifications while evaluating rules. This section provides more details about the Context; in particular, it explains how and when the Context is formed.

See also:

[How Context is Formed](#)
[Instances Prefixes](#)
[Other Usages of Context](#)

How Context is Formed

The Context is used by **Aware IM** to resolve values of attributes of business objects during evaluation of rule collections (both ordered and un-ordered – see [Evaluation of Rule Collections](#)). It is important to emphasize that each rule collection has its own

Context; there is no single Context that is shared by all rule collections. For example, let us suppose that we are executing a rule collection representing rules of a process. This rule collection has a Context associated with it (let us not worry for now how it was formed). If some action modifies the value of an attribute of some business object

Aware IM starts evaluating the rules attached to this business object. Before doing so it assigns a new Context to this collection of rules (again let us not worry for now what gets written into this Context). Once the rules attached to the business object finish execution, the Context associated with the rule collection is discarded and **Aware IM** continues evaluation of the process rules. Now, if some action of these rules starts another process **Aware IM** assigns another Context and starts evaluating the rules of a sub-process. When the sub-process finishes **Aware IM** discards the Context and returns to the evaluation of the rules of the original process.

Let us now have a look at what gets written into the Context and when. The contents of the Context is changed under the following scenarios:

1. Instances of the business objects found by the FIND and PICK FROM actions are written into the Context of the rule collection that invokes these actions⁹.

For example, let us look at the following process:

```
FIND Driver WHERE Driver.Name = 'John Smith'
Driver.Age = 40
```

The first rule in this process finds the driver with the name John Smith. If such an instance is found it is written into the Context.

2. Instances of business objects or notifications created by the CREATE or ENTER NEW actions are written into the Context of the rule collection that invokes the actions.

The following example is similar to the previous one:

```
CREATE Driver WITH Driver.Name = 'John Smith'
Driver.Age = 40
```

3. When **Aware IM** starts evaluating the rules attached to a business object the instance of the business object is written into the Context. The instance is either taken from the parent Context (such as when an instance of a business object is modified by a process) or is provided by the external request (such as when a user changes attribute values on the business object form and submits the changes to the system).

⁹ If an un-ordered collection is executing the instances are written into the Context of the action block - see Note 3 later in this section.

In the process from the first scenario the second rule modifies the attribute of the driver's instance found by the previous rule. If the `Driver` object has rules attached to it **Aware IM** assigns a new Context to these rules, writes the instance of the `Driver` from the process Context into the new Context and starts evaluating rules of the `Driver` object.

4. When **Aware IM** starts executing a process the instances of the business objects representing process input are written into the Context. The instances are taken from the parent Context.

For example, consider the following process:

```
FIND Policy WHERE Policy.MyDriver.Name = 'John Smith'
CalculatePremium
```

Here we assume that `CalculatePremium` process that calculates the premium of the policy has the `Policy` object declared as its input. The first rule finds the policy belonging to John Smith and writes it into the Context of the main process. Then **Aware IM** creates a new Context for the `CalculatePremium` process, writes the instance of the `Policy` from the main process's Context into the new Context and starts evaluating rules of the `CalculatePremium` process.

5. When a new instance of a business object or notification is created by the `CREATE` action **Aware IM** writes the contents of the parent Context into the new Context which is created when rules attached to the business object or notification are evaluated.

In other words the Context of the parent rule collection is available when a new business object or notification are being created. For example consider the following process,

```
FIND Policy WHERE Policy.ExpiryDate < CURRENT_DATE
CREATE ExpiryEmail
SEND ExpiryEmail TO Policy.Driver
```

The first rule of the process finds the expired policy and puts the found instance into the Context of the process. The second rule of the process creates the notification `ExpiryEmail` and evaluates any rules attached to the creation of this notification¹⁰. The new Context is assigned to these rules, but now not only the created notification is written into this Context but the entire contents of the existing Context is written into the new Context as well. Therefore in this example `Policy` instance is available to any initialization rules of the notification. The created notification is also written into the original Context (as a result of creation), so in this particular case both Contexts have identical contents.

¹⁰ In this example the `CREATE` rule is actually unnecessary. The `SEND` action would automatically create the notification if it has not been created already.

NOTE: The following instances of business objects are always accessible to rules directly – there is no need to find them using the FIND action, as they are always implicitly present in any Context:

- a. An instance of a business object representing logged in user (must be a member of the SystemUsers group) – this instance can be referred to using LoggedIn prefix (see [Instance Prefixes](#)), for example LoggedInLibraryMember where LibraryMember is a business object belonging to the SystemUsers group.
- b. Instances of intelligent business objects with Business or System intelligence types. There are always only single instances of such business objects in the system, so they can always be unambiguously resolved.
- c. An instance of the [SystemSettings](#) object.

NOTE: If there are multiple instances of the same business object in the Context any action that operates on such a business object operates on *all* instances of the object present in the Context. For example, in the scenario 1 above which describes the modification of the Driver object found by the FIND action, if the action finds several instances of the Driver object all these instances are written into the Context. Consequently the action that modifies the Age attribute modifies every single instance of the Driver object found by the FIND action. Similarly in scenario 5 if there are several expired policies the email is sent to owners of each policy.

NOTE: When rules of an un-ordered rule collection are executed (see [Evaluation of Unordered Rule Collection](#)) instances of business objects and notifications created by the CREATE or ENTER NEW actions or found by the FIND or PICK FROM actions are not written into the Context of the un-ordered rule collection. Instead these instances are made available only within the action block that contains the FIND (PICK FROM) or CREATE (ENTER NEW) actions. This means, for example, that it is quite meaningless to attach rules to a business object, which have single FIND action. However, having an action block that finds some object and then does something with the found instance within this block may be quite meaningful.

Instance Prefixes

Normally rules do not distinguish between instances of the same business object. Instances are resolved from the Context and if there is more than one instance of the object in the Context the action is applied to all such instances.

However, in certain relatively rare circumstances it may be necessary to distinguish between instances of the same business object stored in the Context. In these cases special *instance prefixes* added to the attribute path just before the name of the business object can be used.

Consider, for example, the following rule attached to a business object `SystemUser`, which checks that there is only one instance of the `SystemUser` with the specified login name in the system:

```
If EXISTS SystemUser WHERE (SystemUser.LoginName =  
ThisSystemUser.LoginName) Then REPORT ERROR 'User with this name  
already exists'.
```

Here the `This` prefix added to the name of the business object (`ThisSystemUser.LoginName`) indicates the `SystemUser` instance located in the Context as opposed to the `SystemUser` instances in the rest of the system, which are searched by the aggregate operation.

There are several special prefixes that are used in the Rule Language to distinguish between instances of business objects in the Context:

- This
- That
- Other
- LoggedIn
- Added
- Removed
- Changed
- Failed

`This` prefix indicates the first instance of an object that has been added to the Context by any of the scenarios described in the [How Context is Formed](#) section.

`That` prefix indicates the second instance of an object added to the Context. Usually it is the instance found by the `FIND` or `PICK FROM` action or created by the `CREATE` or `ENTER NEW` actions. For example, consider the process that has the following rules defined:

1. `FIND Policy WHERE Policy.MyDriver.Name='John Smith'`
2. `If ThisPolicy.Excess > ThatPolicy.Excess Then...`

Let us assume that the above process has the `Policy` object as its input. When this process is executed the instance of the `Policy` object being the input of the process is put in the Context first. This instance may be referred to by the `This` prefix. The first rule of the process finds another instance of the `Policy` object (the one belonging to John Smith). The result is put into the Context as well. As John Smith's policy is the second instance of the `Policy` object in the Context it will have the `That` prefix, so the second rule will compare the excess of the process input instance with the excess of John Smith's policy.

If the `FIND` rule found more than one instance of the `Policy` object, then these instances could be referred to with the `Other` prefix – so we could refer to the initial policy as `ThisPolicy` and to all other policies as `OtherPolicy`.

The `LoggedIn` prefix can be used in conjunction with the name of the business object that is using the system (member of the `SystemUser` group) to refer to the instance of the currently logged in user. For example,

```
If LoggedInAssociate.LoginName='john' Then DoSomething.
```

Added, Removed and Changed prefixes are used in conjunction with `WAS CHANGED` expression, which tracks changes in the list – see [Evaluation of Rules Containing WAS CHANGED Expressions](#).

The Failed prefix is used to indicate the object that caused a failure in process failure rules – see [Process Failure Rules](#).

Other Usages of Context

Aware IM uses the Context not only when rules are executed. It is also used in the following situations:

- When queries using dynamic attributes are run (see [Configuring Queries](#))
- When documents and presentations are generated (see [Document Generation](#))

Queries using dynamic attributes may be invoked either from [form operations](#) in the user interface or from [hyperlinks](#) in presentations or from rules (see `FIND` action). When a query is invoked from a form operation the instance of the business object displayed by the form is written into the Context and used if the query refers to the attributes of this object dynamically. Similarly if a query is invoked from a hyperlink in a presentation the instance of the object that the hyperlink is associated with is written into the Context and used if the query refers to attributes of this object dynamically. If a query is invoked from rules the dynamic attributes are resolved from the Context of the currently executing rule collection – see [How Context is Formed](#).

 **NOTE:** a query using dynamic attributes may not be invoked from a menu item (see [Operations](#)) as there is no Context when the menu item is selected. If this happens run time error occurs.

When documents or presentations are generated attribute values referenced by tags inside documents or tags and conditional elements inside reports or presentations are resolved from the Context. The following scenarios are possible:

1. A document with the data source property set to “Determined at Run-time” is generated in the Operation Mode using an operation of the “Create Document” type

(see [Setting Menu Item Properties](#)) after a user selects one or more instances of the business object on the Query Results screen. In this case selected instances of the business object are written into the Context and used when the document is generated.

2. A document with the data source determined by some query is generated in the Operation Mode using the operation of the “Create Document” type. In this case the query is run before the document is generated and the instances of a business object found by the query are written into the Context and used when the document is generated.
3. A document is generated in the Operation Mode by invoking the operation of the “Create Document” type from the form of a business object (see [Form Caption and Form Operations](#)). In this case the instance of the business object being displayed by the form is written into the Context and used when the document is generated.
4. A document with the data source property set to “Determined at Run-time” is generated from rules (for example, when some attribute is being initialized to some document template – see [Document Generation](#)). In this case the document uses the Context of the currently executing rule collection.
5. A document with the data source determined by some query is generated from rules as in the previous scenario. In this case the query is run before the document is generated and a separate Context is formed. This Context contains the results of the query execution as well as any contents of the Context of the currently executing rule collection. The resulting Context is used when the document is generated.
6. A presentation of some business object is generated to display the instances of a business object found by a query (see [Business Object Presentation](#)). In this case the instances found by the query are written into the Context and used when the presentation is generated.
7. A presentation is generated from a form operation or from a hyperlink located on some other presentation. In this case the instance of a business object that the form is displaying or that the hyperlink is associated with is written into the Context and used when the presentation is generated.
8. Sub-report or sub-presentation is generated as part of the generation of the master report or presentation (see [Document Generation](#)). In this case a query associated with the sub-report or sub-presentation is run first and then a special Context is formed. This Context contains the results of the query and the current instance of the business object in the master report for which the sub-report is generated. (Note that the query associated with the sub-report or sub-presentation may use this instance for attributes resolved dynamically). This Context is used when the sub-report or sub-presentation are generated.

Evaluation of Rules Containing WAS CHANGED expressions

Evaluation of rule conditions containing WAS CHANGED expressions (and also expressions that track changes in the list – WAS ADDED TO, WAS REMOVED FROM, WAS CHANGED FROM – see [WAS CHANGED Expression](#)) is somewhat different from evaluation of other expressions. Whereas most expressions check the *absolute* value of

an attribute (such as “If Driver.Age > 70”), WAS CHANGED expressions check the *relative* value of the attribute – that is, the current value of the attribute compared to the old value of the attribute. The question is which value is considered to be “old”? Similarly if an expression checks whether some element has been added to a list, the question is – added when?

Before answering this question we must explain the meaning of the term *last stable version* of a business object instance. The last stable version is the version of the business object instance that is stored in the system and no rule processing of the rules attached to the object is occurring. When an instance of the business object is modified and rules attached to this business object start to be evaluated the instance of the business object is considered to be in an *unstable state*. When rule evaluation and action execution for the instance of the business object finish the instance of the object moves to a *stable state* again. Any new modification to the business object instance from the outside (for example, by a user or by a process) will cause rule evaluation and action execution to occur again and move the object back to the unstable state.

Now we can answer the question which value **Aware IM** considers to be “old” when evaluating WAS CHANGED expressions. The “old” value is the value corresponding to the last stable version of the business object instance. For example, consider the following rule:

```
If OLD_VALUE(Policy.State) = 'CALCULATED' AND Policy.State WAS
CHANGED Then REPORT ERROR 'Cannot change state of the policy once
it is calculated'
```

OLD_VALUE here is the function that returns the value of the attribute corresponding to the last stable version. Let us assume that the value of the State attribute currently stored in the system is CALCULATED. Let us assume that a user brings up a policy form and changes the value of the State attribute to NEW. When the changes to the policy are submitted **Aware IM** starts evaluating the policy rules. When evaluating the rule above it will compare the value of the last stable version of the State attribute (CALCULATED) with the current value (NEW) and trigger the REPORT ERROR action.

Note that WAS CHANGED expression will return true *each time* it is evaluated provided that the current value is different from the value of the last stable version. So in our example if a rule above is evaluated again as a result of execution of other actions it will still return TRUE. It will keep returning TRUE while rules are being evaluated for the instance of the business object.

Once rule evaluation finishes the instance of the business object moves to the stable state again. Consider the following rules on the Policy object:

1. IF Policy.State WAS CHANGED Then DoSomething
2. IF Policy.MyDriver.Age > 70 Then Policy.Premium = 200
3. IF Policy.Premium = 200 Then Policy.State='BIG PREMIUM'

Let us assume that there is a policy for a driver aged 45, the value of Premium is 100 and the policy state is NORMAL PREMIUM. If a user changes the age of the driver to 50, neither of the actions of the three rules will be triggered (the value of the State attribute for the current and last stable versions are the same and the age is still less than 70). Now, if the user changes the age of the driver to 75 (again without changing the state of the policy) the following will happen after the initial evaluation of rules:

- a. Condition of Rule 1 will not hold because the current state is equal to the state of the last stable version
- b. Condition of Rule 2 will hold and so its action will be placed on the agenda
- c. Condition of Rule 2 will not hold initially because premium is still 100

After the premium is changed to 200 by the action of Rule 2 the action of Rule 3 will be triggered. This action will change the value of the State attribute to BIG PREMIUM. This will cause the conditions of Rule 1 to be evaluated. Now, the current value of the State attribute will be different from the value of the last stable version and DoSomething will be triggered. After that the policy instance will move to the stable state again so the “stable” value of the State attribute becomes BIG PREMIUM. If now the user changes the driver’s age to 80 the action of the first rule will not be triggered.

Evaluation of list tracking expressions is quite similar – they compare the condition of the list in the last stable version of the business object with the current condition.

Initialization Rules

The [Rule Evaluation](#) section enumerates all occasions when rules are evaluated in **Aware IM**. There is one other occasion not mentioned in this section albeit this occasion has a rather secondary nature compared to the ones described before.

When the user brings up a form to create a new instance of a business object (this may happen as a result of the user selecting a menu item of the “Create Object” type or as a result of the execution of the ENTER NEW action in some process), before the form is displayed the rules attached to the business object are evaluated and the appropriate actions are executed. The objective of rule evaluation is to initialize the attributes with their initial values. Because of this not all rules attached to the object are evaluated - only the initialization rules.

By default the system considers the following rules to be initialization rules:

1. Unconditional rules that set attribute values, for example

```
Policy.State = 'NEW'
```

2. Rules that check whether a value is undefined and if so initialize this value, for example

```
IF Policy.Excess IS UNDEFINED Then Policy.Excess = 0
```

It is also possible to explicitly specify whether the rule will or will not be used during initialization - see [Advanced Rule Options](#).

All other rules are ignored at the initialization stage. However, when the form is submitted with the values entered by the user (who could have changed the initial values) all rules are evaluated as usual.

Summary of Rule Evaluation

The following section provides a brief summary of what has been described in the previous sections regarding rule evaluation and action execution in **Aware IM**.

1. Rules are evaluated when the following happens:

- An instance of a business object is created (provided that there are rules attached to this business object)
- Value of an attribute of a business object instance is modified (provided that there are rules attached to this business object)
- A process implemented by rules is started
- **Aware IM** receives notification (provided that there are rules associated with this event)
- Notification is created (provided that there are rules associated with this event)
- Scheduling rules are triggered by a timer event
- Values of attributes of business objects are taken from the Context except for aggregate operations such as EXISTS. When aggregate operations are evaluated **Aware IM** looks at all data available in the system – see [Aggregate Operations](#).

2. The following events change the contents of the Context (see [How Context is Formed](#)):

- Business objects found or selected by the FIND or PICK FROM actions are written into the Context of an ordered rule collection or into the Context of the currently executing action block of an un-ordered rule collection.
- Business objects and notifications created by the CREATE and ENTER NEW actions are written into the Context of an ordered rule collection or into the Context of the currently executing action block of an un-ordered rule collection.
- Before a rule collection attached to a business object is evaluated the instance of the business object for which evaluation occurs is written into the Context.

- Before a rule collection attached to a notification event (creation or receiving) is evaluated the instance of the notification for which evaluation occurs is written into the Context.
 - Instances of business objects representing process input are written into the Context prior to execution of the process.
3. Whenever a change to the system state occurs as a result of the creation of a new instance of a business object or notification or modification of the existing instance, **Aware IM** starts evaluation of the appropriate set of rules, i.e.
- Rules attached to a business object, an instance of which has been created or modified.
 - Rules attached to other business objects that refer to the business object instance that has been created or modified (cross-reference rules).
4. Cross-reference rules are rules attached to some business object that also refer to some other object via a reference attribute or check whether an existing element in a list has been changed – see [Cross-reference Rules](#).
5. When a reference attribute of some object is modified and this reference attribute has matching attribute on the referred object, the referred object is modified as well and its rules (if any) are evaluated.
6. Rule collections can be ordered and un-ordered. Ordered rule collections are evaluated one-by-one in exactly the same order that they appear in the rule collection. Un-ordered rule collections are evaluated by the rule engine using a special algorithm – see [Evaluation of Rule Collections](#).
7. The rule engine works as follows (see [Overview of Rule Engine Framework](#)):
- Initially all rules of the un-ordered rule collection are evaluated and the initial agenda is formed.
 - The first action block is taken off the agenda. The block is taken off according to its priority. If priorities of actions blocks on the agenda are equal the block is taken off at random.
 - The actions of the action block are executed. The changes to the system facts occur.
 - Rules that depend on the changed facts are re-evaluated. The remaining actions on the agenda are also reviewed to check if the conditions that triggered them are still valid. The new agenda is formed.
 - Another action block is taken off the agenda and executed. The process is repeated until there are no more actions on the agenda.
8. Even though actions may be randomly taken off the agenda by the rule engine the end result is the same provided that business rules are self-contained and consistent.

9. Rules may support “while semantics” in which case conditions of the rule that triggered action execution will be repeatedly re-evaluated irrespective of whether rule conditions depend on changed facts – see [While Semantics](#).
10. Actions that assign an attribute value equal to the existing value do not cause re-evaluation of rules, as the system’s state is not changed as a result of such an action – see [Did it Change?](#)
11. **Aware IM** assigns default priorities to rules – actions that modify attribute have highest priority; actions that call “system services” have lower priority and actions that generate documents from templates have the lowest priority – see [Rule Priorities](#).
12. It is possible to distinguish between instances of the same business object by using instance prefixes – see [Instance Prefixes](#).
13. The last stable version is the version of a business object instance that is stored in the system and no rule processing of the rules attached to the object is occurring. The `WAS CHANGED` expressions compare the current value of an attribute (or the current state of a list) with the value of the last stable version – see [Evaluation of Rules Containing WAS CHANGED expressions](#).
14. Initialization rules are rules that set attribute values either unconditionally or after checking whether the value is undefined. Such rules are executed before a form for the new instance of a business object is displayed – see [Initialization Rules](#).

Rules and Transactions

In **Aware IM** data processing may occur under the following scenarios:

1. An external request has been issued to the system, which triggered rule evaluation (see [Rule Evaluation](#)). This external request may have been issued either from the User Interface or from an external software system.
2. A notification has been received by **Aware IM**, which triggered rule evaluation.
3. A timer event triggered scheduled processes to start executing (see [Scheduling](#)).

The following section describes how **Aware IM** handles database transactions when processing data under the above scenarios (transactions are described in the [Data Storage](#) section).

With scenarios 1 and 3 data processing occurs within a context of a single transaction. This means that if something goes wrong all changes that have been done by any of the rules between the start of the external request (or when the scheduled process started) and the error are discarded (transaction is rolled back).

What can go wrong? First of all a transaction is rolled back if any of the rules issues the [REPORT ERROR](#) action. This action indicates an unrecoverable operation error so the current transaction is immediately rolled back and any prior changes are discarded¹¹. A transaction is also rolled back in case of an internal error.

With scenario 2 the behaviour of the system is slightly different. The rules attached to a notification event are considered to be independent and are executed within separate database transactions, so if one rule fails anywhere it does not affect other rules attached to the notification – their changes are committed provided that these changes themselves did not cause errors.

See also:

[Long Operations](#)

[Batch Operations](#)

[Process Failure Rules](#)

Long Operations

An action executed by a rule may start an operation that takes a long time to complete. For example, an action may request a service from some other system (see [Communication with Other Systems](#)) and the other system may take minutes, days or months to implement the request. Or an action may start an operation in the user interface and wait for the input from a user (there is a number of such actions in the Rule Language – see [Rule Language Reference](#)). Again it may take a user minutes or hours to provide this input.

Aware IM seamlessly supports operations that take a long time to complete. If a reply has not been delivered to **Aware IM** within a certain time frame the current request that started the long operation is *suspended*. This means that **Aware IM** stores the current state of the external request that started rule execution in the first place in the database and continues with other tasks. As soon as a reply has been received (no matter how long it took to receive the reply) **Aware IM** restores the state of the request and resumes execution of rules as if no long operation has taken place. While **Aware IM** is waiting for the reply the request is considered to be “active” – it is possible to look at the list of all active processes in the system by selecting the menu item of the “Active Processes” type in the Operation Mode (see [Setting Menu Item Properties](#)).

When an action requests a service of another system **Aware IM** waits for a reply for one minute before it suspends the current request. After that it waits for the reply indefinitely (unless the request is cancelled by the user from the Active Processes screen).

¹¹ Transaction is not rolled back if process failure rules are defined for a process that started rule evaluation in the first place – see [Process Failure Rules](#).

When an action starts an operation of the user interface the request is suspended immediately. If a reply from the user has not been received within half an hour (this is the default value which can be changed in the system's property file – see [Appendix A](#)) the request is automatically cancelled.

When a request is suspended **Aware IM** commits the current database transaction. When a reply is received a new transaction is started. This means that if an error occurs after the reply has been received only changes since the request has been resumed are rolled back. Any changes before the request was suspended remain committed. This behaviour means that it is generally not a good idea to perform any changes to the system prior to the execution of a potentially long operation, such as invocation of a user interface operation – all user interface operations need to be executed first and then the data collected from a user should be used to perform changes to the system.

Batch Operations

When **Aware IM** executes the `FIND` action it runs a query and finds instances of business objects that match the conditions of the query. The instances found are written into the Context (see [How Context is Formed](#)) and any further actions operate with the found instances. If the number of found instances is large enough further operations happen in *batches*. This means that instead of operating on all instances at once further actions operate only on a subset of instances (a batch). When the query is run for the first time the first batch is returned. After all actions finish their execution the query is run again and the next batch is returned. Action execution continues until no more batches are returned by the query. At each iteration after actions finish execution of the current batch the database transaction is committed.

For example, consider the following process consisting of two rules:

```
Rule 1: FIND Account WHERE Account.Balance < 100
Rule 2: Account.State = 'CLOSED'
```

The first rule runs a query that finds all accounts with balances less than 100. The second rule changes the state of found accounts. If the number of accounts found by the query is larger than the batch size the query will initially return only the first batch and the second rule will change the states only of the first batch. After the second rule finishes processing the first batch the transaction is committed (so the changes to the first batch are not rolled back if an error occurs when processing any subsequent batches). After committing the first batch the rule 1 is executed again and the query returns the second batch. This process continues until the query returns the last batch.

The size of the batch is 1000 by default, but the default value may be overridden by specifying the size explicitly in the `FIND` action.

Process Failure Rules

As explained in the previous sections when a rule issues the REPORT ERROR action the execution of the current request is terminated and the current transaction is rolled back. However, what about the situations when we do not want this to happen? Consider, for example, the following scenario. We have a banking system and we want to define a process that would be scheduled to run overnight to find all pending fund transfers and execute them. Some of the fund transfers may fail (for example, there may be not enough funds in the bank account from which the transfer is made). Our process may look something like this:

1. FIND FundsTransfer WHERE FundsTransfer.State = 'READY'
2. FundsTransfer.State = 'APPLIED'

The first rule finds all the pending transfers and the second one executes them. Let us assume that the FundsTransfer object has the following validation rule, which checks that there are enough funds:

```
If FundsTransfer.State WAS CHANGED TO 'APPLIED' AND
FundsTransfer.Amount > FundsTransfer.FromAccount.Balance Then
REPORT ERROR 'Not enough funds in the account for transfer
operation'
```

If our process encounters a transfer with insufficient funds and tries to change its state to 'APPLIED' the above validation rule will be triggered. The problem is that this rule will abort the current transaction and the entire process will be terminated. What we want, though, is not to terminate the current process, but make the appropriate record about the failed transfer and continue execution of the process. One way to solve the problem would be to change the validation rule, so that instead of reporting an error it would set the state of the transfer to "FAILED", for example:

```
If FundsTransfer.State WAS CHANGED TO 'APPLIED' AND
FundsTransfer.Amount > FundsTransfer.FromAccount.Balance Then
FundsTransfer.State = 'Failed'
```

This solution may be valid in some situations; however, the main problem with it is that it makes rules of the object dependent on the context in which the object is used. For example, when setting the state to FAILED in the rule above we make an assumption that the object will be used within the context of the scheduled process and this is the reason why we are setting the state rather than reporting the error. What if the object is used in other contexts – for example, a user sets the state of the transfer manually on the object form?

The recommended solution to the above problem is to define *process failure rules*. These rules may be attached to a process and they will be executed whenever the process fails as a result of the execution of the REPORT ERROR action anywhere during

the course of the process. Failure rules are supposed to perform corrective actions to neutralize the effects of the failure. **Most importantly, if failure rules are defined for a process, execution of the process continues after failure and the current transaction is not rolled back (unless failure rules themselves report an error).** The sequence is as follows:

1. A process starts executing
2. A failure occurs by rules of any object affected by the process issuing the REPORT ERROR action.
3. If process failure rules are not defined, the execution of the current request is terminated and the transaction is rolled back. If process failure rules are defined they start executing and performing corrective actions.
4. Process execution continues as if there was no failure.

In our example we could define the failure rules as follows:

```
FailedFundsTransfer.State = 'FAILED'  
FailedFundsTransfer.FailureReason = ProcessError.Message
```

If we define process failure rules like shown above we can still leave the REPORT ERROR action in the validation rule of the FundsTransfer object.

Note the usage of the special “Failed” prefix in front of the FundsTransfer object. This prefix can be used to distinguish the instance of the FundsTransfer object that caused the failure from all other instances of the FundsTransfer object (see also [Instance Prefixes](#)). In fact, all objects that were involved in the failed operation are placed in the Context and are accessible via the Failed prefix – for example, if in response to changing its state to APPLIED the FundsTransfer object created or modified another object, which created or modified yet another object the rules of which issued the REPORT ERROR action, all these objects are written into the Context and are available to process failure rules. If there can only be one instance of a particular object it can also be accessed by the failure rules without the Failed prefix.

Note also the usage of a special predefined object called *ProcessError*. The instance of this object is automatically created by the system for the process failure rules to use (it is not available to any other rules). The attributes of this object are explained in the following table:

Attribute name	Comments
Message	Error message issued by the REPORT ERROR action that caused the failure
FailedObject	The name of the business object the rules of which issued the REPORT ERROR action
FailedRuleName	The name of the rule that issued the REPORT ERROR action

FailedRule	The text of the rule that issued the REPORT ERROR action
CurrentObject	The name of the business object used directly by the process, the modification or creation of which ultimately caused the REPORT ERROR action (can be UNDEFINED or can be the same as FailedObject)
CurrentRuleName	The name of the rule inside the process that the process was executing when the failure occurred.
CurrentRule	The text of the rule inside the process that the process was executing when the failure occurred.

 **NOTE:** Process failure rules are also executed if a process has been cancelled by the user. For example, if a process calls ENTER NEW action the form of the object will be shown to the user. If the user clicks on the Cancel button on the form, the process will be cancelled and the failure rules (if any) will be activated. In this case no special predefined object describing the failure is written into the context.

Execution Log

The results of rule evaluation and action execution are written into the *execution log*. This log can be very useful when checking whether business rules behave as expected (especially when testing new configuration – see [Testing Mode](#)).

The log record consists of the record timestamp, the name of the business space in which the user that has issued the request operates and the name of the user. For example,

```
2004-06-18 20:26:07,760 AIS#admin -Executing action
Associate.RegisteredOn=CURRENT_DATE from rules of object
Associate
```

Here the name of the business space is “AIS” and the name of the user is “admin”.

The execution log supports different levels of logging:

Rules only

This is the default level – only evaluation/execution results of rules attached to business objects or used in processes are recorded in the log. Evaluation and execution results of scheduling rules are not shown.

All server events except timer and SQL events

At this level the log contains records of all requests that the server receives. It also has results of rule evaluation/execution (except scheduling rules)

All server events excluding SQL

This is the same as the previous level. Evaluation/execution of scheduling rules are also included in the rule log

All server events including SQL

This is the most verbose level. This is the same as the previous level, but the rule log also includes records of all SQL commands that **Aware IM** sends to the database.

The levels may be set up using the [Aware IM Control Panel](#) (Settings/Logging menu item) or in the “logger.props” file located in the BIN directory of the **Aware IM** Server installation.

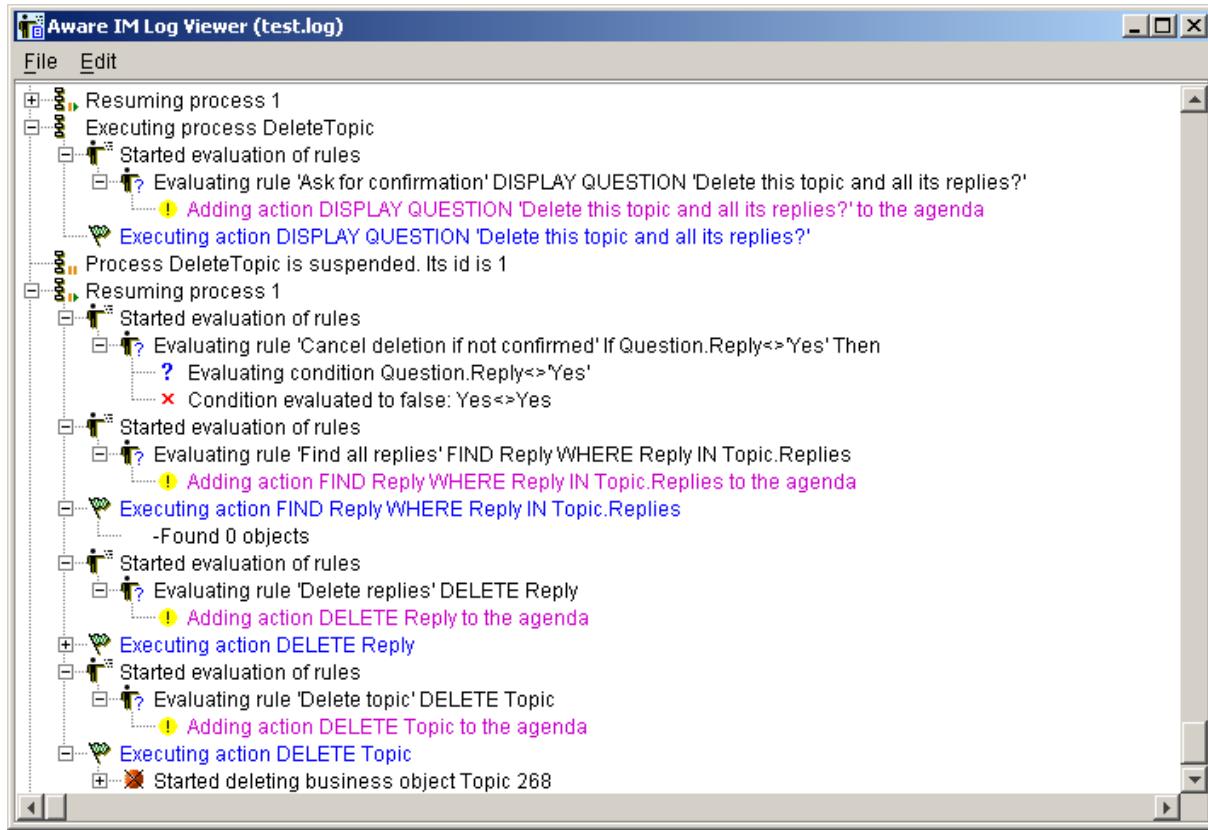
When you run the Settings/Logging command you can also specify whether the system will log any events into a log file or not. If you tick the corresponding checkbox the system will store events of all applications running in the production mode in the file AwareIM/bin/main.log, and it will store events of all applications running in the testing mode in the file AwareIM/bin/test.log

Log Viewer

The execution log may be viewed using the [Aware IM Control Panel](#). There are several menu items that can view the log:

- View/Production Log menu item – opens the current log for all applications running in the production mode
- View/Testing Log menu item – opens the current log for all applications running in the testing mode
- File/Open Log File – opens the specified log file

Aware IM displays the log as a tree structure where every node represents a single log record. The nodes of the tree are hierarchical – for example, all log records spawned by an external request (such as a request to start a process or update an instance of a business object) are children of the node representing the external request. This is illustrated on the picture below:



The picture shows execution of the `DeleteTopic` process – the corresponding nodes are expanded to show all details of the log. Note also that the Log Viewer shows different types of log records with different icons and colors. Using the Log Viewer one can quickly browse through the log and delve into the details of a particular request only when necessary.

Setting Logging Options

You can specify what each log record will contain by choosing the `View/Log View Options` menu item. This menu item opens a dialog where you can specify whether each record will contain timestamp, business space name and user name. You can also filter the log and display only records that belong to the specified user in the specified business space or to all users in the specified business space.

Traversing the log

It's often useful to quickly traverse the log by only going through certain records, skipping records that you are not interested in. To do this you need to specify which records will be filtered out during traversal. This is done by selecting the `Edit/Find Log Record` menu item. In this menu command you specify your filtering criteria and then you traverse the log by pressing the F3 button. Each time you press this button the system will display the next log record that meets your search criteria.

The Edit/Find Log Record menu item opens a dialog where you can set the following options:

By text of the log message

Only log records containing the specified text will be traversed.

By business space name

Only log records that belong to the specified business space (and optionally to the specified user in this business space) will be traversed.

By message type

The following record types are supported:

- EXECUTING ACTION – these are records that indicate that an action of some rule is about to be executed
- ADD ACTION TO THE AGENDA – these are records that indicate that the conditions of a rule are satisfied and the actions of the rule are placed on the agenda of the rule engine
- SQL – these are records that show SQL being sent to the database
- OTHER – all records that do not belong to any of the categories above

By reply to process

Only log records that are involved in the execution of the specified process are traversed

By time difference with previous

Only log records that have timestamp that is different from the timestamp of the previous records by the specified amount or more are traversed. This can be very useful when identifying performance bottlenecks in the system. For example, if you specify 30 seconds than you will immediately go to log records that show operation where execution time was 30 seconds or more.

Configuration of Rules

The configuration process for business rules is described in detail in the [Adding/Editing Rules](#) section.

Productivity Features

In the previous sections we described in detail how **Aware IM** implements the generic aspects of a data management application, such as data entry and editing, data storage, data retrieval, data processing and the user interface (see [Basic Concepts](#)). In the following section we will describe how **Aware IM** implements some other features that most applications are likely to require.

See:

[Access Control](#)

[Login](#)

[Working with Documents and Reports](#)

[Communication with Other Systems](#)

[Scheduling](#)

[E-mail Handling](#)

[Export and Import](#)

[Extending Aware IM](#)

Access Control

One of the issues that most applications have to deal with is security. A system has to make sure that sensitive data is only available to those users who are authorized to view and operate this data. The system therefore has to control access to this data. The following section describes how access control issues are implemented in **Aware IM**.

See also

[Access Level](#)

[Predefined Access Levels](#)

[Conditional Access](#)

Access Level

Broadly speaking access *level* determines which business objects, attributes, processes, queries, documents and services are accessible to the user that belongs to this access level. First of all we need to explain what “the user belonging to a particular access level” means.

In an application created with **Aware IM**, just like in many other applications, anyone wishing to use the application has to log in, i.e. provide credentials that identify the user to the application (see [Login](#)). In **Aware IM** anyone using the application must be represented by an instance of a business object. During login **Aware IM** tries to find the instance of this business object, which has attribute values matching the provided

credentials. Therefore the configurator has to define a business object representing a user and the system administrator has to create an instance of this object with the appropriate credentials before the person represented by this instance can start using the application (some applications may allow users to self-register, i.e. the users themselves can create their own instances).

A business object representing the user must be a member of the predefined SystemUsers [business object group](#). **Aware IM** always creates the default member of this group called RegularUser. Configurators can use this object to represent users of the system and/or define other objects (provided that they add them as members to the SystemUsers group). This group mandates that the following attributes be declared in all its members (if these attributes are not defined they are automatically added to any object when it is added to the SystemUsers group):

- LoginName
- Password
- AccessLevel

The first two attributes represent user credentials whereas the third attribute represents the access level. When a user logs in **Aware IM** finds the instance of the object that matches the provided credentials and checks the value of the AccessLevel attribute of this instance. This value is the name of the access level that is assigned to the logged in user (every access level has a unique name). Once the access level has been assigned, access to business objects, their attributes, processes and queries is determined by this access level.

The value of the AccessLevel attribute can be set either explicitly by the system administrator when she creates instances of the business object representing users or automatically by rules attached to this business object (for example, if the user represents an organization the access level may be set depending on the name of the organization).

Configuration of access levels is described in detail in the [Adding/Editing Access Levels](#) section.

After the access level has been assigned to the user **Aware IM** performs the appropriate protection. If a certain configuration element (for example, business object) has been defined as “not available” by the access level **Aware IM** removes the element from all lists and menus of the application. If an attribute has been defined as “not available” **Aware IM** removes it from all auto-generated forms and its value is not returned by any query (even if the query is defined to display it) or by any document (even if the document has a tag referring to the attribute). If an attribute has been defined as “read only” **Aware IM** makes sure that the attribute cannot be edited.

Predefined Access Levels

There are two access levels that **Aware IM** always creates for any configuration – the “Administrator” access level and the “Guest” access level. The “Administrator” access level by default implies no access restrictions whatsoever – all elements are accessible to the administrator. The deafault business object representing a user called `RegularUser` is assigned the “Administrator” access level (see [Access Level](#)). **Aware IM** always creates one instance of the `RegularUser` object to represent the system administrator. The default values for the predefined attributes of this instance are:

Attribute	Value
LoginName	admin
Password	password
AccessLevel	Administrator

System administrators may use the default credentials to log into the application initially and create instances of other users (as well as change their own passwords).

Unlike the “Administrator” access level the “Guest” access level is heavily restricted. This access level is assigned to users who may access the application without having to log in (see [Guest Entry](#)). Naturally no elements are accessible by default to such users except services.

The default settings for the “Administrator” and “Guest” access levels can be changed but the access levels cannot be deleted.

Conditional Access

Access levels protect configuration elements, such as business objects, processes etc, unconditionally, i.e. under any circumstances. If it is necessary to protect business objects or their attributes based on certain conditions business rules invoking the [PROTECT](#) or [READ PROTECT](#) actions should be used instead of the access level.

For example, in a banking system it may be necessary to protect a transaction once its state has been set to ‘APPLIED’. The following rule will not allow anyone to change any of the transaction’s attributes in this state:

```
If Transaction.State='APPLIED' Then PROTECT Transaction FROM ALL
```

The following rule disallows changes to anyone but the administrator:

```
If Transaction.State='APPLIED' Then PROTECT Transaction FROM ALL  
EXCEPT Administrator
```

Login

Most users of an application created with **Aware IM** need to log in before they can use it. The exception to this are “guest users” who do not need to log in – these users however are always assigned the “Guest” access level, which is normally heavily restricted, so not many operations are available to such users (see [Predefined Access Levels](#)). Guest users may register themselves with the system if the system has been configured to allow this (to configure such an operation a menu type of the “Register User” type has to be defined and made available to a “guest” user – see [Operations](#)). Another exception are users logging in through LDAP/Active Directory – see the [Using LDAP/Active Directory for Login](#) section for more details.

As explained in the [Access Level](#) section the system administrator must create instances of the user object before any users can log in. Once this is done the users log into the system by pointing their Internet browser to one of the system’s URL’s.

These URL’s have the following format:

BaseURL/action?param1=value1¶m2=value2¶m3=value3...

Where `BaseURL` is the address of the **Aware IM** server. For a local machine installation it is usually <http://localhost:8080/AwareIM>; `action` is a login option-dependent operation; `param1=value1` – zero or more name=value parameters, depending on the login option.

The table below presents a summary of the supported login options. The following sections describe each option in detail.

	Type	Action	Business space	Login name	Password	Testing mode
1. Guest entry		logonGuest.aw	Param	N/A	N/A	No
2. Full login, interactive		logonAdmin.html	UI	UI	UI	UI
3. Full login, parameterised		logonOp.aw	Param	Param	param	param
4. Simple login, default business space		logon.html	Default	UI	UI	No
5. Simple login with the “forgotten password” link, default business space		logon2.html	Default	UI	UI (with “forgot your password?” link)	No
6. Simple login, custom business space		logonOp.aw	Param	UI	UI	No
7. Invoke “forgotten password” functionality		logonFp.aw	Param	N/A	N/A	N/A

The following table lists the URL parameters that can be optionally added to the logonGuest.aw and logonOp.aw URL's. For example:

```
logonOp.aw?domain=CRM&userName=admin&password=password&testingMode=false
```

	URL parameter name	Value	Comments
1.	domain	Name of the business space	Instructs the system to login into the specified business space.
2.	userName	Login name of the user	Instructs the system to use the specified name rather than take it from the user interface.
3.	password	Password of the user	Instructs the system to take the specified value rather than take it from the user interface.
4.	testingMode	"true" or "false"	If the value is "true" the login will be into the test database.
5.	logonPage	Name of the logon page to use	This can be used to in logonOp.aw to indicate a page to be displayed. For example, logonOp.aw?domain=CRM&logonPage=logon2.html will display a page with "forgotten password" link
6.	perspective	Name of the visual perspective	Instructs the system to display a particular visual perspective, rather than the default one, upon user login. It can be used to bring the user to a specific section of the system, rather than the default page (see Visual Perspective).
7.	firstCommand	The command to execute after the startup	The command is assumed to be in the following format: commandName,parameter Where commandName is the name of the Javascript function that can be invoked from links (see Links to Aware IM Operations) and the parameter is a combination of parameters to the Javascript function separated by the comma symbol. For example, firstCommand=editObject,MyObject,256 This will invoke editing of the object with the name MyObject and id 256
8	dynamic	True	If this parameter is specified Aware IM will allow to directly enter the system without logging in if the current browser already has an active session. In this case you do not need to specify userName and password parameters
9	captcha	true	If this parameter is specified the login form will include "captcha" – the user will have to enter characters displayed by a random image. This is a standard protection against robots. For example: logonOp.aw?domain=CRM&captcha=true This will load the page logon_captcha.html. This page is fairly basic. You can edit it to add your own style, logo etc
10	e	All the above parameters encrypted	This parameter should be used if you don't want users to see values of other parameters, for example, password object ID's etc. In this case you can encrypt

	using the ENCRYPT_B64 function	all parameters and then use the encrypted string as a value of the “e” parameter, for example: DISPLAY URL 'localhost:8080/AwareIM/logonOp.aw?e=ENCRYPT_B64('domain=MyBusinessSpace&userName=john&password=123')
--	--------------------------------	--

Examples of typical URL's:

1. <http://localhost:8080/AwareIM/logon.html>

Show a dialog to enter user name and password. Once the user enters the values the system will log into the default business space in the regular mode using the specified credentials

2. <http://localhost:8080/AwareIM/logonOp.aw?domain=CRM>

Show a dialog to enter user name and password. Once the user enters the values the system will log into the specified business space (CRM) in the regular mode using the specified credentials

3. <http://localhost:8080/AwareIM/logonOp.aw?domain=CRM&userName=admin&password=password&testingMode=false>

Log into the CRM business space in the regular mode without showing a dialog. Use “admin” as user name, “password” as password.

4. <http://localhost:8080/AwareIM/logonAdmin.html>

Show a dialog to enter business space, user name, password and testing mode. Once the user enters the values the system will log into the specified business space in the specified mode using the specified credentials

5. <http://localhost:8080/AwareIM/logonGuest.aw>

Enter the default business space as a guest user

6. <http://localhost:8080/AwareIM/logonGuest.aw?domain=CRM>

Enter the CRM business space as a guest user

7. <http://localhost:8080/AwareIM/logonFP.aw?domain=CRM>

Invoke a process that handles “forgotten password” functionality. Can be used in links on custom login forms.



NOTE: Login parameter tables above do not include login options for **Aware IM** mobile applications. For details how to login to the mobile applications see the document “Aware IM for Mobile Devices”

Handling Login and Logout Events

It may be necessary for a system to execute certain rules when a new user logs in or out the application. For example, the system might collect the statistics of how many users are online or how many people have been using the system.

To handle login and logout events the configurator needs to define a special *login notification* or *logout notification* and attach rules to these notifications – see [Handling Login Events](#) and [Handling Logout Events](#).

Working with Documents and Reports

Most data management applications need to be able to produce documents. At the very least an application should be able to store, retrieve and print documents, but in most cases it should also be able to *generate* documents. The following section describes how these issues are addressed in **Aware IM**.

See:

[Document Management](#)
[Document Generation](#)
[Reports](#)

Document Management

Data management applications created with **Aware IM** can store, retrieve and print documents. Documents are stored as values of attributes of the Document type, so the configurator has to define a business object that will own the document and define an attribute of the Document type to hold the document (configuration of attributes is described in the [Adding/Editing Attributes](#) section).

In the Operation Mode an attribute of the Document type is displayed on a business object form as a text box with the Browse button next to it (see [Business Object Forms](#)). A user can press the Browse button and select a document from a file on disk. When the form is submitted the file is uploaded to the **Aware IM** database and is stored permanently in the database. There are no restrictions on the type of file that can be stored.

To retrieve the stored document the user has to find an instance of a business object that stores the document and bring up its form for editing (see [Data Retrieval](#)). The attribute of the Document type is displayed as a text box with the Browse button next to it. The text box contains the name of the original file, which the document has been loaded from. There is also the button that allows viewing the document. When the user clicks on this link **Aware IM** downloads the original document from its database to the user's machine. If the document belongs to one of the types that **Aware IM** recognizes **Aware IM** displays the document in a browser. Otherwise the copy of the document is downloaded to a file on disk (the original document remains stored in the system's database). If the document is displayed in a browser, it can be viewed and printed from the browser. If the document has been downloaded to a file, it has to be opened and printed with the software that can work with documents of that type.

Documents stored as attribute values can be displayed, printed, exported and imported from rules (see [DISPLAY DOCUMENT](#), [PRINT DOCUMENT](#), [EXPORT DOCUMENT](#) and [IMPORT DOCUMENT](#) actions).

It is also possible to search for documents using queries. While you cannot use the contents of the documents in queries directly you can use the values of other attributes

to search for documents. For example, one could define a business object that would store a document in the attribute of the Document type and a keyword of search in another attribute of the Plain Text type. Then a query could search by keyword and retrieve the instances of the business object storing the documents that include the keyword.

Document Generation

When documents are simply stored and retrieved (see [Document Management](#)) **Aware IM** does not do anything with the contents of the documents – it stores documents in its original form and never modifies them in any way. However, document storage and retrieval is not the only way **Aware IM** can work with documents – it can also *generate documents from document templates*.

Document Templates

Document templates are defined in the Configuration Tool. When defining a document template the configurator has to indicate the type of template and design the template layout. The following types of document templates are supported:

- Report
- MS Word
- MS Word (XML format)
- MS Excel
- Text
- HTML

Custom types can be plugged in as well (see [Extending Aware IM](#)). Layout of the template is specified using the software corresponding to the type of the template (for example, MS Word for Word templates, any text editor for text templates etc). Report templates are created using the Report/Presentation Designer (see [Reports](#) and [Working with Reports/Presentation Designer](#)).

Configuration of document templates is described in the [Adding/Editing Document Templates](#) section.

Tag Elements

The essential feature of document templates is that they can contain tag elements. A tag element is a special text within a document template that starts with the “<<” symbol and ends with the “>>” symbol. Whatever text is contained between these symbols is called *tag contents*. Tag contents must be of a particular format that corresponds to the format of arithmetic expressions in the [Rule Language](#) – see the “Usage of rules inside tags” section in the “Aware IM Rule Language Reference” document. Most tag elements refer to a value of a particular attribute of a business object. For example,

```
<< Account.Balance>>
```

Below is an example of the usage of this tag element within some document template (which can be of any type). This document template could be part of an account statement or part of a letter to a customer:

“The current value of your account’s balance is <<Account.Balance>> dollars.”

Document generation creates documents out of document templates by replacing tag elements with the appropriate values. Tag elements referring to attributes are replaced with the values of these attributes. In the example above if the actual value of the Balance attribute is 1000 the text in the resulting document will look like this:

“The current value of your account’s balance is 1000 dollars.”

If tag elements contain expressions with attributes **Aware IM** calculates the expressions and replaces tag elements with the resulting values. The values of attributes are taken from the Context (see [Context of Rule Evaluation](#) and [Other Usages of Context](#)). In the example above it is assumed that the instance of the Account business object is present in the Context.

Tag elements used in document templates may also contain conditional expressions that let you specify conditions under which attribute values or static text will be printed out. The format of a conditional expression is the standard format used in rules. The only difference is that these expressions must contain the special SHOW action. An example of a conditional expression:

```
<<IF Account.Balance > 1000 Then SHOW Account.Holder.Name>>
```

If balance of the account is greater than 1000 then include the name of the holder in the document.

You can also conditionally include the entire sections of a document template into the final document. To define a condition of section inclusion, add the condition followed by the action “SHOW SECTION_START”. This also marks the start of the section. To mark the end of the section include, the following tag: <<SECTION_END>>. For example,

```
<<IF Account.Balance > 1000 THEN SHOW SECTION_START>>
The text of the section follows ...
<<SECTION_END>
The rest of the text follows
```

 **NOTE:** conditional inclusion of document sections is only available for MS Word and HTML document templates. Some document templates types allow inclusion of tables using `LIST_TABLE` and `LIST_TABLE_START/END` functions. MS Word document templates also support inclusion of sub-documents using `SUB_DOCUMENT` function (see [Miscellaneous Functions](#)).

The mechanism of document generation that works by replacing tag elements with the corresponding values can be very effectively used to generate multiple documents from the same document template. For example, one could define a template of a letter to a customer. When this letter is sent to a particular customer, the tag elements in this letter referring to customer's name, address etc will be replaced with the details of this particular customer.

When documents are generated

Aware IM generates documents from document templates in the following scenarios:

1. *When instances of business objects containing attributes of the Document type are created provided that the attributes are initialized with a document template.*

It is possible to initialize an attribute of the Document type with the name of a document template (see [Setting Properties of Document Attribute](#)). In this case when an instance of a business object containing such an attribute is created **Aware IM** uses the document template that the attribute is initialized from to generate the document. The instance of a business object being created is available in the Context and may be referred to by tag elements of the template (Note that all other attributes of the business object are guaranteed to be properly initialized before document generation occurs – see [Rule Priorities](#)). Once the document has been generated it is stored as the value of the Document attribute (see [Document Management](#)).

2. *When the name of a document template is specified in certain actions from within business rules.*

The [DISPLAY DOCUMENT](#), [EXPORT DOCUMENT](#) and [PRINT DOCUMENT](#) actions of the Rule Language can specify the name of a document template to display, export or print. It is also possible to assign a value of an attribute of the Document type to the name of a document template, for example

```
Account.Statement = 'StatementTemplate'
```

In each of these cases **Aware IM** generates the document out of the specified template before executing the action (for example, when **Aware IM** executes the DISPLAY DOCUMENT action it generates the document out of the template first and then displays the resulting document). The current Context of rule execution is used to resolve the tag contents.

3. When a user invokes an operation of the “Create Document” type in the Operation Mode.

An operation of the “Create Document” type can be configured to be part of the main menu or can be invoked from a form of a business object or a query. The Context for document generation is formed from the instances of the business objects that a user selects and/or the data source of the document template (see [Other Usages of Context](#)).

4. When tag elements are used in the initialization text of attributes of the Plain Text type.

Tag elements may be used in the initialization expressions of the Plain Text attributes. In this case there is no document template involved but nevertheless **Aware IM** replaces tag elements used in the initialization expressions with the appropriate values before assigning initial text to the attribute.

Reports

One of the document template types supported by **Aware IM** is the Report type. Document templates of this type are somewhat different from other document templates. The main difference is in the document generation algorithm. Whereas for other types **Aware IM** just replaces tag elements with the appropriate values (see [Document Generation](#)), for reports **Aware IM** also repeats a particular section of the document template for each instance of a business object found in the Context. The following section describes this process in detail.

Report Bands

The layout of a document template of the Report type (or simply *report*) is designed using the Report/Presentation Designer. The layout of any report consists of special sections called *bands*. Each band may contain *report elements* and is processed in a special manner during document generation. The following bands can be defined:

Title

This band represents the title of the report.

Page Header

This band represents a header of each page in the report.

Page Footer

This band represents a footer of each page in the report.

Column Header

If the report has multiple columns this band represents the header of each column.

Column Footer

If the report has multiple columns this band represents the footer of each column.

Details

This band is the main section of the report that is repeated for each instance of a business object in the Context.

Summary

This band represents the summary of the report.

Group Bands

Instances of a business object shown in the Details band may be divided into groups – for example, each group may only show data starting with a particular letter of the alphabet. A group may also contain other groups. Each group is represented by a *Group header* and a *Group footer*. Elements of the group header are included into the resulting document at the start of each group and elements of the group footer – at the end of each group. Each group has a *group condition*, i.e. the expression that is calculated during the report generation to check whether a new group should be started (see Report Generation).

The details of defining bands in the Report/Presentation Designer are provided in the [Setting Band Properties](#) section.

Report Elements

The following elements may be included in any of the report bands:

Text

This element usually contains static text. It is possible to include tags, which will be resolved during the report generation, inside the static text. For example,

“The account balance is <<Account.Balance>>”

Tag

See “Tag Elements” in the [Document Generation](#) section.

Line

This element represents a straight line.

Rectangle

This element represents a rectangle.

Image

This element represents an image.

Sub-report

This element refers to another existing report that is embedded into the current (master) report. Sub-report elements are often used to display instances of a business object referenced by a particular [reference attribute](#) – for example, if a master report shows accounts, the sub-report for each account may show transactions of the account. When defining a sub-report it is necessary to indicate a query that finds the data for the sub-report. The query usually finds the instances referenced by an attribute, for example:

```
FIND Transaction WHERE Transaction IN Account.Transactions
```

Note that the query uses the dynamic attribute `Account.Transactions`, which refers to the instances of the `Account` business object in the master report – see [Configuring Queries](#) and [Other Usages of Context](#).

Conditional element

All elements mentioned before are always included into the final document by the report generation algorithm. A conditional element, on the other hand, allows specifying conditions, which define when a particular element should be included into the final document (if at all). Moreover, it makes it possible to designate several sub-elements for the same area in the report and specify conditions, which define when a particular sub-element will be printed. For example, consider a conditional element that includes two tag elements – both tag elements refer to the `Balance` attribute of the `Account` object (`<<Account.Balance>>`), except that one is displayed in green and another one - in red. The conditional element defines the conditions that specify that the first text element should be included if the value of the account balance is greater than 100 and another one – if it is less than 100. The final document therefore will display the account balance in red if it is less than 100 dollars and in green if it is greater than 100 dollars.

The details of defining elements in the Report/Presentation Designer are provided in the [Adding Report/Presentation Elements](#) section.

Report Generation

We can now describe what happens when a report document is generated from a report layout. First of all the Title band is generated. When we say that a certain band is generated it means that the report elements included in the band are transferred into the final document. Static elements, such as static text, rectangles, lines and images are transferred into the final document as is, whereas dynamic elements such as text elements with tags, tag elements, conditional elements and sub-reports are generated and the result is included into the final document. This is how the dynamic elements are generated:

- Text elements with tags and tag elements are resolved from the Context as described in [Document Generation](#).
- Conditions of conditional elements are calculated and the appropriate sub-element is included into the final document (or nothing is included at all). If the sub-element is a dynamic element it is generated as well.

- A query attached to a sub-report element is run, the Context for the sub-report is formed (see [Other Usages of Context](#)) and the report generation algorithm is executed for the sub-report. The resulting document is included into the master document.

After the Title band has been generated **Aware IM** starts generating pages of the report by generating the Details band for every instance of a business object in the Context independently. If, for example, a report is generated for a number of accounts the Details band is generated for each instance of the account. The instances could either be selected by the user or found by a query attached to the document template (see [Adding/Editing Document Templates](#)).

When generating pages of the report **Aware IM** checks whether a new page should be started (the size of the page is specified as part of the properties of the report – see [Setting Report/Presentation Properties](#)). If a new page is to be started **Aware IM** generates the Page Footer band for the previous page and the Page Header band for the new page. Also if the report has been defined to have multiple columns, **Aware IM** generates the Column Header and Column Footer bands when starting a new column.

Whenever **Aware IM** starts processing a new instance of the business object in the Context it checks whether it should start a new group (provided that group bands have been defined in the report). The new group is started if the value of the expression specified as a group condition changes. For example, if the group condition is specified as `Product.Category` the new group will be started whenever the value of the product's category of the new instance is different from the value of the previous instance. When a group is started **Aware IM** generates the Group Footer for the previous group and the Group Header for the new group.

Finally after pages of the report have been generated **Aware IM** generates the Summary band.

 **NOTE:** Some values used in a report may be provided dynamically by the user just before the report is generated, rather than hardcoded in the report layout (for example, the name of the report). Expressions used in the tag elements of the report may refer to such values using the special syntax (see the “Aware IM Rule Language Reference” document) – for example, `<<{REPORT_NAME}>>`. When the user runs such a report **Aware IM** automatically generates a form that prompts the user to enter the values of the report parameters. The entered values are used instead of the corresponding tag elements when the report is generated.

User Defined Documents and Reports

 **NOTE:** This feature is only available in the Aware IM Developer Edition.

Sometimes configurators and developers cannot define all possible templates and reports in their configuration – in this case it may be necessary for their applications to allow end users to define their own document templates and/or reports. In certain cases end users may even want to customize the documents and reports provided to them by the configuration of the application.

To give end users the capability of defining their own document templates and/or reports the configurator has to do the following:

- Add a special business object representing a user-defined document to the business space version. To do this, select the `Add User Defined Document` command in the `Edit` menu. Some attributes of this object are pre-defined and cannot be changed, but configurators can add their own attributes to this object.
- Define commands and queries to create/edit and read instances of this business object. When users will be creating an instance of this business object they will be uploading a document template (a document template is a mandatory attribute of the object). They can prepare document templates using the appropriate document editors, such as Microsoft Word or Excel. They can also prepare their reports using the standalone version of the Report Designer and upload the report files in a similar fashion. The standalone Report Designer can be downloaded from the Aware IM site.
- Define commands and/or operations to allow the user to run their document templates (see below)

There are three ways for the user to [run their document templates](#):

1. Configurators may define a command of the [Create Document](#) type in their visual perspective. When specifying this command they can tick the “User Defined Documents” checkbox. When users select this command **Aware IM** will automatically collect all instances of the user defined document object and present the choice to the users, so that they can choose the document template they want to run.
2. Configurators may define an operation of the Create Document type for their queries or object forms (see [Adding/Editing Form Menu](#) and [Adding/Editing Queries](#)). If a configurator allows a choice of documents to run for the operation and ticks the “user defined document” checkbox **Aware IM** will display a choice of user-defined documents when the user selects the operation.
3. Define a process that uses the `DISPLAY DOCUMENT UserDefDoc.UDD_Name` action

The first way is useful if you want the user to define a query and run the selected document for each instance of the object found by the query. The second way is useful when there is a specific instance of the object already (displayed on a form or shown by a query) and the user wants to run the selected document for this particular instance. The third way is useful when you want to fix a query to be used as the data source and display the results to the user.

 **NOTE:** It is possible to allow users to change the pre-configured document templates. If a particular pre-configured template has been marked as editable by the end user (see [Adding/Editing Document Templates](#)) and when defining an instance of the user defined document the user specifies the name of the pre-configured template as the name of his document, the new template will replace the pre-configured one.

Communication with Other Systems

Many applications need to communicate with other software systems and/or electronic devices. The following section explains how this communication can be achieved in **Aware IM**.

See:

[Intelligent Business Objects](#)

[Requesting Services and Sending Notifications](#)

[Business Space as Intelligent Business Object](#)

Intelligent Business Objects

As described in the [Business Objects as Carriers of Data](#) section all data in **Aware IM** is encapsulated in business objects. Software systems and electronic devices that an application needs to communicate with are also represented in **Aware IM** by business objects. Unlike other business objects, though, software systems and electronic devices contain certain “intelligence”, because they are capable of receiving and/or processing the electronic data. Communication with software systems and devices is nothing else but the exchange of the electronic data between applications configured with **Aware IM** and other software systems and devices.

Human beings and organizations can also be modelled as intelligent business objects provided that **Aware IM** has electronic means of communication with them (for example, e-mail or fax).

Intelligent business objects are, therefore, those elements of a business capable of receiving, sending and processing electronic information thus ensuring meaningful communication.

Aware IM can communicate with intelligent objects in two ways: sending notifications or requesting services. A *notification* is a way of communicating where a party can send a message to another party without having to identify itself and without expecting a reply back from the other party. It is entirely up to the other party to decide how to react upon receiving a notification. E-mail is a good example of a notification. Configuration of notifications is described in the [Adding/Editing Notifications](#) section.

A *service* is a more formal and comprehensive way of communication than a notification. A party requesting a service from another party must first identify itself to the other party, and can expect a meaningful reply back. For example, sending payment details to a payment processing system for completion and getting a payment reference number back.

Aware IM communicates with external parties through channels. A *channel* is software adaptor carrying information between **Aware IM** and an intelligent business object.

Aware IM offers several standard channels including an e-mail channel and a SOAP channel. In practice it means the following:

- **Aware IM** can send e-mails to people and organizations as long as they are configured as intelligent objects with the e-mail channel (see also [Outgoing Email](#)).
- **Aware IM** can use electronic services of service providers over the Internet as long as the service providers are configured as intelligent objects with a suitable channel.

If you need to get **Aware IM** to communicate with a system or a device that does not support the standard protocols, you can develop a custom channel and plug it into **Aware IM** (see “Aware IM Programmer’s Reference”). This way you can communicate, for example, with legacy software systems, or process data input from devices such as barcode readers, utility meters, inventory trackers, etc.

Configuration of intelligent business objects is described in detail in the [Defining Intelligent Business Objects](#) section.

Requesting Services and Sending Notifications

Once an intelligent business object has been configured and its services have been defined or discovered it is possible to communicate with such an object. Communication can only be performed from business rules. Use [REQUEST SERVICE](#) action to request services of an intelligent business object and use [SEND](#) action to send notifications to the object. For example,

```
REQUEST SERVICE RegisterProduct OF Awaresoft  
SEND ReminderEmail TO Customer
```

Scheduling

Quite often applications need to perform processing of data at some regular time intervals, for example, financial reports may need to be compiled at the end of each quarter; reminder e-mails may need to be sent about meetings each Friday.

Aware IM allows configuring *scheduling items* that determine the times when this data processing occurs. The data processing must be encapsulated in a process (see [Processes as Links between User Interface and Business Logic](#)). It is possible to start a

process as a one-off event or as a regularly recurring event. Configuration of scheduling items is described in the [Scheduling](#) section.

E-mail Handling

Many applications need to work with e-mails: e-mails often need to be automatically sent under the appropriate circumstances (for example, to remind customers that their insurance policy is about to expire) and certain actions need to be automatically performed upon receiving e-mails (for example, automatically register a support request from a customer). The following section describes how this can be done in **Aware IM**.

See:

[Outgoing Email](#)
[Incoming Email](#)

Outgoing Email

Sending outgoing e-mails is a part of a communication between **Aware IM** and an external party, such as an individual or an organization. Communication between **Aware IM** and external parties is described in the [Communication with Other Systems](#) section. An outgoing e-mail represents a notification sent by an **Aware IM** –based application to an external party. The external party must be represented by an intelligent business object and must have a communication channel of the “e-mail” type defined. E-mail can be sent from business rules using the [SEND](#) action of the Rule Language.

There are, therefore, 3 steps involved in the configuration of an application that needs to send e-mails:

1. Define an intelligent business object representing the addressee of the e-mail with the communication channel of the “e-mail” type.
2. Define a notification representing a particular e-mail.
3. Define a business rule that will use the [SEND](#) action to send the e-mail under the appropriate circumstances.

Step 1 is described in the [Defining Intelligent Business Objects](#) section. Once the channel has been defined **Aware IM** automatically adds the special attribute called `EmailAddress` to the definition of the intelligent business object. The value of this attribute is used by **Aware IM** to determine the e-mail address of the e-mail recipient when the e-mail is sent. The value of this attribute can be set on the form of the business object by the user or by rules.

Step 2 is described in the [Adding/Editing Notifications](#) and [Sending Outgoing E-mail](#) sections. When configuring a notification representing the e-mail it is important to define the `Subject` and `Message` attributes, the values of which will be used by **Aware IM** to

specify the subject and body of the outgoing e-mail respectively. Also if the email has attachments the notification has to define attributes of the Document type – one attribute per attachment. The documents stored as values of these attributes will be used as e-mail attachments (see also [Document Management](#)).

Step 3 is described in the [SEND](#) action section of the Rule Language Reference. One point to note here is that it is not necessary to create the notification representing the email explicitly using the [CREATE](#) action – **Aware IM** will automatically create and initialize the notification before it is sent if it has not been created explicitly. Initialization expressions of the notification may use tag elements referring to the current Context (see [Document Generation](#)). For example, one could define the `ExpiryEmail` notification with the `Message` attribute initialized to the following text:

“Dear <<Customer.Name>>, your policy is about to expire”.

Then one could define the following rules:

```
FIND Customer WHERE Customer.Policy.ExpiryDate=CURRENT_DATE  
SEND ExpiryEmail TO Customer
```

This is equivalent to the following:

```
FIND Customer WHERE Customer.Policy.ExpiryDate=CURRENT_DATE  
CREATE ExpiryEmail WITH ExpiryEmail.Message='Dear  
<<Customer.Name>>, your policy is about to expire'  
SEND ExpiryEmail TO Customer
```

Incoming Email

Just like [outgoing e-mails](#) incoming e-mails are represented by a notification. Unlike outgoing e-mails there is only one notification that represents an incoming e-mail. Its name is `IncomingEmail`. The name and attributes of this notification cannot be changed.

Conceptually this notification is received by a business space, so to define this notification the configurator must indicate that the business space will be receiving incoming e-mails. This process is described in detail in the [Setting Options for Incoming E-mail Handling](#) section. Basically the configurator has to provide the name of the email server and the details of the e-mail account. After this **Aware IM** will automatically add the definition of the `IncomingEmail` notification to the business space.

Once the `IncomingEmail` notification has been added to the list of notifications it is up to the configurator to define business rules that will be triggered once the e-mail is received (see [Data Processing](#)). The rules may check the attribute values of the `IncomingEmail` notification and perform the appropriate actions. The attributes of the

notification contain the date when the e-mail was sent, who it was sent from, the subject and the body of the e-mail etc. There are also three attributes of the Document type representing the e-mail attachments. The first two attachments (if present) are contained in the first two attachment attributes. If e-mail has more than two attachments all other attachments are zipped up and stored in the third attachment attribute.

Example of a rule attached to the IncomingEmail notification:

```
If IncomingEmail.Subject = 'Support Request' Then CREATE  
SupportRequest WITH SupportRequest.Contents =  
IncomingEmail.Message
```

This rule creates the business object SupportRequest initialized to the body of the received e-mail.

The [SET](#) action of the **Aware IM** Rule Language can be useful for analysing the received e-mail provided that the body of the e-mail is in a format required by the [SET](#) action.

Export and Import

Aware IM includes the functionality to import and export instances of a business object to and from the system. This functionality may be useful under the following scenarios:

1. The user wants to enter large amounts of data into the system – it may be too tedious and slow to enter each instance of a business object using the business object form (see [Data Entry and Editing](#)). It is much faster and easier to use a text editor or a spreadsheet to prepare the data in a file and then import the file in one go.
2. A variation of the first scenario. The user wants to modify large amounts of data. Again it may be too slow and tedious to do it using a business object form. It may be much faster to export the required instances from the system, change the data using some text editor or a spreadsheet and import the data back into the system.
3. It may be necessary to transfer data from some other (non-**Aware IM**) system into the **Aware IM**-based system. The data from another system can be imported from a CSV or XML file.
4. It may be necessary to transfer data from the **Aware IM**-based system into some other (non-**AwareIM**) system. The data to be transferred can be exported into a comma delimited CSV file.

When data is exported from a system **Aware IM** writes out attribute values of those instances of a business object that have been selected for export. The attribute values are written into a comma-separated file (CSV), which is supported by a large number of software programs including Microsoft Excel.

For options 3 and 4 above the best approach is to define your own import or export template that defines mapping between the columns in the data file format supported by an external package and attributes of the object in Aware IM. Aware IM includes a sophisticated mapping module that allows end users to define such templates. For more details about this please watch the [video tutorial](#) about import and export templates.

There are several options that control how export is performed:

For update

It is possible to indicate whether values of the [ID attribute](#) will be written into the output file. If this option is switched on **Aware IM** writes out values of the ID attribute for each instance of the exported business object. When such a file is imported back into the system **Aware IM** detects that the data contains the ID attribute and tries to find the corresponding instance in its database. Then it uses the data in the record to *modify* the instance rather than to *add* a new one. Thus this option controls whether exported data will later be used to import the new data as in scenario 1 or modify the existing data as in scenario 2.

 **NOTE:** It is possible to use a particular attribute, rather than ID attribute to indicate update operation. If you add “*” symbol before the name of the object and attribute in the header of the CSV file, **Aware IM** will use values of this attribute to find instances of business objects to modify (only one instance must be found for each value of the attribute). This may be useful when exchanging data with non-**Aware IM** systems that do not have the ID attribute.

Export Binary

It is possible to select which attributes will be exported and optionally specify whether attributes of the Binary, Document or Picture types should be exported

Export Relationships

It is possible to indicate whether reference attributes should be exported – see [Exporting and Importing Relationships](#)

When the data is imported from a CSV file **Aware IM** checks whether the imported file includes values of the ID attribute and if so tries to find the corresponding instances and update the attribute values with the data from the file. Obviously it changes values only of those attributes that are present in the file leaving other values intact. If the file does not have the values of the ID attribute **Aware IM** creates a new instance of the business object for each record in the file initialises it from the data in the record. The following import options can be specified:

With validation

This option indicates whether **Aware IM** will perform validation of the instances when the data is imported. This option allows bypassing the execution of rules that are attached to the business object being imported. When validation is off **Aware IM** does not execute

the rules thus leaving the possibility of storing logically invalid data. The option exists purely for efficiency reason – importing with validation off is faster, yet it becomes the user's responsibility to provide valid data.

Batch size

Aware IM imports records in batches of the specified size. After each batch has been imported **Aware IM** commits the database transaction thus making the changes permanent (see also [Batch Operations](#)).

Import and export can be performed either from the user interface of the Operation Mode (see [Export and Import in the Operation Mode](#)) or from business rules (see [Export and Import from Business Rules](#)).

Export and Import in the Operation Mode

In order to perform export or import from the user interface an operation of the “Export” or “Import” type has to be configured (see [Setting Menu Item Properties](#)).

If you want import or export to use one of the templates that you have defined select the template from the list. Attribute mapping will be defined by this template. If you choose not to use a template, **Aware IM** will create a special header row describing attributes of the object contained in each column during export and it will expect the file to contain such a row during import.

When exporting the data the user has to indicate which instances of which business object should be exported (unless a template is used). This is specified by either selecting a business object (if all instances are to be exported) or by selecting a query (the instances found by the query will be exported). Then the user can specify export options as described in the [Export and Import](#) section. When specifying export options it is possible not only to indicate which attributes should be exported but also specify the export format of each attribute. By default the format in which the value of the attribute is exported is the format defined in the attribute (see [Adding/Editing Attributes](#)). The user can override the default format and provide custom format. For example, if the Account.OpeningDate attribute is defined to have “dd/MM/yy” format, the user can override this format and define the export format to be “dd/MM/yyyy”. This option can be useful if data is to be transferred to another system as described in scenario 4 of the [Export and Import](#) section.

After the selected instances have been exported the resulting export file in CSV format can be downloaded to the user's computer.

When importing data the user has to indicate instances of which business object are to be imported (unless a template is used) and specify import options as described in the [Export and Import](#) section. The user also has to provide the name of the file to import from and indicate whether this file is a [relationships file](#). After the instances have been imported **Aware IM** displays the export or import log. If there were any records in the

import file that could not be imported for whatever reason, the log shows the records that have not been imported. The user can modify the import file by excluding all records that have been successfully imported; fixing the records that had errors and re-importing the file.

The format of the CSV and XML file is described in the file `ExportImport.txt` located in the `DOC` directory of your Aware IM installation.

Export and Import from Business Rules

Export and import can be performed from business rules by executing the [EXPORT](#) or [IMPORT](#) actions of the Rule Language. The export and import options described in the [Export and Import](#) section can be specified as parameters of the actions. The name of a business object to export or import is also specified as the action parameter. The actual instances of the specified business object to export or import are taken from the current Context of rule execution (see [Context of Rule Execution](#)).

Exporting and Importing Relationships

Aware IM can export and import not only simple attributes of business objects but also [reference attributes](#) that represent relationships between business objects. When values of reference attributes are exported **Aware IM** writes out the following information:

- For single references the name and the value of the [ID attribute](#) of the referred instance is exported. The name and ID are separated by the “#” symbol.
- Values of all “multiple” references of the object are written into a separate file called the *relationships file*. Each record in the file includes the ID of the reference owner (see [ID attribute](#)), the name of the referred instance, the ID of the referred instance and the name of the reference attribute.

Importing relationships is arguably most useful when importing data from other systems as described in scenario 3 of the [Export and Import](#) section. Relationships of a business object are represented in the import file by values of one or several attributes in each record. The first record in the import file contains names of the imported attributes; the names of reference attributes must include the name of the reference attribute and the name of some attribute in the referred object – for example,

`Account.Owner.FirstName`. When **Aware IM** imports a record containing relationships it reads attribute values representing a relationship and uses these values to find the instance of the referred object in the database. Values of reference attributes must point to only one instance of the referred object (in other words, these attributes must uniquely identify the instance) – for example, values of attributes

`Account.Owner.FirstName` and `Account.Owner.LastName` uniquely identify the owner of the account. If **Aware IM** finds the single instance of the referred object in the database it associates this instance with the imported instance through the specified reference attribute (`Account.Owner` in the above example). If **Aware IM** finds more

than one instance of the referred object it does not import the relationship and adds an error record into the import log.

It is possible that referred instances have not been imported into the system yet, so **Aware IM** does not find *any* instance of the referred object from the values of the reference attribute. In this case **Aware IM** creates a relationship file where it writes the ID of the reference owner and the values of the reference attributes. Later on, when referred instances have been imported into the system, this relationship file can be re-imported to recreate the relationships.

For example, let us assume that we are importing accounts of the account owners. The `Customer` object is referenced by the `Account.Owner` attribute and an instance of the owner is identified by the `Account.Owner.FirstName` and `Account.Owner.LastName` attributes. Let us assume that we are importing a single record representing a new instance of the `Account` object. The record has the following values:

<code>Account.Date</code>	<code>Account.Balance</code>	<code>Account.Owner.FirstName</code>	<code>Account.Owner.LastName</code>
22/06/2004	1000	John	Smith

When **Aware IM** imports this record it creates a new instance of the `Account` object with the value of the `Date` attribute equal to 22/06/04 and the value of the `Balance` attribute equal to 1000. `Account.Owner.FirstName` and `Account.Owner.LastName` represent a relationship of the account, so **Aware IM** tries to find the instance of the `Customer` object with the value of the `FirstName` attribute equal to "John" and the value of the `LastName` attribute equal to "Smith". If it finds such an instance it creates a relationship between the new instance of the `Account` object and the found instance of the `Customer` object. If **Aware IM** does not find the instance of the `Customer` object with these values it writes the following record into the relationship file (here we assume that the value of the `ID` attribute of the new `Account` object automatically assigned by **Aware IM** is 1734):

<code>Account.ID</code>	<code>Account.Owner.FirstName</code>	<code>Account.Owner.LastName</code>
1734	John	Smith

Once the instance of the `Customer` object representing John Smith has been imported into the system we can import the above relationship file created when importing accounts. This time **Aware IM** will find the instance of the `Customer` object representing John Smith and create a relationship between the account with ID 1734 and this instance.

Setting Initial Values of the Application

Quite often it may be necessary to initialise an application with attribute values specific to a particular group of end users. For example, in a generic application for schools it may be necessary to initialise the application with values specific to a particular school, such as specify the name of the school, number of lessons per day etc.

Usually such initialises on is performed by the administrator of the system, who does it once before the majority of users access the system.

Aware IM includes the predefined business object **SystemSettings** that can help in setting the initial values of the application. The **SystemSettings** business object is automatically included in all business space versions – it has a number of predefined attributes and configurators can also add their own attributes. The instance of the **SystemSettings** object can be created by the administrator of the system or created automatically by rules. The interesting feature of the **SystemSettings** object is that there can only be one instance of this object in the system – **Aware IM** will not let you create the second instance. This makes it possible for **Aware IM** to always keep this single instance in the [Context](#) and configurators can use this object anywhere in business rules or inside tags without having to worry about placing this instance in the Context first.

The **SystemSettings** object essentially lets you use its attributes as parameters of the application. For example, if the application that you configure includes document templates that have logos of the end users you may want to let the system administrator provide the logo of the specific end user before this user starts working with the system. You can solve this by adding “**LogoImage**” attribute of the Picture type to the **SystemSettings** object and design document templates to contain the reference to this attribute (`<<SystemSettings.LogoImage>>`) rather than providing the specific image in the document template. You will then define the menu item (for the system administrator only) that will create the instance of the **SystemSettings** object and bring up its form. The administrator will use this menu item and provide the specific image as the value of the “**LogoImage**” attribute.

Extending Aware IM

Aware IM is a powerful software system that allows users to configure fully functional Internet enabled applications without programming in most cases. Thus **Aware IM** can be used not only by professional developers but also by business professionals.

In certain cases, however, it may be necessary to add programming extensions to **Aware IM** in order to implement application functionality that is otherwise very difficult or impossible to configure using available configuration tools. This mostly applies to calculation extensive functionality (for example, some mathematical algorithms) or

interaction with some non-standard hardware that is not supported by **Aware IM** out-of-the-box.

It is important to stress, though, that in order to support such functionality programmers do not have to learn new technologies or understand at a very deep level the internals of the **Aware IM** software.

Aware IM allows programmers to write extensions (plug-ins) in the following areas:

- Custom processes implemented by software components rather than by configured rules (see [Adding/Editing Processes](#))
- Custom forms (see [Defining Forms](#))
- Custom channels for intelligent business objects (see [Intelligent Business Objects](#))
- Custom function libraries
- Custom document types (see [Working with Documents](#))
- Report calculation components (see [Setting System Calculation Properties](#))

The details on how to write code for **Aware IM** extensions are provided in the “Aware IM Programmer’s Reference”.

Configuration Process

In the previous sections we have frequently mentioned configuration of different elements of an application such as business objects, business rules, processes etc. The following section provides an overview of the configuration process while the details are provided in the [Working with Configuration Tool](#) section.

See also:

- [Business Space Versions and Version Control](#)
- [Productivity Features](#)
- [Testing Mode](#)
- [Working with Aware IM in Hosting Environment](#)
- [Configuration Guidelines](#)

Business Space Versions and Version Control

To configure an application is to configure a [business space](#). At the end of the day it is the business space that must contain all the configuration elements – business objects, business rules, processes etc. The default business space is created during **Aware IM** installation (see the “Aware IM Installation Guide”). This business space is usually the one that represents the application.

Application configuration is not a trivial process – it involves detailed preparation as the configurator has to collect and analyse requirements of the system and think how these

requirements are translated into business objects, business rules etc, and it usually evolves over time as new requirements and new business rules appear or old requirements are changed or become irrelevant.

To help manage changes of a business space **Aware IM** includes a built-in version control mechanism. It allows configurators to make and test changes to a business space without affecting the normal operation of the system. When a change to a business space needs to be made a new *business space version* must be created and the change must be made in that version. Thus all elements of a configuration are always contained within some business space version.

With the version control mechanism configurators can also keep track of changes made to the application over time. For example, one can find out which rules and processes were in effect at a particular date and time or what specific information was being registered by the system by inspecting a particular business space version that was current at that time.

Some business space versions are treated differently from others. This treatment is based on their *state* – this is explained below.

Most business versions undergo the following lifecycle:

1. The version is created (either as a blank version or from some base version – see [Major and Minor Versions](#)) in the **NEW** state. The configurator makes changes to the version by creating or making modifications to the configuration elements, such as business objects, business rules etc
2. Once the configurator is happy with the version she makes it available for testing and the state of the version becomes **UNDER TEST** (see [Testing Business Space Version](#)). At this moment the configurator can test the version in the Operation Mode to verify that the changes work as expected. **Aware IM** keeps the version being tested separately from the current operating version, so the testing is not going to disrupt operation activities (see [Testing Mode](#)). If testing discovers that more changes need to be made to the version the version is moved back to the **NEW** state and step 2 is repeated.
3. Once the configurator is satisfied with the version she makes it operational (see [Publishing Business Space Version](#)). **Aware IM** makes any necessary adjustments and starts using the updated configuration information in the operation mode. The state of the version becomes **CURRENT**.
4. When some other version is made operational the version becomes **OBSOLETE**. It can be deleted or kept for historical purposes. It is also possible to return to the

obsolete version and make it operational again if for whatever reason the new version has been proven not satisfactory.

See also [Lifecycle of a Business Space Version](#).

Productivity Features

Aware IM offers a number of productivity features that help configurators work with business space versions:

- A business space version can be exported to, or imported from a file, so that configurations can be shared (see [Exporting Business Space Version](#) and [Importing Business Space Version](#)). This makes it possible to prepare [configuration templates](#) for others to use.
- A business space version in the CURRENT or UNDER TEST state must be consistent, i.e. it must not have invalid rules, references to non-existent business objects etc. **Aware IM** performs rigorous checks of the validity of the version's elements before the version is made operational or made available for testing. This process is called integrity checking – see [Checking Version Integrity](#).
- On configurator's request **Aware IM** can generate documentation for a particular version. This documentation has the names, properties and descriptions of all elements in the version (business objects, business rules, processes etc) in the format that can be easily viewed or printed. The documentation is an entirely separate structure and no access to **Aware IM** software is required to view it. The documentation can be used for reference and/or audit purposes. See also [Generating Documentation](#).

Testing Mode

As described in the [Business Space Versions and Version Control](#) section a business space version can be put under test to verify that the version works as expected before making the version operational.

To test the business space version the configurator has to log into the system in the Operation Mode using the URL described in the [Login](#) section. The screen displayed by **Aware IM** includes the “Testing Mode” check box – this checkbox needs to be ticked to indicate that **Aware IM** should operate in the testing mode.

Using the application in the Operation Testing Mode is very similar to using the application in the regular Operation Mode. The main difference is that the operation data created when the application works in the Operation Testing Mode is stored in a completely separate database, so that the main data of the system is not affected by any

operations performed in the testing mode. There are also some other relatively minor differences that are summarized below:

1. Users with the “Guest” access level (see [Predefined Access Levels](#)) cannot log into the system in the testing mode. If one wants to test the “Guest” access level while working in the testing mode the following can be done:
 - a. Log in as administrator into the testing mode as described above.
 - b. Create a new instance of the `RegularUser` object and set the value of its `AccessLevel` attribute to ‘Guest’
 - c. Logout and login as the newly created user.
2. Menu item of the “Login” type will attempt to login the user into the regular mode, not the testing mode.
3. Menu item of the “Register User” type: when the user completes registration the system automatically logs in the user into the regular mode of the same business space using the newly entered login name and password.
4. If a business space version is configured to process incoming e-mails (see [E-mail Handling](#)) it will periodically check the specified mailbox on the mail server, whether in the regular or testing mode. Therefore, if there is an operational version in the regular mode and the one in the testing mode that are both configured to receive e-mails from the same source they will compete for incoming e-mails. As a result new incoming e-mails can end up in either regular or testing version. To avoid this situation, change the version to be put under test to use an alternative mailbox.
5. It is not possible to save newly built queries in the testing mode (see [Building Queries in the Operation Mode](#)).

Working with Aware IM in Hosting Environment

The main components of the **Aware IM** software are the **Aware IM** Server and the Configuration Tool. **Aware IM** Server is the core component of the software that stores configuration and operational data and executes processes and business rules, whereas the Configuration Tool provides the functionality that allows configurators to define business objects, processes, business rules and other elements of an application.

Normally the Configuration Tool works in tandem with the **Aware IM** Server – the changes to the configuration data performed in the Configuration Tool are stored on the **Aware IM** Server and vice versa – the Configuration Tool obtains the initial configuration data from the **Aware IM** Server (see also [Configuration Process](#)). This makes it possible to store and update the configuration information in one repository managed by the **Aware IM** Server.

Aware IM allows users to access their business space in the Operation Mode from any location via the Internet using a standard Web browser. This requires the **Aware IM** Server to be installed on a computer that has a permanent connection to the Internet

with sufficient speed and bandwidth. The users who do not have a suitable Internet connection can run the **Aware IM** Server on a remote computer managed by an Internet hosting service provider (this set-up is called a hosting environment – see also “Aware IM Installation Guide”). Users who only need to access their application within a single location do not need a hosting environment.

In the hosting environment the Configuration Tool is unable to work with the **Aware IM** Server directly. However, one can prepare and test configurations on the local machine and then export the configuration into a BSV file. Once saved to a file the configuration information can then be uploaded to the remote **Aware IM** Server from the user interface of the Operation Mode.

In order to upload the configuration file to the **Aware IM** Server the system has to be configured to include the menu item of the “Publish Business Space Version” type (see [Setting Menu Item Properties](#)). When the user selects this menu item in the Operation Mode **Aware IM** displays a form where the user can specify the configuration file and provide the description of the changes. When the user submits the form the version is uploaded to the **Aware IM** Server and becomes operational (at this point **Aware IM** also performs the usual checks of the version to make sure that it is consistent – see [Checking Version Integrity](#)).

A few other features that can be very helpful for users that need to operate with the remote **Aware IM** Server can also be configured:

- Operation of the “List Business Space Versions” type shows all business space versions available on the server in the Operation Mode. One can view the properties of the versions and delete them if necessary. This is like having a bit of functionality of the Configuration Tool in the Operation Mode
- Operation of the “Create Business Space” type allows creating a new business space in the Operation Mode. The functionality is equivalent to the similar functionality in the Configuration Tool. A system of an Internet host may include this operation to allow their users to create their own business space and work in it.
- Operation of the “Log Management” type allows downloading the rule execution log from the **Aware IM** Server (see [Execution Log](#)). This feature makes the log accessible in the Operation Mode. The feature allows turning log management on and off for the current session as well as setting the level of logging. Note that any changes to the log settings only affect the log of the current user and do not affect the settings of the logs of other users.

Configuration Guidelines

See:

[Configuration steps](#)

[Configuration principles](#)

Configuration steps

This section describes the recommended sequence in which configuration elements should be defined when configuring a new application.

See:

[Business objects](#)

[Business object rules](#)

[Processes](#)

[User interface](#)

Business objects

Business objects are the central elements of any **Aware IM**-based application. None of the other elements would be of any use without business objects. It is therefore important to start working on an application by configuring objects of the business environment for which the application is being created.

Which objects need to be configured depends entirely on the nature of the business. You can, therefore, start by identifying the business elements that people deal with as part of their day-to-day activities.

See section [Business Objects as Carriers of Data](#) for general description of business objects. See section [Configuration principles](#) for recommendations on configuring business objects and object groups.

Business object rules

Once you have created your business objects you can start attaching rules to the objects. All data processing in **Aware IM** is done by object rules. Such rules can find, create or delete objects, perform initialises on, validation and calculation operations, communicate with other software systems or people, etc.

Rules are found everywhere in a business environment. You need to identify the rules that are applicable to your application and attach them to the appropriate objects. Some rules may be well-known and easy to spot. For example:

- No account can be open for a person under 16 years old.
- Once a transaction is approved its amount cannot be changed.
- If an item is not returned to the library by due date a reminder e-mail is sent to the borrower.

Other rules can be found by inspecting processes and procedures performed by people in the course of their day-to-day activities. You would need to break these procedures into steps and configure each step as one or more rules attached to one or more business objects.

To configure effective object rules it is essential to understand how rules work in **Aware IM**. See section [Business Rules as Carriers of Business Logic](#) for introduction

into object rules, [Data Processing](#) for detailed explanation of rule processing, [Configuration principles](#) on important guidelines on configuring object rules.

Processes

Now, that you have the business objects and object rules that handle information processing, you can add processes to provide a convenient way of making and handling incoming requests for information or operations. See section [Processes as Links between User Interface and Business Logic](#) for details on the purpose and use of processes.

To make it easier for the users to perform an operation that applies to a particular object you can configure a process that takes that particular object as its input. For example, a transaction approval operation can be configured as a process `ApproveTransaction` that takes `Transaction` object as its input and contains the following two rules:

- `Transaction.State='Approved'`
- `DISPLAY MESSAGE 'Transaction has been completed'`

Processes with a single object as their input will be available for users to start on the corresponding object forms. Therefore, rather than having to manually change the state of a pending transaction and submit the form, the authorized user can simply choose process `ApproveTransaction` on the transaction object form.

You can also define processes with no input objects, which are useful for creating new objects or performing other operations that do not require selecting a particular single object upfront. Such processes can be made available to the users as operations via the main menu of the system. For example, an account opening process could be configured as follows:

- `ENTER NEW Account`
- `PRINT DOCUMENT AccountOpeningLetter`
- `VIEW Account`

Remember that processes should not be configured to process information. This is a job for object rules – see [Configuration principles](#) for more details.

User interface

When you configure a new application **Aware IM** provides the default interface for the users of the application. This includes the main menu with a set of generic operations allowing the users to search for business objects in the system, create new objects or documents and perform some other actions. For each of the business objects you configure **Aware IM** generates the default object form to allow the users to edit the object. There are several steps you can take to enhance and fine-tune the user access to the system.

First, inspect the auto-generated object forms. With very little effort you can adjust the forms by selecting the attributes to appear on forms. For complex objects with many attributes you can split the form into several sections and select the attributes for each of the sections. If you have configured processes to start operations that are applicable to particular objects, such operations will be available on the object form for the users to start, making the system easier for people to use.

The main menu of the system the users see when they log into the system can also be easily customized. You can hide the generic actions from the menu and add specific operations such as finding customers, creating accounts, registering members, etc. To initiate such specific operations you can define queries looking for particular objects matching the search criteria entered by the users. You can also attach to the menu the no-input processes, as described in the previous section, to let the user perform operations.

If you want the object information to appear differently to users of different categories you can define additional access levels and specify the information and operations available to users of each level. **Aware IM** will adjust object forms and the main menu accordingly. In addition, you can configure different object forms and different visual perspectives, which include the main menu and other visual settings, for different access levels. This gives you more options of controlling the way the users work with the system.

Configuration principles

This section contains several key recommendations on configuring **Aware IM** applications. The rationale behind these recommendations is to help creating applications that have fewer elements, easier to understand and, most critically, easier to maintain. People familiar with development of data management applications may find some of the recommendations familiar and obvious. Certain things, however, are done differently in **Aware IM** compared to traditional development tools. This is why reading these guidelines would be beneficial for experienced developers as well.

The recommendations of this section describe the general principles of configuring applications.

[Business objects represent elements of business environment](#)

[Business object groups unite dissimilar objects](#)

[Object rules perform all information processing](#)

[Object rules are self-contained](#)

[Object rules are attached to the right objects](#)

Business objects represent elements of business environment

It is very important that each object you configure represents some real element of the business, not just an arbitrary collection of data. Systems having objects with unclear purpose and processing logic are difficult to operate and maintain.

Examples of legitimate business objects, commonly found in many business organizations, could be customers (clients, members, etc.), accounts (contracts, policies, etc.), orders, fees, payments, etc. They would have attributes and rules clearly identifiable from day-to-day business activities.

Business object groups unite dissimilar objects

Use a business object group only when the objects in the group cannot be configured as a single object. Unnecessarily creating several similar objects will lead to duplicating of configuration information such as attributes and rules. Whenever the configuration of one of such objects needs to be changed, other similar objects are likely to require the same change.

You need to configure business elements of similar nature as separate objects, as opposed to a single object, when:

- Attributes of one of the objects are not applicable to other objects and should not be displayed on an object form for the other objects.
- Different processing logic applies to different objects. There would be too many rules for one object and they would become too complicated because of the differences.

For example, different forms of customer communication such as email, telephone call, fax or traditional letter, have to be configured as separate objects because of the different way the message information is stored and presented to the user. Withdrawal and deposit transactions, while both being financial transactions applicable to accounts, have to be configured separately because of different processing rules that apply to the transactions.

When objects differ only to a minor extent the difference may be covered by an attribute in a single object. For example, a library catalogue may contain items of different types such as books, videos, CDs, etc. Other attributes such as title, author, description, or catalogue number would be identical. Therefore, a single `LibraryItem` object may be configured that has an additional attribute representing the item type.

Object rules perform all information processing

All essential processing logic in the system should be specified as individual rules attached to applicable objects, not processes. There are two important reasons for this principle.

Reason 1. There may be many scenarios causing a change to an object. If the processing logic is spread across various scenarios, any change to the logic needs to be propagated throughout the scenarios. With the object rules approach, for each object you specify all rules that make sense from that particular object point of view. None of these rules are duplicated anywhere else in the system.

For example, **Aware IM** will automatically evaluate the following validation rule on account whether a new holder is linked to the account, or the existing holder's age is changed:

```
If Account.Holder.Age < 16
Then REPORT ERROR 'Account holder must be 16 years old or over'
```

Reason 2. Object rules are independent from each other and therefore allow configuring each step in multi-step procedures separately from other steps. A really complex procedure would be difficult to configure as a single process because of multiple conditional, parallel or overlapping steps it may contain.

Let us consider an example of a withdrawal transaction, which requires an approval by an authorised person if the withdrawal amount exceeds 5000. Before the transaction is approved all necessary validation checks should be made. After the approval the account balance should be updated accordingly.

We will first demonstrate how this procedure can be implemented by object rules. We configure `WithdrawalTransaction` object with its `State` attribute initialises to 'New'. We then attach a pre-approval validation rule to the object:

```
If WithdrawalTransaction.State = 'New' AND
WithdrawalTransaction.Account.Balance <
ABS(WithdrawalTransaction.Amount)
Then REPORT ERROR 'Insufficient funds on account'
```

In a similar manner we could attach all other validation rules as necessary. Next, we need to see if the transaction can be approved automatically, which is done by attaching the following rule to `WithdrawalTransaction`:

```
If WithdrawalTransaction.State = 'New' AND
ABS(WithdrawalTransaction.Amount) < 5000
Then WithdrawalTransaction.State = 'Approved'
```

If the transaction amount is larger the transaction will wait for manual approval (or rejection) by an authorized person. The manual approval will change its state to 'Approved' signalling the start of the second step in the processing of the transaction, namely the updating of the account balance. This can be done by attaching the following rule to `Account` object (note that `Transaction` here is a name of object group that has `WithdrawalTransaction` as well as objects for other transaction types as its members):

```
Account.Balance = SUM Transaction.Amount WHERE
(Transaction IN Account.Transactions AND
Transaction.State = 'Approved')
```

Let us now see how the same procedure could be configured using processes, a more traditional approach, which is not recommended for use in **Aware IM**. We would need two processes. The first is called `EnterTransaction` and contains the following sequential rules:

- ENTER NEW `WithdrawalTransaction` WITH
`WithdrawalTransaction.Account` = `Account`
- If `ABS(WithdrawalTransaction.Amount) < 5000` Then
`WithdrawalTransaction.State` = 'Approved'
`REDUCE Account.Balance BY`
`ABS(WithdrawalTransaction.Amount)`

The second process is called `ApproveTransaction` and used by an authorised person to complete pending transactions. It contains the following rules:

- `WithdrawalTransaction.State` = 'Approved'
- `REDUCE Account.Balance BY`
`ABS(WithdrawalTransaction.Amount)`

What is wrong with these processes? Several things:

1. The rule updating the account balance is duplicated in both processes. All other similar processes, configured to handle other transaction types, would also have to include a step updating the account balance. Compare this with the object rules approach where there is only one rule on the `Account` object that updates the balance whenever a new transaction is applied.
2. Transaction processing logic is entangled with the user interface step that allows the user to enter the transaction details. If the transaction needed to be created without the user input, for example as a part of a funds transfer transaction, the validation and calculation rules would have to be duplicated in the transfer process.
3. If the logic of updating account balance needs to be changed, the change would need to be propagated throughout all the processes configured in the system that update account balance.

Object rules are self-contained

Each individual rule attached to an object should be self-explanatory and independent of other rules. In other words, it should include all necessary conditions to clearly specify when the rule action should be executed. There are two important reasons for this principle.

Reason 1. If specific conditions for the rule action are not defined, the action can be executed at the wrong time leading to the wrong results.

Reason 2. A rule cannot depend on execution of actions of other rules since the order in which object rules are executed is not defined.

For example, the following rule initialises the account address with a default value. Once the address is given the rule action will not be executed again:

```
If Account.Address IS UNDEFINED
Then Account.Address = Account.Holder.Address
```

If we removed the condition the rule would execute every time the Account object is changed, thereby overwriting the address manually entered by the user.

In another example the rule below ensures that the transaction amount cannot be changed once the transaction is completed. If the condition were removed the system would not allow changing the amount at any time, including the initial entry of the transaction details:

```
If Transaction.State = 'Approved'
Then PROTECT Transaction.Amount FROM ALL
```

Let us consider yet another example in which the final action is determined by several possibly dependent events or facts. There may be a requirement to notify the library member when an item the member reserved is returned to the library. If the e-mail address of the member is known the member is notified by e-mail, otherwise a letter is posted to the member. These requirements are implemented in **Aware IM** by two self-contained and independent rules attached to the Reservation object:

Rule 1:

```
If Reservation.Status WAS CHANGED TO 'Offered'
AND Reservation.Member.EmailAddress IS DEFINED
Then SEND ReservaitonOfferEmail TO Reservation.Member
```

Rule 2:

```
If Reservation.Status WAS CHANGED TO 'Offered'
AND Reservation.Member.EmailAddress IS UNDEFINED
Then PRINT DOCUMENT ReservaitonLetter
```

Object rules are attached to the right objects

A rule attached to an object should specify the logic that applies to that object, not other objects. In particular, a rule that modifies an attribute of an object should be attached to the object to which the attribute belongs. There are two important reasons for this principle.

Reason 1. The right rule attached to the wrong object will lead to the wrong results.

Reason 2. When you need to make a change to an object configuration you will see all relevant rules in one place. You will not need to search through the system to see what other object rules can make a change to the object and when. This may also help reducing the number of similar rules, which will further simplify the system.

Let us illustrate this principle with examples. Consider a validation rule that a person must be 16 or over to be an account holder. This rule should be attached to the Account object and can be specified as follows:

```
If Account.Holder.Age < 16  
Then REPORT ERROR 'Account holder must be 16 years old or  
over'
```

However, the same rule attached to the Person object would have a very different meaning:

```
If Person.Age < 16  
Then REPORT ERROR 'Account holder must be 16 years old or  
over'
```

This is because the latter rule would essentially state that no person under 16 can be registered in the system, whether to be an account holder or for any other purpose. While this may very well be another business rule on its own right, it is definitely not what the original rule was meant to specify.

As for the object-modifying rules, consider an example when an account balance is updated following a financial transaction applied to the account. A rule on the transaction could update the account balance:

```
If Transaction.State WAS CHANGED TO 'Approved'  
Then INCREASE Transaction.Account.Balance BY  
Transaction.Amount
```

Now suppose that there are a number of transactions in the system, each represented by a separate object. The above rule would have to be configured, essentially duplicated, for each specific transaction object. The correct way of updating the account balance, and also a safer one, would be for the account to update its own balance following the addition of a new transaction. This is done by attaching the following rule to Account object:

```
Account.Balance = SUM Transaction.Amount WHERE  
(Transaction IN Account.Transactions AND  
Transaction.State = 'Approved')
```

Note that **Aware IM** will execute the above rule whenever any of the account details change, including the transaction list, or the state of a transaction, that is already in the list, changes. We can be more specific and state that the balance should be updated only when the transaction list changes (i.e. a new transaction is added), but not when other account details change. Then we would need to add a corresponding condition to the above rule:

```
If Account.Transactions WAS CHANGED  
Then Account.Balance = SUM FinancialTransaction.Amount WHERE  
(FinancialTransaction IN Account.Transactions AND  
FinancialTransaction.State = 'Approved')
```

In this case, however, we should also remember to update the balance when a pending transaction is approved, which can be done by adding the following rule to Account:

```
If Transaction FROM Account.Transactions WAS CHANGED  
AND ChangedTransaction.State WAS CHANGED TO 'Approved'  
Then Account.Balance = SUM FinancialTransaction.Amount WHERE  
(FinancialTransaction IN Account.Transactions AND  
FinancialTransaction.State = 'Approved')
```

Configuring Applications

Overview of the Configuration Tool

Applications are configured in the Configuration Tool. The screen area of the Configuration Tool is divided into several regions:

- *Elements Tree* (red)
- *Working Area*. (orange)
- *Main Element Properties* (green)
- *Selection Properties* (blue)
- *Additional Windows* (yellow)

The Elements Tree contains the configured elements presented as a hierarchical tree structure. Right clicking on a tree node brings up a pop-up menu specific to the selected element. Most elements provide the *New* and *Open* commands in their pop-up menus that allow adding new elements or editing the existing ones. Once the user selects the *New* or *Open* command from a pop-up menu the editor corresponding to the selected element appears in the Working Area. The user can then enter properties of the new element or change properties of the existing element using the controls of the editor. You can also edit an existing element by double clicking on it.

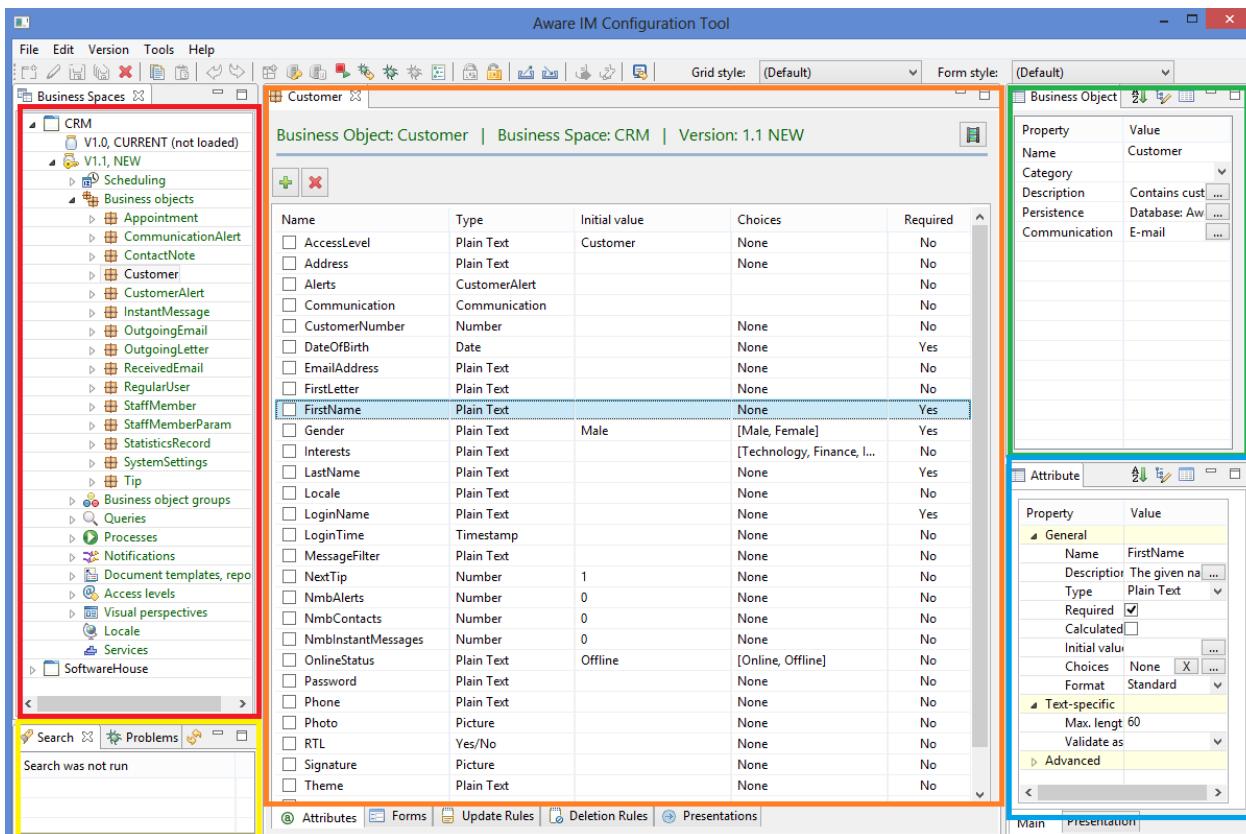
It is possible to enter/edit properties of several elements at the same time – the editors are displayed as different tabs and it is possible to switch between editors by clicking on the corresponding tab. See also [Adding Element](#), [Editing Element](#).

The “Main Element Properties window” contains a list of properties of the element being edited – for example, a business object. The “Selection Properties” window shows the properties of the selected sub-element that belongs to the main element. For example, an attribute of the business object being edited.

The “Additional Windows” area contains some other windows – for example, results of search and a list of integrity problems of the business space version.

Note that most windows can be moved around the screen, so that the user can re-arrange them the way it suits him/her.

The screen of the Configuration Tool also contains the main menu and the toolbar that allows performing frequently used operations.



Configuration elements of an application are contained in [business space versions](#); business space versions exist in a [business space](#). After the initial installation the Configuration Tool contains one business space with two business space versions (which have some pre-defined elements). One of these versions is in the NEW state and is ready for modifications. Configuration work usually begins with configuring business space-specific elements in this version – see [Working with Business Space Versions](#).

Working with Business Space Versions

Business objects, rules, processes and other elements of the system belong to a [business space](#). A business space may have a number of [business space versions](#), each containing different versions of the elements that you configure. The following section explains the life cycle of a business space version and the steps required to create and edit the version.

[Lifecycle of a Business Space Version](#)

[Creating Minor Version](#)

[Creating Major Version](#)

[Updating Business Space Version](#)

[Loading Business Space Version](#)

[Checking Version Integrity](#)
[Testing Business Space Version](#)
[Publishing Business Space Version](#)
[Deleting Business Space Version](#)
[Viewing Version Properties and History](#)
[Exporting Business Space Version](#)
[Importing Business Space Version](#)

Lifecycle of a Business Space Version

As work on the configuration of the application evolves the business space version undergoes certain stages in its lifecycle.

Business space version in the NEW state.

When a business space version is initially created its state is always NEW. A version in a NEW state may not be deployed for the end users nor can it be tested. It exists purely as the working version of the configurator. The Configuration Tool displays the business version in the NEW state in green. Once the configurator is happy with the contents of the version she can make the version available for testing (or even publish it straight away, although publishing without testing is strongly discouraged) – see [Testing Business Space Version](#).

Business space version in the UNDER TEST state.

Once the version has been made available for testing its state becomes UNDER TEST. A version in this state can be tested by the configurator in the Operation Mode (see [Testing Mode](#)). The purpose of testing is to ascertain that the configured system works as expected. The operation data created during testing is stored in a separate database and does not affect operation data of the end users. There may only be one business space version in the UNDER TEST state in a business space – if there is already a version in the UNDER TEST state it will move back to the NEW state after a new version has been made available for testing. The Configuration Tool displays business space versions in the UNDER TEST state in pink.

Business space version in the CURRENT state.

If the configurator finds some problems with the version during testing, she can start editing the version under test (which moves the version to the NEW state) or create a new minor or major version (see [Creating Minor Version](#) and [Creating Major Version](#)) from the version being tested, correct errors in this new version and then make the new version available for further testing. Once the configurator is finally happy with the version she can publish (deploy) it so that it can be used by the end users (see [Publishing Business Space Version](#)). When the version is published its state becomes CURRENT. There may only be one version in the CURRENT state in a business space. If there is already a CURRENT version it is moved to the OBSOLETE state after the new version has been published.

Once the version has been published it may not be changed by anyone. If further changes to the version are required a new major or minor version may be created from the current version and the changes may be introduced in this new version.

The Configuration Tool displays business space versions in the CURRENT state in black.

Business space version in the OBSOLETE state.

A business space version currently used by the end users is made obsolete when the configurator publishes a new version. The new version moves to the CURRENT state and the previously used version is moved to the OBSOLETE state. A version in this state may not be modified, however, it can be published again (if for whatever reason the configurator decides to go back to the old version). It is also possible to create a new minor or major version from the OBSOLETE version and then make changes to the new version (see [Creating Minor Version](#) and [Creating Major Version](#)). The Configuration Tool displays a version in the OBSOLETE state in grey.

Business space version in the IN DEVELOPMENT state.

A version in this state indicates that the business space is running in a multi-developer mode when several developers are working on the same business space version concurrently. For more details about the multi-developer mode please watch the [Multi-Developer Mode video tutorial](#). The Configuration Tool displays business space versions in the IN DEVELOPMENT state in orange.

Major and Minor Versions

Each business space version has a number associated with it that uniquely identifies the version within a business space. This number has the format “n.m” where “n” is the number identifying the major version and “m” is the number identifying the minor version. Major versions usually represent big steps forward compared to the previous version, whereas minor versions usually contain small modifications to the previous version. This is, however, entirely up to the configurator to decide whether the new version will be major or minor.

[Creating Minor Version](#)

[Creating Major Version](#)

Creating Minor Version

A new minor version is always created from some existing base version. When a new minor version is created the entire contents of the base version is copied into the new version and the new version is assigned a new number being an increment of the maximum minor version number used already. The new version is created in the NEW state – see [Lifecycle of a Business Space Version](#).

To create a new minor version:

1. Click on the base version in the Elements Tree to select it.
2. Select “Version/New Minor Version” in the menu or right click to bring up the pop-up menu and select “New Minor Version”. The new version must appear in the Elements Tree.
3. The Configuration Tool will bring up a dialog where you can enter any comments about the new version being created and the press the OK button. Alternatively press the Cancel button if you do not want to enter any comments.

Creating Major Version

A new major version can either be created from some existing base version or from a blank version. When a new major version is created from a base version the entire contents of the base version is copied into the new version. When a new version is created from a blank version the version only contains pre-defined elements (such as the `RegularUser` business object) and nothing else. The number of a major version assigned to a new version is the increment of the maximum version number used already. The new version is created in the `NEW` state – see [Lifecycle of a Business Space Version](#).

To create a new major version from the existing version:

1. Select “Version/New Major Version” in the menu or right click on the base version in the Elements Tree to bring up the pop-up menu and select New Major Version. The new version will appear in the Elements Tree.
2. The Configuration Tool will bring up a dialog where you can enter any comments about the new version being created and the press the OK button. Alternatively press the Cancel button if you do not want to enter any comments.

Loading Business Space Version

When the Configuration Tool starts up it does not load the contents of some versions for efficiency reasons. When such versions are displayed in the Elements Tree the tree only shows version number and state – there is no little “plus” sign next to the version to indicate that the contents of the version have been loaded from the server. If you want to view and/or change the elements of such a version you have to load its contents from the server.

To load a business space version:

1. Click on the node displaying version number and state in the Elements Tree to select it.

2. Select “Version/Load Version” in the menu or right click to bring up the pop-up menu and select “Load Version”. Once the version is loaded a little “plus” sign is displayed next to its node in the Elements Tree. You can now expand the node and view/change its contents.

Updating Business Space Version

Any changes to a business space version have to be saved to the **Aware IM** server. If you do not update the version data on the server your configuration changes will be lost when you close the Configuration Tool (unless you export the version to a file and then import it back next time you start the Configuration Tool – see [Exporting Business Space Version](#) and [Importing Business Space Version](#)).

To update the version:

1. Click on the version you want to update in the Elements Tree to select it
2. Select “Version/Update” in the menu or right click to bring up the pop-up menu and select “Update”.

Checking Version Integrity

A business space version being published or made available for testing must be consistent, i.e. must not have invalid rules, references to non-existent business objects etc. The Configuration Tool performs rigorous checks of the validity of the version’s elements when they are being created and/or edited. However, such checks are not made when significant modifications to the version elements are taking place and elements are being deleted and replaced. In this scenario it is easy to overlook a reference to an obsolete element.

To make sure that the version is consistent the Configuration Tool *always* checks the integrity of the version when it is being published or made available for testing. The Configuration Tool will not allow publishing or testing an inconsistent version. If a version is inconsistent the Configuration Tool displays a list of the version’s problems and does not proceed with publishing or testing. It is also possible at any time to check the integrity of the version irrespective of the state it is in.

To check version integrity:

1. Click on the version that you want to check in the Elements Tree to select it.
2. Select “Version/Check Integrity” in the menu or right click to bring up the pop-up menu and select “Check Integrity”. A list of the problems from the last time you ran the integrity check will be shown in the “Problems” window (the list is empty if integrity is being checked for the first time).

If a version has integrity problems the Configuration Tool will display a list where each entry in the list contains the description of the problem. You can double click on the entry to bring up the editor that will allow you to fix the problem.

 **TIP:** If a problem is inside a report or presentation the integrity checker will tell you which report or presentation has a problem but it will not take you directly to the problem. You can open the report or presentation manually and find the offending element using the Find Design Element feature of the Report/Presentation Designer – see [Find Design Element](#).

Testing Business Space Version

Once you are happy with your changes to the business space version you can make the version available for testing. You may need to test the version in order to make sure that your business rules and processes work as expected, presentations and reports look good etc. It is recommended that you always test your version prior to publishing it for the end users. Once the version has been made available for testing its state changes to UNDER TEST, and you can now try creating instances of different business objects from this version, run processes, reports etc in the Operation Mode (see [Testing Mode](#)). Instances of objects created during testing are stored in a separate database so the operational data of the end users is not affected by any testing activity – see also [Lifecycle of a Business Space Version](#).

To make a version available for testing:

1. Click on the version you want to test in the Elements Tree to select it (make sure that the version is loaded – see [Loading Business Space Version](#)).
2. Select “Version/Put under Test” in the menu or right click to bring up the pop-up menu and select “Put under Test”.
3. If you already have a version in this business space in the UNDER TEST state, you will be offered a choice of whether to copy the operation data from the existing test version or create the test version with no operational data at all. If you already had some test instances of business objects from the previous rounds of testing it may be helpful to use the same instances during the new round. Once you select the required option the version will be moved to the UNDER TEST state (this may take some time) and displayed in pink.

If your business space version has already been in the UNDER TEST state before **Aware IM** will display a dialog asking you whether to perform integrity checking of the version and whether to use the existing data for testing or clear the testing data. If you are going through many testing cycles during development and put version in and out of testing many times then constantly answering the questions of this dialog can be tedious. To avoid the dialog and to get Aware IM to use the default values (no integrity

checking and using the existing data for testing) you can use the “Put under Test (quickly)” command available in the main menu or in the popup menu instead of the “Put under Test” command. You can also use the Ctrl+Q shortcut to make it even quicker.

Embedded Testing

“Embedded testing” allows you to test your business space version not in the standalone browser but in the browser embedded in the Configuration Tool. A separate tab in the Working Area of the screen is opened and the default browser is started inside this window. An advantage of using embedded testing is that you can not only test the version in the UNDER TEST state but you can also test the version you are currently editing (which is in the NEW state) provided that this version is based on some version in the UNDER TEST state.

The rationale for embedded testing is to free the developer from constantly putting the version under test and then editing it again in order to make further changes. With embedded testing you can perform changes to the version and test it in the embedded browser straight away. You can have the embedded browser open and once you make your changes you can continue working with the browser, which should automatically pick up the changes you made

Not all changes, however, are allowed if you want to continue working with the embedded browser. If you make changes that affect the database structure (such as, add, delete or rename an attribute of a business object) or if you make changes to a document template you won’t be able to continue with the embedded browser – it will automatically close and you will have to put your version under test and start a new testing session.

To start embedded testing select the version you want to test (it can be in the UNDER TEST state or in the NEW state) and then select “Version/Start Embedded Browser” in the menu or right click and select “Start Embedded Browser” from a popup menu. This will open the embedded browser for the selected version in a separate window. If you already have this browser open you can just switch to this window and the browser will automatically pick up your changes.

Publishing Business Space Version

Once a business space version has been tested and you are happy with how your business rules and processes work, the business space version can be published. Publishing business space version makes it available to the end users. The version is moved into the CURRENT state – see also [Lifecycle of a Business Space Version](#).

If you already have a version in the CURRENT state it is recommended that you publish the new version when no one is using the old version in the Operation Mode. **Aware IM** will not proceed with publishing of the new version until there is no user activity with the old version, so if the old version is being heavily used **Aware IM** will keep waiting until there is a break in the old version usage. Once the new version has been published any current users of the old version will not be able to use the old version any more – they will be advised to log out and log into the new version.

It is also highly recommended that you back up your existing operation data before publishing the version – see [Backing up Operation Data](#).

Publishing business space version is a complicated process – in particular, if any new business objects have been defined in the version being published or definitions of the existing business objects have been changed, **Aware IM** will build and/or alter the corresponding database tables.

 **CAUTION:** If there is already operational data created by the end users while working with the previous versions, publishing a new version may destroy this data if changes to the business object in the new version are such that it is not possible to preserve the existing data – for example, if a definition of a business object has been deleted, all instances of the business object are lost. Similarly if some attribute of a business object has been deleted, the existing data corresponding to this attribute is lost. **Aware IM** does everything it can to preserve the existing data whenever possible (for example, when an attribute type is changed) and the Configuration Tool warns the user immediately if the configurator's changes lead to any loss of data – see also [Adding/Editing Business Objects](#).

To publish a business space version:

1. Make sure that the version you want to publish is loaded – see [Loading Business Space Version](#).
2. Click on the business space version you want to publish in the Elements Tree to select it (the version must be in either the UNDER TEST, OBSOLETE or NEW state)
3. Select the “Version/Publish” command in the menu or right click to bring up the pop-up menu and select “Publish”. The version will be moved to the CURRENT state (this may take some time) and displayed in black.

 **NOTE:** before a version is moved to the CURRENT state the integrity checking of the version is performed. If the version has any integrity problems it will not be published, instead the list of integrity problems will be displayed – see [Checking Version Integrity](#).

Working with a Business Space Version in a Multi-Developer Mode

Several developers can work on the same business space version concurrently (this is called a “multi-developer mode”). In this mode developers lock (check-out) those elements of the version that they are working on (business objects, queries, processes etc). To make changes to the version they have to check-in their changes. To start the multi-developer mode a system administrator has to “put a business space version in development”. To do this:

1. Click on the business space version you want to put in development in the Elements Tree to select it
2. Select the “Version/Put In Development” command from the menu or right click to bring up the pop-up menu and select “Put In Development”.

For more details about the multi-developer mode please watch the [Multi-Developer Mode video tutorial](#).

Deleting Business Space Version

To delete a business space version:

1. Click on the business space version you want to publish in the Elements Tree to select it
2. Select the “Edit/Delete” command from the menu or right click to bring up the pop-up menu and select “Delete”.

 **NOTE:** a business space version in the CURRENT state cannot be deleted.

 **CAUTION:** Deleting a business space version is not an undoable operation; so once deleted the business space version cannot be recovered. Make sure that you only delete those versions that you no longer need.

Viewing Properties and History of the Business Space Version

To view business space version properties and history of changes:

1. Double click on the business space version you want to view in the Elements Tree to edit it.
2. The Working Area of the screen will show the details of the selected version:
 - a. The name of the business space to which the version belongs.

- b. The state of the version.
- c. Version number.
- d. The description of the version.

The “History of Changes” section will show what has been done to the version before. In particular:

- a. When a version has been created.
- b. When a version has been updated on the server.
- c. When a version state has been changed.
- d. When a version has been imported.

The Properties window will show other properties of the business space version:

- Timeout page – a page that the system will display when a browser session times out. If not specified the default one will be used
- Incoming Emails – whether the version handles incoming emails (see [Incoming Emails](#) for details)
- Login options – how the system will handle login. See [Login Options](#) for more details.
- Database scripts - in most cases there is no need for you to worry about database scripts, as **Aware IM** will take care of the database issues for you. In some cases, however, you may want to add custom database scripts to your application. Usually you may want to do this if you implement a query using a stored procedure (see the [EXEC SP action](#)) or if you implement your own indexing of the database tables automatically created by **Aware IM**. Saving a database script with the business space version saves you the trouble of applying these scripts manually every time you install your Aware IM application on your customer’s site, as **Aware IM** will automatically run the scripts when the business space version is published for the first time.
- Password protection – whether a configurator needs to specify a password to look at the configuration of the version
- Push notification – whether the version supported push notifications for mobile devices – see the “Mobile Applications” document for more details.

Exporting Business Space Version

A business space version may be saved to a file to be later imported back (see [Importing Business Space Version](#)) or uploaded to the **Aware IM** server in the Operation Mode.

To export a business space version:

1. Click on the business space version you want to view in the Elements Tree to select it.

2. Select the “Version/Export” command in the menu or right click to bring up the pop-up menu and select “Export”. The Configuration Tool will display the File Selection Dialog.
3. Select the file you want the version to be written to or type in the name of the file and click OK.

Importing Business Space Version

To import a business space version from a file:

1. Click on the business space version you want to import into in the Elements Tree to select it (the version must be in the **NEW** state)
2. Select the “Version/Import” command in the menu or right click to bring up the pop-up menu and select “Import”. The Configuration Tool will display the File Selection Dialog.
3. Select the file you want the version to be read from or type in the name of the file and click OK. The current contents of the business space version will be replaced with the contents of the version read from the file.

Refreshing Business Space Version

If several configurators are working with the business space versions at the same time it may be necessary to upload the current contents of the business space and/or business space version from the **Aware IM** server to see the new changes to the versions performed by other configurators.

To refresh a business space version:

1. Click on the business space version you want to refresh in the Elements Tree to select it
2. Select the “Version/Refresh” command in the menu or right click to bring up the pop-up menu and select “Refresh”. The current contents of the business space version will be uploaded from the server and displayed in the Elements Tree.

Working with Configuration Elements

Business space version elements are added/edited using property editors specific to the element being added/edited. However, certain editing principles described in the following sections are common to all configuration elements.

[Adding Elements](#)

[Editing/Viewing Elements](#)

[Deleting Elements](#)
[Copying Elements](#)
[Pasting Elements](#)

Adding Elements

To add a new configuration element of any type:

1. Click on a node in the Elements Tree that represents the collection of elements of the required type – for example, to add a new process click on Processes; to add a new business object click on Business Objects (the version that you are adding to must be in the NEW state— see [Lifecycle of a Business Space Version](#))
2. Select the “File/New” command from the menu or right click to bring up the pop-up menu and select “New”. The editor appropriate to the given type of element will be displayed in the Working Area of the screen.
3. Specify properties specific to the element being added in the editor and/or in the properties of the element and its sub-elements. When finished press the Save button in the toolbar (or select File/Save from the menu) to save the new element in the business space version or close the editor tab to discard the changes.

Editing/Viewing Elements

To edit an existing configuration element of any type just double click on the element in the tree. Alternatively do the following:

1. Click on the element’s node in the Elements Tree to select it.
2. Select the “File/Open” command in the menu or right click to bring up the pop-up menu and select “Open”.

The editor appropriate to the given type of element will be displayed in the Working Area of the screen. Modify properties specific to the element being edited inside the editor and/or in the properties windows for the main element and its sub-elements. When finished press the Save button in the toolbar (or select the “File/Save command from the menu) to save the changes to the element in the business space version. Close the editor tab to discard the changes.

Deleting Elements

To delete an element of any type:

1. Click on the element’s node in the Elements Tree to select it (the element must belong to a business space version in the NEW state – see [Lifecycle of a Business Space Version](#))

2. Select the “Edit/Delete” command in the menu or right click to bring up the pop-up menu and select “Delete”.

 **NOTE:** Certain elements of a business space version may not be deleted. This applies to those elements that are added to the business space version automatically and are required for the business space version to operate correctly. Examples of such elements are the `RegularUser` business object and the `SystemUsers` business objects group. An attempt to delete such an element will result in an error message.

Copying Elements

Elements of a business space version may be copied within a single business space version, between business space versions of the same business space or between business versions of different business spaces. Only compatible elements may be copied – for example it is possible to copy an attribute into a business object or notification but it is not possible to copy an attribute into a process or rule.

To copy an element to the clipboard:

1. Click on the element’s node in the Elements Tree to select it
2. Select “Edit/Copy” in the menu or right click to bring up the pop-up menu and select “Copy”.

Pasting Elements

Elements of a business space version may be copied within a single business space version, between business space versions of the same business space or between business versions of different business spaces. Only compatible elements may be copied – for example it is possible to copy an attribute into the business object or notification but it is not possible to copy an attribute into a process or rule.

To paste an element which has been previously copied into the clipboard:

1. Click on a node in the Elements Tree that represents the element into which the element in the clipboard is being pasted – for example, to paste a process click on Processes; to paste an attribute into a business object select the business object. The business space version where an element is being pasted must be in the `NEW` state – see [Lifecycle of a Business Space Version](#)
2. Select the “Edit/Paste” command in the menu or right click to bring up the pop-up menu and select “Paste”. Pasted element will appear in the Elements Tree.

 **NOTE:** If an element with the same name already exists in the business space version **Aware IM** will change the name of the pasted element so that it is unique (you can later change this name to whatever you want) – for example, if a business object with the name `Account` is pasted into the version which already has a business object named `Account`, the name of the pasted object will become `Account1` (or `Account2` if `Account1` exists as well).

 **NOTE:** If a rule is being pasted the Configuration Tool may inspect the contents of the rule and offer to rename certain identifiers used in a rule. For example, if the following rule is pasted into the rule collection attached to the `Account` business object:

```
Account1.Balance = 100
```

The Configuration Tool will detect the usage of the identifier `Account1` possibly inconsistent with the name of the owner of the rule collection (`Account`) and offer to rename `Account1` to `Account` (see also [Adding/Editing Rules](#)).

Finding where Element is Used

To find out where a particular element is used in a business space version:

1. Select the node of the element in the tree
2. Select “Edit/Find References” in the menu or right click and select “Find References”

Aware IM will list all elements of the business space version that refer to the selected element in the Search Window. For example, if you have a menu item defined in a [visual perspective](#) that starts a process and you selected this process to check where it is used, the menu item that starts the process will be listed in the window.

Adding/Editing Business Objects

The following section describes how to work with the editor of business objects when adding a new business object or editing the existing one. Business objects are described in the [Business Objects as Carriers of Data](#) section.

[Specifying General Properties](#)

[Defining Forms](#)

[Defining Presentations](#)

[Defining Intelligent Business Objects](#)

Specifying General Properties

The editor of business objects has several tabs – Attributes, Forms, Update Rules, Delete Rules and Presentations. The Property window contains the following properties:

Name

Specify the name of the business object uniquely identifying it within the business space version. The following restrictions apply:

- a) The name must start with a character (not digit) or underscore symbol. All other symbols in the name must be either characters (including underscore symbol) or digits. No spaces or special symbols are allowed.
- b) The name must be unique among the names of other business objects, business object groups and notifications.
- c) The name must not start with one of the [instance prefixes](#) – This, That, Added, Removed, LoggedIn, Changed **or** Failed.
- d) The name must not be one of the reserved names – File, Day, Question, EmailSender, ReceivedEmail, IncomingEmail.
- e) The name must not coincide with the name of the basic attribute types – Number, Date, Duration, Timestamp, Shortcut, Document **or** Picture.

Description

Specify any text that describes what the business object is for, the business concept that it represents, how it is used etc. Any description if defined is included into the generated documentation for the business space version – see [Generating Documentation](#). To provide the description for the business object, click on the Menu button in the top right corner of the screen and select “Business object description”.

Category

You can group objects by category. Objects belonging to a particular category are grouped in the Elements Tree. Enter a new category or select from the list of existing ones. You can apply the same category to several objects at once if you paste them under this category in the Elements Tree.

Persistence

You must specify where instances of the business objects will be stored:

- Usually business objects are permanently stored in the database that is automatically managed by **Aware IM**. This is the default persistence option (*Database: Aware IM automatic*).
- Sometimes it may be necessary to use existing database tables not initially created by **Aware IM** (see [Working with Data Stored in Existing Database Tables or LDAP](#) for details). To select this option choose *Database:existing external* (for data stored in external databases) or *LDAP* (for data stored in a LDAP server) from the persistence drop-down.
- If you choose *Not persisted* option instances of the business object will be temporarily created in memory (see [Data Storage](#)). In this case the instances are

destroyed when they are no longer needed by those rules that create and use them.

- Select *Custom* option if you develop a Java plug-in that implements custom persistence storage (see Programmers Reference Guide for more details). Specify the fully qualified name of the plug-in by clicking on the Settings button.

Communication

Intelligent business objects are those that **Aware IM** can communicate with through the defined channels (see [Intelligent Business Objects](#)). By default business object is not intelligent. To make business object intelligent define the Communication channels of the object by clicking on the “Communication” property and defining its communication channels – see [Defining Intelligent Objects](#) for details.

Attributes tab

Any business object must have at least one attribute defined. Attributes are defined and displayed on the Attributes tab of the business object editor.

- a) To add a new attribute, select the “Attributes” tab and click on the  icon. See [Adding/Editing Attributes](#) for details on how to add attributes of the specific types.
- b) To edit an existing attribute select the attribute you want to edit and change its properties in the Selection Properties window. See [Adding/Editing Attributes](#) for details on how to edit attributes of the specific types.
- c) To delete an existing attribute click on the attribute you want to delete in the Attributes table to select it and then press the  icon at the top of the attributes table.

Forms tab

Forms define how attributes of a business object are presented to the user when an instance of the object is added or edited in the Operation Mode. There must be at least one form defined for the business object. The Configuration Tool generates the default form automatically when a new business object is created – you can add more forms and/or edit the default form. See [Defining Forms](#) for details.

Update and Deletion Rules tabs

Selecting these tabs displays rules attached to the business object – see [Adding/Editing Rules](#). The Update rules are invoked when an instance of the object is being created or modified. The Deletion rules are invoked when an instance of the object is deleted.

 **NOTE:** When you save changes to the business object by pressing the Save button the Configuration Tool may ask you whether you want the same changes to apply to other members of the business object groups. This question will be asked if the business object being edited is a member of one or more [business object groups](#) and you have changed any of the attributes that are common to the members of the business object group. If you agree to apply changes to other members of the group, exactly the same changes that you have done to the attributes of the business object will be performed with the attributes of other group members.

The same principle applies when you edit rules of the business object that is a member of some business object groups – the changes will be applied to the rules attached to other members of the groups provided that the rules in all members are equivalent and that you agree to perform changes to other members. [See also Adding/Editing Rules.](#)

Presentations tab

Presentations may be defined to provide a custom layout of the attributes of a business object when its instance(s) are displayed by a query or by a process. See [Defining Presentations](#) for details.

Defining Forms

Business object forms are used in the Operation Mode under the following circumstances:

1. When a new instance of a business object is being created as a result of:
 - a. The user creating an instance of the business object explicitly using the New Object command (see [Data Entry and Editing](#)).
 - b. A process executing the [ENTER NEW](#) action.
 - c. The user registering herself with the **Aware IM** system.
2. When an existing instance of a business object is being edited or viewed as a result of:
 - a. The user editing or viewing an instance of the business object explicitly.
 - b. A process or rule executing the [EDIT](#) or [VIEW](#) actions.
 - c. Execution of the Change Login Details command (see [Setting Menu Item Properties](#)).

In each of the above scenarios a form containing input fields representing different attributes of a business object is presented to the user. The user enters the values of the business object's attributes and submits the form. After receiving the values of the object's attributes **Aware IM** creates a new instance of the business object or modifies the existing one (if there are any rules attached to the object they are evaluated as well).

Using the Configuration Tool it is possible to define one or several forms of the business object and specify which attributes will be displayed in each form as well as under which circumstances the form will be used.

See also:

[Adding/Editing Forms](#)
[Form Properties](#)

Adding/Editing Forms

There must be at least one form defined for a business object. When a new business object is being defined the Configuration Tool creates the default form automatically. You can add new forms and/or edit the default one.

Add

To add a new form switch to the “Forms” tab and click on the  icon at the top of the Forms table. There are two types of forms you can create – Aware IM-managed forms and custom HTML forms. Aware IM-managed forms are fully managed by Aware IM – you can customize the appearance of such forms using the Form Designer. Raw HTML forms are created outside of Aware IM using any 3rd party HTML editors, They are then imported into Aware IM and input fields of these forms are mapped to the attributes of the business object where the form belongs. For more details about custom HTML forms watch the [Custom HTML Forms video tutorial](#). All further discussion in this and subsequent sections will apply to AwareIM-managed forms.

Enter the name of the new form and the form entry will be displayed in the table. You can now define properties of the new form in the Selection Properties window – see [Form Properties](#).

Edit/View

To edit/view an existing form select the form in the Forms table and the properties of the selected form will be displayed in the Selection Properties window. You can edit these properties – see [Form Properties](#). You can also expand the form entry and edit the form sections of the form – see [Adding/Editing Form Sections](#).

Delete

To delete an existing form select the form in the Forms table and press the  icon at the top of the Forms table.

Preview

To see how the form will look like in the browser use “form preview”. The preview of the selected form in the embedded browser is displayed underneath the forms table. All changes to the form will be automatically shown in the embedded preview. To turn the embedded preview on/off click on the  icon at the top of the forms table. To set

preview settings (such as the “theme” and font size) click on the  icon. To see how the preview will look in the standalone browser click on the  icon.

Apply Style

Clicking the  icon allows the user to apply a particular presentation style to the form. For more details about styles see [Form and Grid Styles](#) section.

Form Properties

To change properties of a form of a business object:

1. Begin adding or editing the business object – see [Adding Element](#) and [Editing Element](#).
2. Click on the “Forms” tab at the bottom of the screen. Select the form you want to edit. The properties of the form will be displayed in the Selection Properties window. The following properties can be defined:

Name

Specify the name of the form. Can be any text including space symbols. The name must be unique among other form names of the business object.

Description

Specify the description of the form. Can be any text including space symbols.

Width

Specify the width of the form in pixels. If you leave this value blank (default) the form will occupy all the available width of the screen

Height

Specify the height of the form in pixels. If you leave this value blank (default) the form will automatically calculate its height based on its contents. In this case no vertical scroll bar will be displayed. If you specify a particular height of the form the vertical scroll bar may be displayed if the contents of the form does not fit the specified height.

Panel Header

Select this property to define how the header of the form will look like. The following options are available:

Default Header / Custom Header/No Header

Aware IM can either display a default header, a custom header or no header at all. The default header includes a special area at the top of the form that may optionally contain the caption of the form, the icon and “tools” (form operations specifically designated for this area) – see the form below.

The screenshot shows a user configuration form titled "Regular User". The top section is an orange header bar containing the title and several small circular icons representing form operations. Below the header are five input fields: "Login Name:" with a red asterisk, "Password", "Access Level" (with a dropdown arrow), "Locale", and "Time Zone" (set to "Eastern Summe..."). At the bottom are two buttons: an orange "Save" button with a checkmark icon and a grey "Close" button with a close symbol.

The orange area at the top represents the default form header that contains default icon, default caption and default “tool operations”

To define a custom header, specify HTML of the header. It will be displayed at the top of the form. The form below shows custom header with the following simple HTML:

```
<span style='font-family:Arial;font-size:18px;color:orange;padding:15px'>REGULAR  
USER</span>
```

REGULAR USER

Login Name: *

Password:

Access Level:

Locale:

Time Zone: Eastern Summe...

Theme:

Save **Close**

Default Caption

Select this radio button if you want **Aware IM** to use the default caption – for forms with one form section it is the caption of the form section; for forms with multiple form section it is the name of the business object.

Use This Caption

Select this radio button to display the specified text as caption.

No Caption

Select this radio button if you do not want the caption of the form to be displayed.

Put caption in the application toolbar at the top

You want want to save real estate by displaying caption of the form inside the application toolbar (one must be defined in the Top Bar area of the corresponding visual perspective). In this case you can turn the header of the form off completely but still display its caption. This option is especially useful if a form is displayed on mobile phones where screen real estate is limited.

Icon, No Icon, Default Icon

Select these radio options to display or hide the icon inside the header area of the form.

Show Caption/Show Icon

Tick these checkboxes to show caption or icon in the default header.

 **NOTE:** Even if the caption/icon are not shown in the default header you may define them, so that they are displayed as the caption or icon of the tab where the form is displayed (if a form is displayed on a tab of a visual perspective)

Mobile Style Header

If this option is selected a special CSS style is assigned to the default header – the caption is displayed with large bold letters in the middle of the header. This style is useful when the form is displayed on mobile phones.

Panel can be collapsed/expanded

If this option is selected the “tools” displayed in the header include an icon to collapse or expand the form

Panel is initially expanded

This option can only be used if “Panel can be collapsed expanded” option is selected. If this option is selected the form is initially displayed in a collapsed state.

Use automatic

The following options specify the times at which **Aware IM** will use the form in the Operation Mode (see [Defining Forms](#)).

- a. Tick the “Object creation” checkbox if you want the form to be used when new instances of the business object are created.
- b. Tick the “Object editing” checkbox if you want the form to be used when existing instances of the business object are edited/viewed
- c. Tick the “User registration” checkbox if you want the form to be used when the end users register themselves with the system (if your system supports this feature).
- d. Click on the “Access levels” property if you want the form to be used only when the user creating or editing an instance of the business object has a particular [access level\(s\)](#). By default a form is used by users of all access levels. You can exclude certain access levels by selecting them in the left list box and using the Right arrow button to move the selected access levels into the right list box.

 **NOTE:** Among all forms defined for the business object there must be at least one that is used when creating new instances of the object and at least one that is used when editing instances of the business object (could be the same form). Also there must not be an access level that does not have creation or editing form defined for it, otherwise **Aware IM** will not know which form to use when the user with this access level creates or edits an instance of the business object.

 **NOTE:** The default form created by **Aware IM** automatically for a new business object is intended for both creation and editing and covers all access levels (you can change this if you like).

NOTE: Some forms may be created only to be used by the ENTER NEW or EDIT actions in a particular process. You can uncheck the “automatic usage” check box for such forms, as **Aware IM** will not be using these forms automatically.

Navigation Type

The navigation type of form sections in a form determines how form sections are navigated in the Operation Mode (this is relevant, of course, if a form has more than one form section). There are two types of the navigation style – *tabs* and *wizard*.

With “tabs” the order of form sections in the form is undefined – the user can navigate between form sections at random choosing any form section after the current one (this is like working with the tabbed dialog). The names of the existing form sections are displayed above the form and the name of the currently displayed form section is highlighted. The user can click on the name of the form section to navigate directly to this section – see also the picture shown in [Form Sections](#).

With wizard-like navigation the order of form sections is strictly defined. The user can only navigate to the next or previous form section in the defined order. The currently displayed form section contains the Next and Previous buttons that brings the user to the next or previous form section.

Tab reordering

Tick this checkbox if the user is allowed to change the order of the tabs(form sections) defined by the configurator. The user will then be able to save the new order of tabs.

Mobile tabs

Tick this checkbox if the tabs of the form are to be displayed using a “mobile” style – the tabs are then bigger than usual and the icon is displayed above the text

Tabbar position

Select whether the tabbar will be displayed at the top, bottom, left side or right side of the form

Centre Align Form

Tick this checkbox if you want the form to be displayed in the centre of the screen (otherwise the form will be left-aligned).

Autosave

Normally when the user closes or abandons a form without saving his changes the system automatically asks whether the user wants to save the changes. Tick this box to suppress this prompt – in this case the form will be automatically saved without asking the user. There will also be a Cancel button that allows user to close the form without saving the changes.

Display Mask

Tick this checkbox if you want to see the “Executing...” message every time the changes of the user are committed to the server – either when the changes are “auto-saved” (see the paragraph above) or when dynamic rule execution happens (see [Advanced Rule Options](#)).

Button Alignment

By default Save and Close buttons are displayed center-aligned. You can select different alignment here.

Panel Operations

This option allows you to define operations that you can do with the instance of a business object while the form is being edited or viewed in the Operation Mode. See [Adding/Editing Panel Operations](#) for details.

Form Auto Refresh Settings

Select this option from the menu if you want to specify how the form refreshes itself when some operation in the system has been done. By default **Aware IM** will automatically refresh the form when the form is saved or when a process is started from the form itself. Sometimes it may be necessary to refresh the form when other processes are executed or other forms are saved. You can specify such processes and objects in the Auto Refresh dialog.

Form panel resizing

Select this option from the menu to allow/disallow the user to resize the form at run time and/or specify size constraints. The Resizing Options dialog will be displayed. Tick the “Resize Width” checkbox to allow user to change width of the form; tick the “Resize Height” checkbox to allow user to change the height. If you tick the “Allow User to Save/Restore Current Size” checkbox user will be able to save the current settings of width and height, so that the form is displayed again with the saved width and height when the user logs in again (note, that the settings are maintained by **Aware IM** per user). The user will also be able to restore the form to the configured settings.

CSS Style and CSS class

Here you can also assign CSS style and/or class to the form. You may want to do this if you want to customise the appearance of the form. See the “How to use CSS” section in the How To Guide for more details.

Responsiveness

Select this option from the menu to make the form “responsive” to changes of the screen size. For more details please watch the [video tutorial](#).

Tour

The “Tour” feature allows configurators to add explanation to the elements of the form, so that the user can understand the screen better. The explanation of the element is displayed to the user at the bottom of the screen with the marker pointing to the element

of the screen being displayed. The user can jump between the elements of the screen and Aware IM automatically scrolls to the element being explained and displays the marker for the element. For more details about tours see the “How to use the Screen Tour feature” in the How To Guide.

Scripts

For users who are familiar with Javascript this dialog allows specifying additional parameters when forms are initialized and displayed. See Programmers Reference Guide for more details.

Adding/Editing Form Sections

To add or edit a form section:

1. Begin adding or editing a business object – see [Adding Element](#) and [Editing Element](#).
2. Select the Forms tab and then select the form that owns the form section.
3. To add a form section click on the  icon at the top of the forms table. In the dialog that appears select the “New section” radio button and specify the name of the new section. Click OK on the dialog and the new entry for the form section will be displayed underneath the form. Select this entry and edit the form section properties in the Selection Properties window.
4. To edit a form section expand the form that owns the section and select the form section to edit. Its properties will be displayed in the Selection Properties window. The following properties can be specified:

Name

Specify the name of the form section. The name may contain any characters including spaces. The name must be unique among the names of other form sections in the form.

Description

Specify the description of the form section.

Caption

Specify the caption of the form section. By default it is the name of the business object that owns the form.

Icon

Specify the icon that will be displayed inside the tab representing the section in the Operation Mode (only for sections with random navigation order).

ID

Specify a unique ID of the section. This ID can be used in the Tour feature.

Not present when

You can specify that under a certain condition the form section should not be displayed. If the specified condition holds true the tab showing the section will not be displayed or (for wizard-style navigation) the section will be skipped during navigation. When specifying conditions you can only use attributes of the object whose form the section belongs to.

 **TIP:** To use attributes of the referred instances in conditions define shortcut attributes that refer to the required attributes (see [Reference Attributes](#) and [Setting Properties of Shortcut Attributes](#)) and use shortcuts instead of reference attributes.

Tour

This is similar to the Tour property of a form, except that the tour element is meant to explain what the form section is for.

Badge

Click on this property to display a “badge” for the tab representing the form section. A badge is a little icon on top of the tab usually showing a number (for example, a number of unread messages for the current user). This number is constantly refreshed – it can be changed by the rules and the number will then be displayed. When specifying badge properties you have to define an expression for the number (or text) displayed on the badge (usually the value of the attribute that stores this number). You can then specify the background color of the badge as well as the refresh rate and tooltip.

Scripts

For users who are familiar with Javascript this dialog allows specifying additional parameters when form sections are initialized and displayed. See Programmers Reference Guide for more details.

Defining Form Section Layout

To define the layout of a form section, double click on the form section entry on the Forms tab of a business object (or click on the  icon at the top of the table. The Form Section designer for the selection section is then displayed in a separate window.

The layout of the section represents a table consisting of rows and columns. Each cell in this table represents an attribute (sometimes several attributes) or it can contain an HTML or be empty. By default the table has a single column so the attributes are laid out in a top-down fashion.

The Form Section Designer has two modes – the Preview mode and the Table Layout mode. In the Preview mode the changes you make to the layout of the form section are immediately displayed in the embedded browser, so that you can immediately see how the form will look like in the browser. A form is represented by a table consisting of cells. Each cell contains specific information – either an attribute or several attributes or HTML

or a Google Map. In the Table Layout mode the cells are represented by an entry in the table (see the picture below). In the Preview mode cells are harder to see but you can still notice small dividing lines between them. You switch between modes by clicking on the and icons at the top of the editor.

The pictures below show a particular form section in the Table Layout mode and Preview mode respectively:

The screenshot shows a window titled "Appointment Main" with a toolbar containing various icons for editing and previewing. Below the toolbar is a status bar displaying "Section Main in form Main of object Appointment | Business Space: CRM | Version: 1.1 NE". The main area contains a table with two columns. Column 1 has several rows of attributes, and Column 2 has corresponding attribute names. The table is part of a larger form section.

Column 1	Column 2
<input type="checkbox"/> Attribute: StartTime	Attribute: EndTime
<input type="checkbox"/> Attribute: Subject	
<input type="checkbox"/> Attribute: Description	
<input type="checkbox"/> Attribute: StaffResponsible	
<input type="checkbox"/> Attribute: Type	Attribute: Priority
<input type="checkbox"/> Attribute: AllDayEvent	

The screenshot shows the 'Appointment' form section within the 'Main' object. The title bar indicates 'Section Main in form Main of object Appointment | Business Space: CRM | Version: 1.1 NE'. Below the title bar is a toolbar with various icons for navigation and editing. The main area contains fields for 'Start Time:' and 'End Time:', both with date and time pickers. There is also a 'Subject:' field, a large 'Description:' text area with scroll bars, a 'Staff Responsible:' dropdown, and fields for 'Type:' and 'Priority:' with dropdown menus. An 'All Day Event:' checkbox is present. At the bottom are 'Save' and 'Close' buttons.

Most of the time you will work in the Preview mode, so that you can see what you will get in the browser immediately. But sometimes selecting the cells you want to work with is difficult in the Preview mode, so in this case you can switch to the Table Layout mode, perform the changes and switch back to the preview mode. Note also that you can always see how the form section looks like in the standalone browser by clicking on the icon.

Specifying which attributes will be shown on the form

You can control which attributes will be shown on the form section by including them into the layout. If the form section is the only section of the form **Aware IM** automatically

includes all attributes of the business object into the form section and lays them out in the top-down fashion. If you do not want the form section to show all attributes you can delete the corresponding cell by clicking on the cell and pressing the  icon at the top of the editor.

If the form section is not the only one in the form you have to specify which attributes will be shown. To do this:

1. Click on the  icon at the top editor
2. In the dialog that appears tick the attributes you want to insert and click OK

The rows representing the attributes will appear in the form section. You can change the order of the attributes by clicking on the Up and Down icons in the toolbar of the editor.

Cell Properties

By default each attribute on the auto-generated form section will be displayed according to the presentation information specified for the attribute (see [Adding/Editing Attributes](#)). It is possible, however, to override the default presentation of the attribute when it is displayed on a particular form section. To do this, click on the cell that contains the attribute and the cell properties will be displayed in the Selection Properties window. You can then specify the presentation properties of the attribute as described in the [Adding/Editing Attributes](#) section. If it's an HTML or a Google Map cell, the Selection Properties window will display the properties specific to the type of the cell.

Multiple columns

Each attribute in the resulting form is displayed according to the presentation information defined for the attribute – see [Adding/Editing Attributes](#). The default top-down fashion of laying out attributes can be easily changed so that the form section contains more than one column. To do this:

1. Click on the  icon in the toolbar of the editor.
2. A blank column will be added to the form.
3. Click on the cell representing the attribute you want to display in a different column.
Drag and drop the cell to the new column

The pictures above show an example of a multi-column form section:

Column properties

To select a column rather than an individual cell depress the SHIFT key and click on any cell that belongs to the column you want to select. Alternatively toggle “column selection” mode by clicking on the  icon and then click on the column you want to select. The column is highlighted and its properties are displayed in the Selection Properties window. You can specify the following properties:

Column Width

Specify percentage of the overall width occupied by the column. If you have two columns like on the picture above the default value for the width of each column is 50%, which means that each column will occupy equal share of the total width of the form section. You can make a particular column wider or narrower.

Label Alignment

You can specify how labels of the controlled are aligned relative to the control itself. Labels can be placed on the left of the column (left aligned or right-aligned) – see the Item Type form above. Or labels can be placed above controls as in the Contact Note form above.

Label Width

This setting is relevant only when labels are placed to the left of the control and defines the width of the label column. Width can be specified as an absolute value or percentage. Percentage is especially useful for forms displayed on mobile phones.

Width of input control

Usually width of the input control is specified in the Presentation properties of the corresponding attribute. However, you can override the value in the control by selecting “Width in percentage” or “Entire width less” radio buttons. The former is used when label width is specified in percent. In this case the control occupies the rest. If you select the “Entire width of the column less” radio button all controls of the column will occupy the entire width of the column less specified value in pixels or percent.

Merging and splitting cells

It is possible to define cells that span across several columns. Only an attribute cell can span rows like this and it can only be merged with empty cells. You can see in the Appointment form above that the Subject, Description and StaffResponsible attributes span across two columns. To achieve this we need to merge the corresponding cells. First we need to select the leftmost non-empty cell that should be merged. Note that the Merge icon  becomes enabled. We click on the icon and the two cells are merged.

Note that a separate column is formed and we can now define properties of this column.

To split a cell that has been merged before select the cell and click on the  icon.

Displaying reference tables

If you put a reference attribute represented by a table into a layout cell the reference table will be displayed as part of the form section – see how the Items attribute is displayed in the Item Type form below:

Section Main in form Main of object ItemType | Business Space: Library | Version: 1.1 NEW 



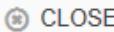
Item Type  

X DELETE

Name:*

Items 

Title	Author	Code	 EDIT

SAVE  **CLOSE**

Here the “Items” attribute is put into its own cell. It is also possible to display references in tabs at the bottom of the form section as shown on the Contact Note form below – see In Reply To, Replies and Alert tabs.

Section Main in form Main of object ContactNote | Business Space: CRM | Version: 1.1 NE

Contact Time	Subject
04/20/2017 17:33	Subject

Here “ReplyTo”, “Replies” and “Alerts” attributes (all are references) are each displayed in their own tab. To achieve this effect one has to place reference attributes into the same cell. This should be done in the Table Layout mode. To do this select the cell with one reference attribute and drag it to the cell with another reference attribute.

Alternatively, select the cell with the reference attribute and click on the “Attribute name” property in the Selection Property window. Then tick other reference attributes in the dialog that comes up to indicate that these reference attributes should be added to the cell.

Putting cells inside group boxes

You can enclose a group of logically related cells into a named group box:

The screenshot shows the 'System Settings' dialog with a blue header bar. The main content area has a title 'Library details' enclosed in a light gray border. Inside this border are several input fields: 'Name:' with a red asterisk, 'Address:' with a red asterisk, 'Telephone No.' with '(999) 999-9999' below it, 'Max Loans:' with a numeric input field and up/down arrows, and 'PayPal Account Name:' with a question mark icon. Below this group box are two sections: 'Outgoing e-mail' and 'Incoming e-mail', each preceded by a minus sign and a downward arrow. At the bottom right are 'Save' and 'Close' buttons.

To insert a group box:

1. Click on the icon.
2. In the dialog that appears specify the title of the group box, for example “Library Details” and click OK.
3. Using the Up and Down arrows move the separator row to the required place.

If you click on the separator row you can define the following properties of the group box:

Title

The title of the group box

Width and Height

Width and height of the group box in pixels. If left blank **Aware IM** will calculate these automatically

Collapsible

If you tick this box **Aware IM** will display a control that will allow users to collapse the group box to save space – see the little triangle next to the Library Details text above.

CSS style

Specify the CSS style of the group box.

CSS class

CSS class of the group-box. This class has to be defined in the custom CSS file of the application.

Collapsed initially

If you tick this box the group box will be collapsed initially when the form is displayed. On the picture above the “Outgoing email” and “Incoming email” group boxes are initially collapsed

 **NOTE:** At the moment you can only define group boxes located beneath each other, you cannot define group boxes located next to each other.

Not present when

It is possible to include a group box conditionally. Here you can specify a condition when the group box will not be included. If left blank the group box will always be included.

Adding HTML

Using Form Section Designer you can also add arbitrary HTML to your forms. For example, you may want to add some static images or add a descriptive and text. To add HTML to your form:

1. Click on the drop down next to the  icon of the Form Designer toolbar
2. Select “HTML row from the drop down menu.
3. The HTML dialog will come up. Add HTML to be placed into the form cell

 **NOTE:** If you refer to images in your HTML place the image files into some subdirectory of the web application directory of the web server. For the default Windows installation of **Aware IM** this directory could be c:\AwareIM\Tomcat\webapps\AwareIM\myimages.

Here is an example of a form that uses an HTML cell:

Jane Allison

Main Communication Alerts Signature

Click on an item in the list to see more details on a separate form. Use buttons in the caption of the table to filter the list.

Type	Contact Time	Subject	State	
Incoming phone call	03/02/2016 09:00	Support call	Read	
Outgoing letter	01/03/2014 12:05	Payment reminder	Sent	
Incoming e-mail	03/02/2015 13:10	RE: Payment reminder	Unread	
Outgoing phone call	02/01/2015 09:11	Product key issue	Unread	
Incoming phone call	01/01/2015 10:26	Product key follow up call	Read	
Incoming phone call	12/01/2014 12:45	Product key request	Read	
Outgoing e-mail	03/06/2014 12:05	Payment reminder	Sent	

Note the explanation with the grey background at the top of the form has the following HTML:

```
<div style="border: solid 1px gray; PADDING: 8px; BACKGROUND-COLOR: lavender; TEXT-ALIGN: justify; LINE-HEIGHT:1.2em">
Click on an item in the list to see more details on a separate form.
Use buttons in the caption of the table to filter the list.
</div>
```

You can refer to the attributes of the object whose form is being displayed. For example,
<<Customer.EmailAddress>>

NOTE: You can embed video in your form if you refer to the document attribute representing a video in your HTML cell – see How To document for more details.

You can also embed buttons in your HTML. You can do this by clicking on the “Add Button” button displayed on the dialog where you specify the HTML code. You can then specify the operation that will be performed when the user clicks on the button. The button itself will be styled according to the currently used theme. Note that **Aware IM** will generate a special HTML element representing the button. You do not need to understand what this element contains, but the button will be properly generated at run time. If you want change the parameters of the button you have to re-create it – you cannot edit it.

Alternatively, you can provide an HTML hyperlink using one of the [Javascript operations](#), for example:

```
<a href="#" onclick="AwareApp.startProcessFromForm ('My process', 'main', this, true)>My Process </a>
```

Forms that use Google Maps

Using the Form Section Designer you can also get your forms to display Google Maps. You would do this only if you want to show some address on a Google Map. The object that owns the form must have an attribute that stores the complete address. Note that you cannot display a Google map when you are creating an object. To add a Google Map to your form:

1. Click on the drop down menu next to the  icon of the Form Designer toolbar.
2. Select “Google Map Row” from the drop down menu.
3. The dialog with Google Map properties will come up. Select the attribute that stores the complete address that can be shown on a Google Map or an attribute that stores a reference to a special MGeoLocation object that stores location latitude and longitude (See Mobile Applications document for details about MGeoLocation)
4. Select other map properties and click OK.

 **NOTE:** For details how to use the “Polygons” feature of the Google Map please refer to the How To Guide.

 **NOTE:** Some usages of Google Maps require you to create an account and specify a special key. If you need to provide a key for your Google Maps account you can do this in the predefined GoogleMapsKey attribute of the SystemSettings object.

Forms that use Gauge Chart

Using the Form Section Designer you can also get your forms to display a gauge chart. This is useful when you want to show the value of a particular attribute as a gauge. To do this you need to define a cell of the Gauge type. The steps for defining such a cell are similar to defining the Google Map cell. You also need to select an attribute whose value will be displayed on the gauge chart and provide min. and max. values for the gauge (either as fixed numbers or refer to values of some attributes).

Adding Custom HTML forms

Native Aware IM forms that you can create using embedded Form Designer are very powerful and normally you don't need to use any other forms. However, if you want to use very specific styling which is difficult to achieve using native Aware IM forms, you can create such forms outside of Aware IM using any HTML editor of your choice and then import them into Aware IM mapping input fields in the HTML form to the attributes of the business object that owns this form. Please watch the [video tutorial](#), which explains this process in great detail.

Adding/Editing Panel Operations

This section describes how you can define “context” operations that can be invoked from the form. Note that this section is also relevant for queries – when the results of a query are displayed users can perform operations relevant to the query. The buttons representing operations are usually displayed in the toolbar at the top or bottom of the form/query, but they can also be displayed in the “tools area” in the default panel header (see “Panel Header”) or they can be temporarily added to the system menu. In the latter case buttons for the form or query are added to the system menu when the form/query is displayed and removed from the menu when the form/query is closed.

An instance of the object shown by the form is automatically added to the Context of the operation. For a query the Context is formed when the user selects one or more records shown by the query (provided that the operation is marked as Applicable to Multiple – see below)

To add/edit panel operations to a form or query:

1. Begin adding or editing the business object or query – see [Adding Element](#) and [Editing Element](#). If editing a business object select the required form on the Forms tab.
2. The properties of the selected form will be displayed in the Selection Properties window, while the properties of the query will be displayed in the Element Properties window.
3. Click on the “Panel Operations” property to bring up the “Panel Operations” dialog.

Add/Edit

These buttons let you add/edit an operation to the form or query (see below for more details)

Edit Toolbar

If an operation is located on one of the toolbars of the form or query this button allows you to further edit the contents of the corresponding toolbar:

Add Separator

This button lets you define a “separator” to the toolbar – a vertical dividing line separating groups of operations.

Add Text

You can add not only operations to your toolbar but also arbitrary text. You can use HTML tags here and you can refer to the values of object attributes using tags.

Add Folder

You can add a “folder” to your toolbar. A folder consists of operations that you can add to this folder. At runtime Aware IM will show a “menu button” representing this folder. If the user clicks on such a button a list of operations of the folder will pop down.

Right Aligner

When you add “right aligner” all operations, text, folders and separators added to the toolbar after the right aligner will be aligned to the right of the menu. You can have only one right aligner in the menu.

Delete/Change Order

Use these buttons to delete selected operations or change their order

Adding/Editing an operation

You can set the following properties when adding/editing an operation

Name

Specify the name of the operation. This name will be displayed in the menu. Any identifier is allowed including HTML tags.

Description

Specify the description of the operation. This description will be shown as a tooltip when the user hovers the mouse over the text/icon representing the operation.

Location

Specify where the button of the operation will be located – as explained before you can choose one of the toolbars around the form/query, “tools” area in the default header or you can choose to temporarily add operation button to one of the system menus.

Applicability condition

This option allows you to specify the condition(s) that must be satisfied in order for the operation to appear on the form of the business object. For example, if you specified the condition `Loan.Status='CURRENT'`, the operation will appear only for loans with current statuses. If condition is left blank the operation will always appear on the form. The format of the condition must satisfy the format of the Rule Language condition (see [Rule Language](#)).

Text Color

Allows specifying the color of the text displayed on the button (provided that the “Display Operation Name” is ticked)

Background Color

Allows specifying the background color of the button representing the operation

CSS class

You can assign custom CSS class to the button representing the operation. This can be useful if you assign button colors in the CSS rather than explicitly. In this case changing colors in the CSS will change them for all operation buttons where the CSS class is used.

Display Image on the Button

If this box is ticked an icon will be displayed along with the name of the operation (if “Display Operation Name” is ticked) to represent the operation. You can choose an icon by specifying an icon file or referring to a CSS class. See “How to use icons fonts to display an icon for a button” section in the How To Guide.

Display Operation Name on the Button

If this box is ticked the name of the operation will be displayed along with the icon (if “Display Icon” is on) to represent the operation.

Operation Type and Parameters

The most common types of operations are described below:

Start Process

This operation type starts a process. When the Start Process operation type is selected the Configuration Tool displays the combo box containing all processes defined in the business space version. Select the process you want started when the operation is invoked. If the process has [input](#) then you may need to provide the value for this input. Two scenarios are possible:

- If the object defined as the process input is the same as the owner of the form, you don't have to do anything, as the system will automatically provide the input when the process starts.
- If the object defined as the process input is different from the owner of the form, you must specify the input in the “Value” column of the “Process Input Table”. Click on the appropriate cell in the “Value” column and enter the process input as the reference attribute of the form owner. For example, let us assume that we are creating a Forum management system where we have a `Topic` and a `Forum` objects defined. The `Topic` object has a single reference attribute named `MyForum` that refers to the `Forum` where the `Topic` belongs. Let us assume also that we are editing the form of the `Topic` object and we want to define the operation that starts the `PostNewTopic` process, which allows posting a new topic from the form of the existing one. Let us assume that the `PostNewTopic` process requires `Forum` as its input. When defining the operation we would define the operation type that starts the

PostNewTopic process and we would specify “Topic.MyForum” in the “Value” column of the Process Input Table (note that Topic is the owner of the form we are editing) as the process input.

Run Query

An operation of this type runs the specified query. When the “Run Query” operation type is selected the Configuration Tool displays the combo box containing all queries defined in the business space version. Select the query you want run when the operation is invoked.

Create Document

An operation of this type generates a document from the specified document template or report and displays the resulting document (see [Document Generation](#)). When the Create Document operation type is selected the Configuration Tool displays the combo box containing all document templates defined in the business space version. Select the document template you want to generate the document from when the operation is invoked. Alternatively you can let users choose the document at run-time from the list of pre-configured document templates or [user-defined documents](#).

Delete Object

An operation of this type deletes the instance of the business object being edited (a warning is displayed before the object is deleted). This operation type has no parameters.

Edit

An operation of this type allows editing a different form of the business object from the one shown currently (if one is defined). Select the name of the form to be edited and the form section to be displayed when editing starts.

View

An operation of this type either shows the specified presentation of the business object that owns the form (see [Business Object Presentation](#)) or shows a different form of the business object. In the latter case the form being shown has all input controls disabled so that a user cannot change attribute values. Select the presentation or form you want to show when the operation is invoked.

Create Object

An operation of this type allows creating an instance of an object. Select the name of the object to create and the form of the object to be used during creation.

Execute Javascript

An operation of this type executes the specified Javascript. This can be used by advanced developers who are familiar with Javascript. One of the common uses of this operation is integration of custom Cordova plugins for native mobile applications. This is described in detail in the Programmer’s Reference Guide. When a script is executed the following Javascript objects are available:

- `parser` (controller of the corresponding widget)
- `context` – an array of objects containing `objectName` and `objectId` of the record that the operation is for

Defining Presentations

Presentations are explained in the [Business Object Presentation](#) section.

Presentation layout is created in the Report/Presentations Designer – see [Working with Report/Presentation Designer](#).

Add

1. To create a new presentation click on the Presentations tab in the business object editor and click on the  icon located at the top of the Presentations table. New Presentation dialog will be displayed
2. Enter the name of the new presentation (the name must be unique among the presentations of the business object) and optionally specify the description of the presentation
3. Click OK and the entry for the new presentation will appear in the table of presentations.
4. Click the Save button on the application toolbar (or select “File/Save” from the menu to save changes to the business object).
5. Double click on the presentation entry to open the Report/Presentation Designer where you can design the layout of the presentation - see [Working with Report/Presentation Designer](#).

Edit/View

Double click on the presentation entry in the table of presentations of the business object. The Report/Presentation Designer will be displayed where you can change the layout of the presentation - see [Working with Report/Presentation Designer](#)

Delete

1. Select the presentation you want to delete in the table of presentations of the business object
2. Click on the  icon located at the top of the table.

Export

Exporting a presentation may be useful if you want to reuse the layout of the presentation in another presentation or report. To export the presentation layout open the Report/Presentation Designer and export it from there see [Working with Report/Presentation Designer](#):

Import

Importing a presentation may be useful if you want to reuse the layout of the presentation in another presentation or report. To import the presentation layout open

the Report/Presentation designer and use its import functionality - see [Working with Report/Presentation Designer](#)

Defining Intelligent Business Objects

Intelligent business objects are described in the [Intelligent Business Objects](#) section.

In order to define an intelligent business object the configurator has to click on the “Communication” property of a business object and define communication channels of the object in the “Communication Channels” dialog that comes up.

Aware IM supports the following types of communication channels out-of-the-box:

- *E-mail channel* – communication with an intelligent business object is via e-mail
- *SOAP channel* – communication with an intelligent business object is via Web services mechanism which supports SOAP (Simple Object Access Protocol)
- *URL channel* – communication with an intelligent business object is via HTTP URL (Unified Resource Locator)
- *REST channel* – communication with an intelligent business object is via a popular REST protocol

In addition to the above pre-defined types it is possible to plug-in custom channel types – see “**Aware IM Programmer’s Reference**”.

A particular object may expose several communication channels at once – when a notification or service request are sent to the object it is possible to indicate which type of channel the request or notification should be sent through (see [SEND](#) and [REQUEST SERVICE](#) actions). Therefore the configurator has to indicate which channels the intelligent business object exposes.

Every channel has certain properties specific to its type. To set the properties of a channel tick the channel type in the “Communication Channels” dialog and define its properties.

Setting Properties of the SOAP Channel

To set properties of the SOAP channel you need to provide settings to discover web services offered through this channel. Discovering services is getting **Aware IM** to automatically figure out which services are exposed by an intelligent object by sending a special discovery request through the communication channel provided that the channel supports the service discovery protocol.

To discover services press the Discover button next to the Services table. Discovered services (if any) will be displayed in the Services table.

NOTE: Business objects declared as service input and reply are automatically added to the business space version once you have saved the changes for the intelligent business object you are defining or editing.

NOTE: If the service provider changes definitions of services the services may be re-discovered in the same way as described above. The Configuration Tool will automatically replace all services and business objects declared as service input and replies with the new definitions.

Setting Properties of the E-mail Channel

The following properties should be specified:

Outgoing mail host

The DNS name of your e-mail server that will send outgoing e-mails to the intelligent business object.

“From” address

The e-mail address that your e-mails to the business object will have as the “from” address. Note that the “from address” must be recognized by your email server, so it must be registered on this server.

Login details

If your outgoing e-mail server requires that you log in select the “Login Required” option, press the Details button and enter login credentials. Otherwise select the “No Login Required” option.

NOTE: When an e-mail channel is defined for a business object the Configuration Tool automatically adds the `EmailAddress` attribute to the business object. This attribute can be used to set the e-mail address of a particular instance of the business object in the Operation Mode. When the e-mail channel is removed from the business object the `EmailAddress` attribute is automatically removed as well.

NOTE: If you select the “Use values from SystemSettings object” radio button the system administrator will have to provide the values for the outgoing mail host, from address and login details when the system is initialised – see [Setting Initial Values of the System](#).

Setting Properties of the URL Channel

Communication with an intelligent business object via the URL channel assumes that **Aware IM** sends service requests to the specified URL. It is expected that when this URL is called the browser will go to the web site of the service provider. When this web site finishes its task it will return to the **Aware IM**-based application. A typical scenario for the URL channel service is a payment system (such as PayPal) that collects credit card details and returns to the web site of the merchant.

If services exposed by the business object require input (see [Defining Services](#)) the attribute values of the business object instances representing service input will be passed to the specified URL as request parameters. For example, if a service requires the business object `URLParameters` that has `Parameter1`, `Parameter2` and `Parameter3` attributes defined and the provider's URL is www.provider.com the service requests will be sent to the following address:

www.provider.com?Parameter1=value1&Parameter2=value2&Parameter3=value3

where `value1`, `value2` and `value3` are values of the `Parameter1`, `Parameter2` and `Parameter3` attributes respectively.

The following properties should be specified:

URL of the service provider

This is the URL where the requests will be sent. This property is mandatory.

Request parameter identifying the URL to return to if success

The service provider represented by the intelligent business object may expect that the request contain the URL that the provider should return to in case of the successful fulfilment of the service. **Aware IM** will take care of supplying the appropriate URL provided that it knows the name of the request parameter that should contain this URL. For example, if you specify "successURL" as a request parameter the service request sent to the service provider will be:

www.provider.com?Parameter1=value1&Parameter2=value2&Parameter3=value3&successURL=returnURL

where "returnURL" is the value that **Aware IM** will supply so that when the reply from the provider is delivered via this URL **Aware IM** will know that the service has been completed successfully. If this parameter is not specified **Aware IM** will assume that any service request sent to the provider has been successfully completed without waiting for any reply from the provider.

Request parameter identifying the URL to return to if a failure occurs

This is the same as the previous parameter except that the return URL indicates failure rather than success. If this parameter is not specified **Aware IM** will either assume that any service request sent to the provider has been successfully completed without waiting for any reply from the provider (if success request parameter is also not specified) or it will wait for the service reply from the provider and if the provider's service fails the service request will eventually time out (this scenario should be avoided unless the provider's service can never fail).

Setting Properties of the REST Channel

Communication through the REST channel involves sending an HTTP call to a particular URL. Unlike the URL channel no user interface is involved in the call – the service returns straight away and the execution of the rules continues. Services exposed by an intelligent object through the REST channel can be discovered if the provider supplies a file in an Open API format describing exposed services. They can also be added manually as described below.

To discover services automatically click on the “Discover” button above the services table. Then provide the URL of the file in the Open API format (with .json or .yaml extension). Aware IM will automatically discover services exposed by the provider and will display them. You can then select the services you will be using in your application.

To add a service manually, click on the “Add” button above the services table. To edit the service details click on the “Edit” button and to delete a service click on the Delete button. You can also copy a service that you have already defined to use it as a basis for another service. To do this select a service, click on the “Copy” button, then click on the “Paste” button to create a duplicate of the service and then click on the “Edit” button to modify it.

The following properties can be specified when adding/editing a service.

Name

Specify the name of the service. The name must be unique among other services of the business object. The name must start with a character or underscore symbol and contain characters, digits or underscore symbols. Spaces are not allowed in the name.

Description

The optional description of the service: what it does, how it is used etc.

Base URL

The URL to call when the service is requested. This URL should not include any URL parameters. You can use tag expressions to refer to attributes of the objects in Context here.

HTTP Verb

HTTP verb to use when the service is called – usually GET or POST

Parameters

Parameters of the service can be specified in different ways depending on what the provider requires.

URL-encoded string

If a provider requires that parameters must be specified in the URL of the call, specify them here. You can use tag expressions to refer to attributes of the objects in Context.

Request Body

Use these values if parameters need to be encoded into the body of the request. You can define the details if you click on the Details dialog. A body of the request may consist of several “parts” if parameters include binary content. Usually, though, the request contains just one part. To specify the content of the part you either need to provide the text string containing all parameters or refer to an attribute of some object in Context or refer to the entire object.

If you specify a parameter string you next to specify “text/plain” as ContentType and then provide the parameter string by selecting the “Use this String” radio button. The string may refer to attributes of the objects in Context in tag expressions.

The value of the parameter may also be stored in an attribute of some object in Context in which case you should select the “Take From Context” radio button and then select the name of the object and attribute that holds the parameter. You also need to specify the correct Content Type of the value stored in the attribute.

If you select the “Take From Context” radio button, specify the object, but do not specify the attribute **Aware IM** will automatically convert the entire instance of the object either into JSON or XML representation (depending on whether the Content Type is specified as “application/json” or “text/xml”). You can then customize how the conversion will occur by clicking on the “Name Mapping” and “Attribute Encoding” links and also specifying how undefined values will be encoded.

If your service provider requires that you provide binary content as parameter along with some primitive values (for example, text or number) you should specify each parameter in its own part. For example, if you need to provide a binary value and a number you should define two parts – the first part (binary) should have “application/octet-stream” as Content Type and it should refer to the attribute of some object in Context of the Picture or Document type. The second part should have “text/plain” as Content Type and then refer to some attribute of the Number or Plain Text type.

 **NOTE:** If you are referring to the entire object in Context and this object has an attribute of the Picture or Document type, the picture or document will be automatically encoded without you having to define an additional part.

 **NOTE:** If a provider requires that the value of some attribute is an array of primitive values and you are referring to the entire object in Context, please make sure that the value of the “array” attribute is a string that concatenates all array members delimited by the “#” symbol, for example Object.Attribute = “Value1#Value2#Value3”

 **NOTE:** If a provider requires that the value of some attribute is a dictionary and you are referring to the entire object in Context, please make sure that the value of the “dictionary” attribute is a string containing pairs of key/values separated by the “|” symbol. Each key/value pair must be separated by the “~” symbol, for example Object.Attribute = “Key1~Value1|Key2~Value2|Key3~Value3”

To add a part, click on the “Add” button above the list of the defined parts.

HTTP Headers

Click on the “HTTP Headers” link to define one or more optional HTTP headers that will be added to the HTTP request if the provider requires them. For each header provide its name and value. Note that the value may refer to the current Context of the process when the service is called. To do this, enclose the value in “tags” (double angular brackets), for example: <>MyObject.MyAttribute>>

Reply

If the REST call returns a reply that you need to handle in your application you should select the “Reply returned of type” radio button and then click on the “Details” button. Then you should provide the details of the reply in a similar way that you define the body of the request (see “Parameters” above). However, when you define a reply you should always specify just one part:

1. For text replies all you can do is write the string with the reply into some attribute of an existing object in Context of the process where the service is called. You need to specify the name of the object and the attribute where the reply will be stored. You will then need to add further rules to analyse the provided reply and perform further actions
2. For JSON and XML replies you can get **Aware IM** to automatically parse the contents of the reply into attributes of some object. **Aware IM** will create a new instance of such object and populate its attributes from the values of the corresponding fields in the reply. By default **Aware IM** will try to find an attribute with exactly the same name as in the JSON/XML attribute definition, but you can also provide your own mapping between names in JSON/XML and the corresponding **Aware IM** attribute names.

OAuth Support

Many vendors providing REST services support OAuth protocol that mandates that the caller of the service authenticates himself using a special protocol before a call to the service is made. If this is the case you need to tick the “OAuth Supported” checkbox underneath the services table and then click on the “Details” button to provide further details:

Provider

Aware IM already includes settings that you need to specify for many popular REST service vendors, so if your vendor is already in the list you can prepopulate most settings with vendor-specific values by selecting the vendor from the drop down list.

You can also add your own providers to the list if you know their values. To do this modify the file

AwareIM/ConfigTool/eclipse/plugins/com.awaresoft.awareim.configtool_XXX.jar. This file is a zip file, so you can open it with an archiver utility. Then add the appropriate property file to the config/oauth directory within this archive, You can take a look at any existing property file in this folder for an example.

OAuth version

Different vendors support different versions of the OAuth protocol. The settings are quite different depending on which version is supported. Choose either version 1.0 or 2.0

API Key, API Secret

The caller of the service must be registered with the vendor to make OAuth-based REST calls. The vendor issues API Key and API secret to the caller. These need to be specified here. If these values are stored in the attributes of some object (for example, SystemSettings) you can refer to this attribute by using tag expressions, for example <<SystemSettings.APISecret>>

Also when registering your application with a provider, make sure that you include the following URI as “redirect URI”:

<http://YourServerName:8080/AwareIM/req.awurl>

Scope

Some vendors require that you specify the “scope” of the service request. This is vendor-specific – refer to the documentation of the vendor.

Signature type

This value is only for OAuth 1.0. Refer to the documentation of the vendor as to which signature type you need to provide

Request for request token

The values in this section are only for OAuth 1.0 that requires that the system first sends a request for a “request token” to the specified URL. The URL then returns a reply that contains “request token” and “request secret”. You need to specify the URL to send the request to, the HTTP verb of the request, the type of return and regular expressions to extract token and secret from the reply.

Request for access token

A call to the service using OAuth can only be done if the vendor issues an “access token”, which is then used for authentication. To get an access token the system first needs to call an “authorization URL” that provides a special code in the reply. This code is then used in the call to the “access token URL” that returns the access token, which then needs to be stored in an attribute of some object (so that it can be used in the service call). You need to specify the “authorization URL”, the name of the parameter of the reply that contains authorization code, the “access token URL”, the regular expression that extracts access token from the reply and finally an expression where to store the access token. When specifying the expression use a tag expression, for example, <<LoggedInRegularUser.AccessToken>>. The object referred to in the

expression must be in the Context of the service call. For more details please refer to the OAuth and vendor's documentation.

Token expiry

Access tokens may expire. If a call to the service is made with an expired token an error message will be returned. The error message is specific to the vendor. If you help **Aware IM** identify the “token expiry” error message it will automatically invoke the access token workflow again and request a new token. Otherwise, it will just display the error message. To support automatic token expiry click on the “Token Expiry” button, tick the “Check for expired tokens” checkbox and provide the string that distinguishes token expiry error messages from other error messages.

Adding/Editing Attributes

The following section describes how to add or edit attributes of business objects or notifications. Attributes are added or edited on the Attributes tab of a business object or notification editor. To add an attribute click on the  icon at the top of the attributes table.

See also:

- [Common Properties](#)
- [Setting Properties of Plain Text Attributes](#)
- [Setting Properties of Number Attributes](#)
- [Setting Properties of Date, Timestamp and Duration Attributes](#)
- [Setting Properties of Reference Attributes](#)
- [Setting Properties of Picture Attributes](#)
- [Setting Properties of Document Attributes](#)
- [Setting Properties of Shortcut Attributes](#)
- [Setting Properties of Yes/No Attributes](#)
- [Setting Options of Binary Data Attributes](#)

Common Properties

Each attribute of a business object or notification must be assigned a particular type (Plain Text, Number, Date etc). Some properties of the attributes are specific to the assigned type whereas others are common to attributes of all types. Both common and specific properties are specified in the Selection Properties window. When you select the specific attribute its properties are displayed in the window. Which properties are displayed depend on the attribute type. The following section describes properties common to all attribute types.

Name

Specify the name of the attribute. The following restrictions apply:

- a. The name must start with a character (not digit) or underscore symbol. All other symbols in the name must be either characters (including underscore symbol) or digits. No spaces or special symbols are allowed.
- b. The name must be unique among the names of other attributes of the business object or notification owning the attribute.
- c. The name cannot be one of the names reserved for system use – ID, BASVERSION, BASTIMESTAMP, AccessLevel, LoginName, Password, PersonalSettings.
- d. The name cannot be the name of an identifier used in SQL – FROM, SELECT, IN, INTEGER, TEXT, BLOB, CHAR, VARCHAR etc.

Description

Specify any text that describes what the attribute is for, the business concept that it represents, how it is used etc. Any description if defined is included into the generated documentation for the business space version – see [Generating Documentation](#).

Type

Any attribute must be assigned a type. Choose the required type from the “Type” combo box. The list of types contains *basic types* (Plain Text, Number, Date, Timestamp, Yes/No, Binary Data, Document, Picture, Shortcut) and *reference types*. Reference types include the names of all business objects and business object groups defined in the business space version – see [Reference Attributes](#).

Required

If you tick the “Required” checkbox **Aware IM** will check that there is a non-blank value for the attribute when an instance of the business object that owns the attribute is created or edited. The check will be made irrespective of whether the instance of the business object is created or edited by the user or created/changed by rules. If the value of the attribute is blank the appropriate message will be issued to the user and any currently executing processes or rules will be aborted. If the user is creating or editing an instance of the business object the input control displaying the attribute value will have a red star next to it to indicate that the value of this attribute must be provided.

Calculated

If you tick the “Calculated” checkbox the user will not be able to change the value of the attribute – the attribute will be read-only. The value of the attribute can only be changed by rules. This option is not applicable for attributes owned by notifications.

Initial Value

Most attribute types allow specifying the initial value of the attribute. The initial value is the value that the attribute is initialised with when an instance of the business object or notification is created. This applies both to business objects created by the user or to objects and notifications created by rules. If the user is creating an object she will see the initial value when the form of the object is displayed. She can then change this value if necessary. Be also aware of the following:

- The type and format of the initial value must correspond to the type of the attribute.
- Rule expressions are not allowed as initial values (with the exception of expressions that set the current date or time, such as CURRENT_DATE). If the attribute value should be initialised to some expression a rule has to be attached to the business object or notification that owns the attribute – see [Adding/Editing Rules](#).

Choices

Most attribute types allow specifying a number of choices for the attribute value. Choices indicate that the attribute may take values from the specified list. Clicking on the “Choices” property brings up the “Choices” dialog where you can add or delete choices.

If the “Other values allowed” checkbox is unchecked on the “Choices” dialog the attribute may not take any other values. In this case if the attribute value is different from the one specified in choices an error message will be issued to the user and the currently executing process or rules will be aborted. When no other values are allowed an attribute with choices is displayed on the form of the business object as a combo box or as radio buttons.

If the “Other values allowed” checkbox is ticked the attribute may take values different from the ones specified in choices. In this case **Aware IM** makes no checks of the attribute value and the list of choices exists purely for convenience of the user. When a form is generated the field is displayed as an editable combo box where you can choose values from the list and also specify other values.

It is also possible to specify different values for when a choice is displayed to the user and what is stored in the database. For example, if you have a choice of gender you can display “Male” and “Female” as choices but store “M” and “F” in the database. By default display value is equal to the database value.

It is also possible to use tag expressions as choice values – for example
`<<SystemSettings.TaxRate>>`

- To add a new choice entry click on the cell in the Choices list box and type in the text of the choice entry. Press Enter to finish. To add another entry click on the next cell and type in the text.
- To modify the existing choice entry click on the cell containing the entry in the Choices list box, modify the text of the entry and press Enter.
- To delete the existing choice entry click on the cell containing the entry in the Choices list box and press the Delete button located next to the Choices list box.
- To change the order of entries click on the cell containing the entry and press the Up or Down buttons next to the Choices list box.
- If you want to add more blank entries to the list box press the “More Rows” button.

 **NOTE:** The type and format of a choice value must correspond to the type of the attribute.

 **NOTE:** Choices are not applicable for attributes owned by notifications.

Dynamic Choices

A list of choices can be calculated at run-time rather than explicitly specified by the configurator. When the user clicks on the drop down with choices **Aware IM** can dynamically run a query to load the choices into the drop down. This will happen if you select the “Choices are determined at runtime” radio button on the “Choices” dialog. You can specify any existing query that will be run to extract choices or define any custom query. As a convenience option you can also select “Use Existing Attribute Values” radio button. In this case **Aware IM** will automatically construct a query that will extract all existing values of the current attribute and present them as choices.

Allow end users to add and edit choices

Ticking this checkbox will allow end users to manage the list of choices in the Operation Mode. This may be necessary if the configurator does not know up front the list of choices relevant for a particular end user and he does not want end users to work with the Configuration Tool directly. If this option is on end users of particular access levels (usually the system’s administrator) will see an icon on the object form next to the attribute control. If they click on this icon a window will pop-up where they will be able to add, edit or modify a list of choices.

The initial list of choices seen by end users will be pre-populated with the choices entered by the configurator in the Configuration Tool (if any).

 **NOTE:** The option for end users to edit list of choices will not be available if the configurator provides her own list and specifies that “other values are not allowed”.

Include empty text

Tick this checkbox to include an empty line into the list of choices to allow the user to select a “blank” value

Indexed

This is the database specific option for the advanced users. If the “Indexed” checkbox is ticked **Aware IM** will instruct the underlying database system to create an index for this attribute. Creating a database index for the attribute can significantly speed up database queries involving the attribute. If your database is likely to have lots of records of instances of the business object that owns the attribute and end users are likely to frequently perform queries on this attribute you may consider making the attribute “indexed”. The “Indexed” option is not available for attributes owned by notifications.

Validate as

This dropdown allows you to select an Input mask that will control how validation of Plain Text attributes is performed. For example, an e-mail address attribute needs to conform to the input standards of the e-mail address, some attributes need to be alphanumeric only etc. When you specify the input mask for the attribute **Aware IM** will perform validation of the values entered by the user to make sure that they conform to the

requirements of the input mask. There are several pre-defined input masks provided by Aware IM and you can also define your own input masks. The input masks provided by Aware IM are:

- E-mail
- URL
- Alpha (characters only)
- Alphanumeric (characters and digits only)
- US Phone (999) 999-9999

If you need to provide an input mask different from the above you can enter a regular expression defining the mask. The regular expression must start and end with the "/" symbol, for example:

```
/\\(\\d{3}\\)? \\d{3}[-.]\\d{4}/
```

The information about format of regular expressions can be found in the [Appendix E](#) or on the following site: <http://www.regular-expressions.info/reference.html>

If you want to re-use the same regular expression in different attributes you can assign a textual name to your expression. To do this you have to modify the UIConfig.props file located in the BIN directory of your **Aware IM** installation to add an entry representing your expression. The entry must start with the "TextInputMask" prefix and contain the name of the expression followed by the "#" symbol and then followed by the expression itself, for example:

```
TextInputMask1=US Phone#/\\(\\d{3}\\)? \\d{3}[-.]\\d{4}/
```

Once you define your expression in the UIConfig.props file you need to re-start the Configuration Tool and the name of your expression will appear in the "Input Mask" combo box.

SQL type

Aware IM automatically manages database for all attributes that the configurator defines, so SQL types of each attribute are usually determined by default. It is, however, possible to specifically indicate an SQL type to be used for a particular attribute, for example:
DECIMAL (2,10)

Attribute Presentation

All attribute types allow specifying presentation options for the attribute. These options control how the input control displaying attribute value will be generated on a business object form.

NOTE: Presentation options specified for an attribute will be used by default when the attribute is shown on forms unless a particular form section overrides the default options – see [Adding/Editing Form Sections](#).

The following presentation options are common to many attributes:

Label

Specify the label that will be displayed next to the input control. By default it will be the name of the attribute (if this name has capital letters they will be replaced with spaces – for example, if the attribute name is `AccountBalance` the default label displayed will be “Account Balance”). You can also indicate an empty label.

Icon

Specify the icon that will be displayed together with the label next to the input control. By default no icon is displayed. Click on the “Edit” button to specify the icon.

Description

If you want to provide the description of the attribute click on the “Description” property to bring up the “Attribute Description” dialog. You can type it in in the “Description” text area. If the “Show description underneath the control” radio button is selected the description will appear underneath the input control representing the attribute on the form (see the “Max Borrow Number” attribute on the picture below):

The screenshot shows a dialog box titled "Item Type". At the top right are standard window controls: close, minimize, maximize, and refresh. Below the title is a toolbar with icons for back, forward, search, and other functions. The main area contains four input fields with descriptions:

- Name:** * (text input field)
- Max. duration:** * (text input field) with a tooltip: "Maximum loan duration in days"
- Max. borrow number:** * (text input field) with a tooltip: "Maximum number of items that can be borrowed per member"
- Max. renewals:** * (text input field) with a question mark icon in the corner

At the bottom are two buttons: "Save" (blue background with white checkmark) and "Close" (white background with black close symbol).

If the “Show description as popup window” radio button is selected, a little icon will be displayed next to the control representing the attribute. When a user moves the cursor over this icon a small popup window containing the text of the description will be shown – see the “Max Renewals” attribute.

If the “Show description to the right of input control” radio button is selected the description will be shown to the right of the control – see the “Max Loan Period” attribute.

 **NOTE:** You can enclose attribute description in HTML tags to improve its presentation, for example: <p style="color:#ff0000">This description will be displayed in red. </p>

Save form on selection change

This option is only valid if an attribute has choices. Ticking this checkbox will make the sure that the form of the object will be saved as soon as the user chooses a different choice in the selection.

Save form on focus loss

This option is only valid if an attribute does not have choices. Ticking this checkbox will make the sure that the form of the object will be saved as soon as the user moves away from the control representing the attribute.

Widget property (Radio buttons)

For many attribute types there is a “Widget” property that allows you to specify which widget will be used to display the attribute. If an attribute has choices and no other values other than choices are allowed it will be possible to select “Radio buttons” as a widget type. In this case you will also be able to set the “Number of columns” property.

Widget property (Checkboxes)

This option is only available for an attribute of the Plain Text type and only if it has choices defined. Selecting this option indicates that the user can choose multiple choices and each choice is represented as a checkbox. Setting details of this option is similar to setting options of radio buttons.

 **NOTE:** **Aware IM** represents selected choices as a single delimited string. You must make sure that the length of the attribute is no less than the string formed as a result of concatenation of all possible choices (in case a user selects all checkboxes) plus delimiters.

Presentation rules

This property allows you to define conditions when certain presentation elements are displayed. You need to define a condition and select the type of the presentation element that the condition applies to. Then you need to define properties of the element specific to the selected element type. If a condition is not specified the properties of the element will be applied unconditionally. The following element types are supported:

- ICON – this element type controls how attribute will be displayed in different lists, such as in query results or in reference lists. Instead of displaying a value for the attribute you can display an icon representing the value.. For example, you can display different icons for the Balance attribute of the Account object –

depending on the value of the balance. You can also display icon only or both icon and value – this is specified when you [define a query](#) or set up [presentation options for references](#).

- **STYLE** – this element type allows you to specify different CSS style options for particular attributes when they are displayed on forms. By default attributes are displayed using predefined colors, fonts and other properties. The “Style” element type allows you to override the default settings. For example, you can display account balance in red if its value is less than 50 or in green if it is more than 50. To do this define two styles with different color settings and specify a condition for the first style as Account.Balance<=50 and for the second one as Account.Balance>50.
- **DISPLAY FORMAT** – this element type allows you to display attributes on forms or inside query results using a different format than the format defined in the attribute itself. This can be especially useful when displaying numbers – you may want to display numbers in different formats on different forms. You can even store the format in an attribute of some object – in this case you should specify a tag expression as the format value, for example
`<<SystemSettings.NumberFormat>>`
- **INPUT MASK** - this element type allows you to specify an unput mask for entering text attributes on forms, which can be different to the mask defined in the attribute itself. You can even store the input mask in an attribute of some object – in this case you should specify a tag expression as the input mask value, for example `<<SystemSettings.InputMask>>`

Script

For users who are familiar with Javascript this dialog allows specifying additional attribute configuration parameters when attributes are initialized and displayed. See Programmers Reference Guide for more details.

Setting Properties of Plain Text Attributes

The Plain Text attribute type represents text strings. Most properties you need to specify for attributes of the Plain Text type are common to all attribute types – see [Common Properties](#). The properties specific to the Plain Text type are:

Maximum length

This value specifies the maximum number of characters that the text string representing the value of the attribute may have.

Content

You can choose “Standard”, “HTML” or Color. If you choose “HTML” it is assumed that the text represents HTML. A text in the HTML format is displayed as HTML on forms and can be edited using the built-in HTML editor (see Presentation Options below). If

you choose “Color” it is assumed that the text holds color value and can be edited with a special Color Picker widget. In queries such text is displayed as a color box by default.

Presentation Options

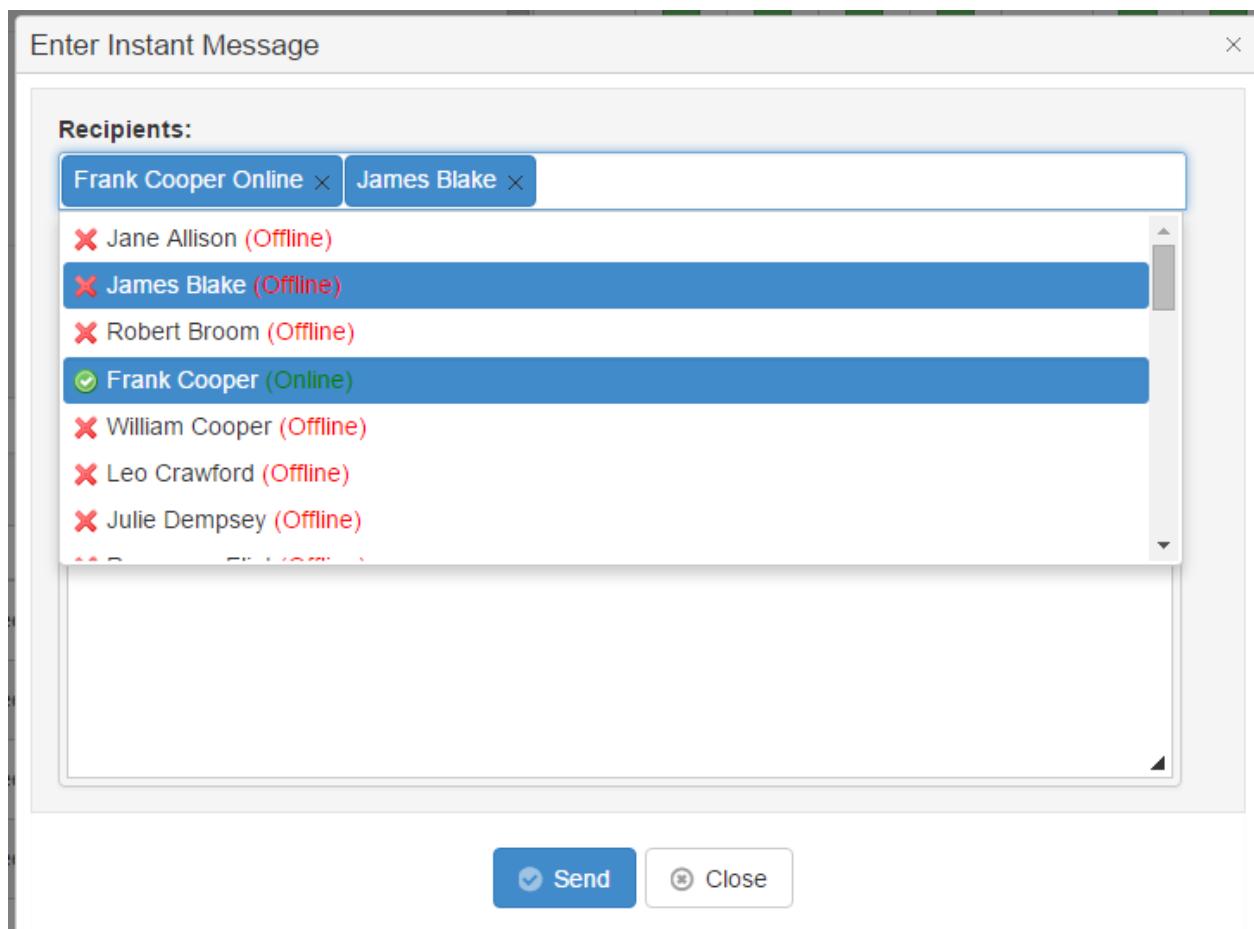
Some common presentation options, such as “label” and description are described in Common Properties. You can also define the following properties for the Plain Text attributes:

Widget

If text has no choices there are two types of widgets that you can choose from – “Text box or “Text area”. In the latter case you can also specify the height of the text area in pixels and indicate whether the user will see how many characters are left to type (“Count characters” property). The value specified in the “Width” control specifies the width of the generated text box or text area in number of characters or pixels (one or the other). If you select “Text box” you can also specify whether the control represents a password and whether the user is required to enter password confirmation.

If the attribute has choices and “Other values allowed” is un-ticked then possible widgets are “Combo-box” or “Radio buttons” and “Checkboxes”. If “Other values allowed” is ticked the choices are “Combo-box”, “Checkboxes” or “Multi-selector”.

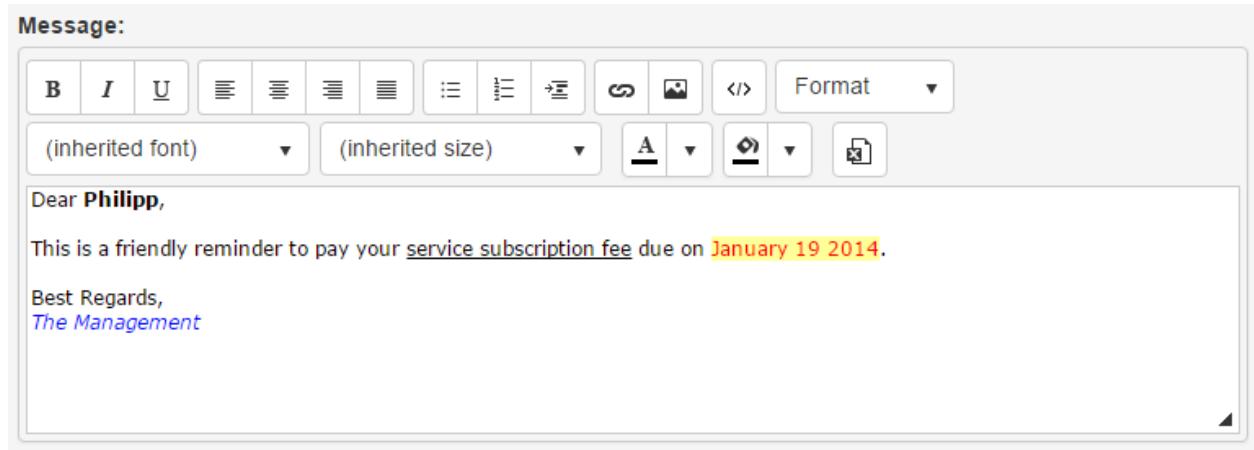
With the “Multi-selector” widget the user can make multiple choices from the drop-down list - see the picture of the “Multi-selector” widget below:



Just like “checkboxes” the “Multi-selector” option implies that the attribute can store multiple strings and so internally all selected choices are stored as strings separated by a delimiter.

Widget property (HTML Editor)

This option is only available for text in the HTML format. If you select this option the text will be edited on forms using the built-in HTML editor (see the picture below):



You can then specify the width and height of the HTML editor and whether this editor will support the “inline mode”. In the inline mode the toolbar of the editor will only be displayed when the user starts editing the text – this saves some screen real estate.

Input mask

Use this property to mask user input and only allow particular characters during input. This is different from the “Validate as” masking which allows any characters during input, but performs validation according to the mask when the form is submitted. Character masking, on the other hand, only allows certain characters to be entered in certain positions. When you click on this property you can define your mask or select from a number of predefined masks.

Setting Properties of Number Attributes

The Number attribute type represents floating point and decimal numbers. Most properties you need to specify for attributes of the Number type are common to all attribute types – see [Common Properties](#). The properties specific to the Number type are:

Format

The format basically indicates whether the number may have decimal point and also how many digits should be displayed before and after the decimal point. The format is specified as a text string with special symbols. The allowed special symbols are described in the [Appendix C](#). You can specify the format directly or click on the “...” icon of the property to bring up the “Number Format” dialog. The following settings can be specified on this dialog:

Number of digits before decimal point

If “Automatic” is selected (this is the default option) the number of digits before the decimal point is not limited; there will be as many digits displayed before the decimal point as the number has. If you specify a particular value instead of selecting the “Automatic” option the number of digits before decimal point will always be equal to this value. If the number has fewer digits than the value specified, the remaining digits will be displayed as zeroes. For example if you specified 4 as the number of digits before the decimal point, number 10 will be represented as 0010.

Number of digits after decimal point

If zero is specified (the default) the number represents an integer and no decimal point will be displayed. If some non-zero value is specified the number will be displayed with the specified number of digits after the decimal point padded with zeroes if necessary.

Custom format

Type the symbols directly into the text box according to the conventions described in the [Appendix C](#).

Min. value / Max. value

If specified indicates the upper and/or lower limit that the value represented by the number may take (both are inclusive). Note that it is possible to indicate both upper and lower limits, lower limit only, upper limit only or no limits at all.

Auto Incremented

If this property is defined **Aware IM** will automatically set values of this attribute incrementing by 1 every time a new instance of the object that owns the attribute is created. The benefit of using auto-incremented numbers compared to incrementing numbers by rules is that the auto-incremented number is set into the database immediately without waiting for the current database transaction to commit. This avoids the potential problem of having two users having the same number if numbers need to be unique.

When you click the “...” button of the property you can control how auto-incremented numbers are applied:

Auto-increment every object instance

This is the default option. Every time the new instance of the object is created the number will be incremented by 1.

Auto-increment within a group of object instances

Sometimes it may be necessary to increment numbers within a “group” of instances. For example, you may want to have invoice numbers automatically incremented for customers from different countries. Every country may have its own group of numbers. In this case you select this option and then select the attribute of the object that identifies a “group”, for example Country.

Initial Value

This determines the value for the first instance of the object or the first instance of the “group” of instances. The default value is taken from the Value Range defined for the number (if undefined 1 is used). You can also specify an attribute that will hold the initial value.

Presentation Options

Some common presentation options, such as “label” and description are described in Common Properties. You can also define the following properties for the Number attributes:

Widget

Most of the choices here are similar to the Plain Text attribute – “Text box”, “Combobox”, “Radio buttons” and “Checkboxes”. If the number has “Min. value” and “Max. value” defined there is also an option to display the number using the slider widget. You can then specify the orientation of the slider, the increment value and whether to display a tip.

Spinner

This checkbox indicates whether or not to generate a spinner control when displaying the number attribute.

Setting Properties of Date, Timestamp and Duration Attributes

The Date attribute type represents dates, for example 12/09/95; the Timestamp attribute type represents date and time, for example 12/09/95 12:45 and the Duration attribute type represents the duration of an event, for example 2 weeks 10 days 3 hours. Most properties you need to specify for attributes of the Date, Timestamp and Duration types are common to all attribute types – see [Common Properties](#). The properties specific to these types are:

Format

This is the format of the date, timestamp or duration. The format is specified as text with special symbols. The following symbols are most frequently used:

- d – day in month (number of days for duration)
- M – month in year
- y – year
- h – hour (1-12)
- H – hour (1-24) (number of hours for duration)
- m – minute in hour (number of minutes for duration)
- s – seconds in hour
- w – number of weeks (duration specific)

For example, first of June 2004 will be displayed as 01/06/2004 if the format is specified as dd/MM/yyyy.

Rather than specifying the explicit format of the attribute you can choose “Take from locale” option if your application supports multiple languages. In this case the actual format of the attribute will be defined by the currently used locale – see [Creating Applications in Different Languages](#).

Presentation Options

Some common presentation options, such as “label” and description are described in Common Properties. You can also define the following properties for the Date, Timestamp and Duration attributes:

Use browser control

By default **Aware IM** displays its own controls for Date and Timestamp attributes. These controls include calendars and drop downs for the selection of time. Some browsers

(especially mobile browsers) have their own controls for representing date and time. Select this property to use native browser controls for representing date and time.

Time interval, Time min. value, Time max. value

These properties are only available for the attribute of the Timestamp type. Timestamp control is displayed as a combination of the date control and time control. The time control represents a drop down of times. You can specify the time increment and the boundaries for the values displayed in this drop down. Note that if the format of the Timestamp only includes time (for example, HH:mm) only the time control will be displayed.

Setting Properties of Reference Attributes

Reference attributes are explained in detail in the [Reference Attributes](#) section.

Entering or editing values of reference attributes on a form of a business object in the Operation Mode is somewhat different to other attribute types.

To provide a value of a reference attribute is to indicate that the instance of the business object being created or edited is related through this attribute to one or more instances of another business object. For example, an `Account` object can be configured to contain a list of its transactions in a reference attribute called `MyTransactions`. Thus a particular instance of the `Account` object can be related to a number of instances of the `Transaction` object.

To display a value of a reference attribute is to display a list of instances of related business objects (or maybe just some members of this list).

When displaying a form containing reference attributes **Aware IM** generates the appropriate controls required to display, enter or edit values of such attributes. An example of a reference attribute is shown on the picture below:

Jane Allison

Main	Communication	Alerts	Signature
Click on an item in the list to see more details on a separate form. Use buttons in the caption of the table to filter the list.			
Type	Contact Time	Subject	State
Incoming phone call	03/02/2016 09:00	Support call	Read
Outgoing letter	01/03/2014 12:05	Payment reminder	Sent
Incoming e-mail	03/02/2015 13:10	RE: Payment reminder	Unread
Outgoing phone call	02/01/2015 09:11	Product key issue	Unread
Incoming phone call	01/01/2015 10:26	Product key follow up call	Read
Incoming phone call	12/01/2014 12:45	Product key request	Read
Outgoing e-mail	03/06/2014 12:05	Payment reminder	Sent

The instances of the objects related to the instance currently being edited are shown in a table where each row represents an instance of a related object. Table columns show values of certain attributes of the related objects (which attributes will be shown can be defined at the configuration stage – see [Presentation Options for References](#)).

The buttons in the rightmost columns of each row allow performing operations with the related instance represented by a particular row. The list of operations is configurable – see [Presentation Options for References](#). In the example above the “Edit” operation represented by the “Edit” button brings up a form of a related business object.

Configuring References

When configuring references the following properties must be specified:

Multiple allowed

If this checkbox is ticked the reference represents a “multiple” relationship, otherwise a “single” relationship.

Matching data

Click on this property to define relationship type (“Peer”, “Owner of” or “Owned by”) and matching attribute in the referenced object. When defining a matching attribute select the “None” radio button if the reference attribute represents a non-matching relationship; if the reference attribute represents a matching relationship select either “Create” or “Existing” radio buttons.

Create

The “Create” option is available if the new reference attribute is being created or the reference attribute represents the non-matching relationship. Selecting this option will create the matching attribute on the referred business object when changes to the current business object are saved. If you select the “Create” option you must also specify the name of the matching attribute on the referred object (the name must meet the requirements imposed on the attribute names – see [Common Properties](#)). If the referred object is a [business object group](#) the matching attribute is created for all members of the group. You can also specify whether the matching attribute created will be “multiple allowed” or not.

Existing

The “Existing” option is available if the new reference is being created or the reference attribute represents the non-matching relationship *and* there is an attribute on the referred business object or group that refers to the business object being edited through a non-matching relationship. In this case we are “binding” two non-matching relationships in one matching relationship. As there may be several attributes on the referred object having non-matching relationship with the object being edited you may need to select the attribute you want.

Matching relationships are not applicable to attributes owned by notifications.

Presentation Options for References

For reference attributes presentation options define how instances of the referred object are displayed (if at all) on a business object form. There are several ways the referred instances can be displayed on a form – as a table, as a list (either a combo box for single references or a list box for multiple references), as a tree or as a calendar.

When the referred instances are displayed as a table usually only a few instances (the most significant ones) are displayed on the form. Also, usually values of only certain attributes of the referred instances (the most significant ones) are displayed on the form. To display all attributes of a referred instance the user can press the Edit button next to the referred instance entry in the table to bring up a form of the referred object. **Aware IM** also provides buttons to add and remove instances of the referred object as well as perform operations with the referred instances. An example of such a table is shown in the [Working with References in the Operation Mode](#) section.

When the referred instances are displayed as a combo box (for single references) or a checkbox list (for multiple references) *all* instances of the referred object are always displayed. Specific instances that are referred to by the object are selected (only one is obviously selected in a combo box). Therefore this option is only recommended when there are not many instances of the referred object in the system so that all of them will fit into the combo box or the list box. In this case this option is preferable because the user will see all instances she can choose from on the form. For example, a `Car` object may refer to a `CarModel` object. There are only a fixed number of instances of a

CarModel object so a reference to a CarModel on the form of the Car object may be represented as a combo box.

The details of the presentation options that can be specified on the Presentation dialog for references are explained below:

Label

This is the label that will be displayed next to the input control. By default it will be the name of the attribute (if this name has capital letters they will be replaced with spaces – for example, if the attribute name is AccountReference the default label displayed will be “Account Reference”).

Widget

This is the most important presentation property that determines how the reference attribute will be presented to the user. The choice of the widget depends on whether it is a single or multiple reference attribute. For multiple references possible widget types are “Grid”, “Checkboxes”, “Swap Select”, “Multi-selector”, “Chart”, “Custom List” or “Tree”. For single references possible widget types are “Grid”, “Combo-box”, “Checkboxes”, “Tree” and “Form”. Once you select the widget type you need to provide settings of the widget in the “Widget settings” property. Widget settings obviously depend on the selected widget.

Grid widget

With this widget type referred instances are represented as a standard table (or grid). This is described in the [“Displaying References as a Table” section](#).

Drop down widget

This option is only applicable for single references. Choose this widget type to display a referred instance as the current selection in a combo box. The choices in the combo-box display possible other instances to choose from and set as a referred instance. The following properties are available for this widget type:

Fetch records

Two choices are available – “Fetch all records” or “Fetch records as user types”. You can choose the first option to get **Aware IM** to fill up the combo box with all existing instances of the referred object for the user to choose from. Select this option when there are not too many instances of the referred object in the database.

Choose the second option to get **Aware IM** to fill up the combo box dynamically. The user will be able to type in values in the combo box. As soon as the user finishes typing **Aware IM** will fill up the combo box with those instances of the referred object that start with or contain values entered by the user. Select this option if there are a large number of instances to choose from.

Empty Text

If you type any text into this property the drop down will include the specified text when it has no value

Mobile style choices

If this checkbox is ticked the drop down pops up from the bottom of the screen. This is especially useful for mobile applications

Save form on selection

If this checkbox is ticked the form will be saved every time the user selects a value in the drop down

Include empty text in choices

If this checkbox is ticked **Aware IM** will add a blank record (if empty text is defined) or the empty text (if it is defined) into the list of choices. This makes it possible for the user to “clear out” the value

Page size

If this property is specified the drop down will display one page at a time, so that the user can choose the page he wants to see. This is useful if the drop down shows large amount of data

Generate Add New button

If this property is defined **Aware IM** will add an icon next to the drop down. When the user clicks on this icon **Aware IM** will display the form of the referred object. The user will be able to fill out the form and create a new instance of the referred object. Once the new instance is created it will be set as the referred value into the drop down. By clicking on this property you will be able to define further details – which icon is displayed and so on.

Displayed attributes

By clicking on this property you can specify which attribute(s) of the referred object will be displayed in the drop down (usually just one). If you select more than one, they will be separated by spaces.

Custom layout

Using this property it is possible to define custom data template for displaying entries of the referred object in the drop down. Defining this template is similar to defining custom data template for custom query presentation – see [Displaying Query Results](#).

The picture of a custom drop down that uses an image, a bold subject on the first line and the description on subsequent line is shown below:

Purchase Order

Complete order

Number:	6	State:	New
---------	---	--------	-----

Customer

Number	First Name	Last Name	Date of Birth
000002	William	Cooper	03/05/1967

Items

Product	Code	Price, \$	Quantity	Amount, \$	
smart C7180 Printer	HP0006	294.50	1	294.50	
	HP0001	234.50	1	234.50	

of 1 | ► | ▶ | | | 1 - 2 of 2

Total Amount, \$: 529.00

Last Updated On: 11/13/2014 16:57

Save Cancel

Code: AC0002
Acer 17in LCD Monitor

Code: AC0004
Acer 37in High Definition Ready

1 - 4

Checkboxes widget

Use this widget type if you want references to be displayed as a list of checkboxes. This list shows all possible instances of the referred object and the instances referred to by the attribute are ticked. The option should only be used if the list of all instances is not too large.

People			
<input type="checkbox"/>	First Name	Last Name	DOB
<input type="checkbox"/>	John	Smith	02/12/1970
<input checked="" type="checkbox"/>	Ray	White	03/10/1967
<input type="checkbox"/>	Jason	Johnson	04/11/1986
<input checked="" type="checkbox"/>	Luke	May	05/09/1980
<input type="checkbox"/>	Frank	Cooper	06/02/1974
<input type="checkbox"/>	Lucy	Gray	07/04/1990

The settings of this widget are similar to the “Grid” widget.

Swap select widget

This option is similar to the checkbox list in that it shows a list of all possible instances and instances referred to by the attribute. The user moves instances from one list to another – see the picture below. Just like checkbox list this widget should be used only if the list of all instances is not too large.

Select a person:

Available	Selected
Ray White	John Smith
Jason Johnson	Luke May
Frank Cooper	
Lucy Gray	

Up, Down, Left, Right arrows between the two lists.

Multi-select drop down widget

This widget is similar to the “multi-selector” widget used for text attributes. See the picture below:

Select a person:



Calendar widget

Choose this widget type if you want references to be displayed in a calendar-like fashion (see [Calendar Form of Query Results](#)). Note that only references of the [Appointment](#) type can be presented in this manner. The settings you can specify are similar to the ones you specify when configuring a [calendar query](#).

Chart widget

Choose this widget type if you want references to be displayed as a chart (see [Displaying Query Results](#)). The settings you can specify are the same as when configuring a chart.

Custom list widget

Choose this widget type if you want references to be displayed as a custom presentation of a query (see [Displaying Query Results](#)). The settings you can specify are the same as when configuring custom presentation of a query.

Record sorting/Filtering

Using this property you can specify whether referred instances will be sorted or filtered in any way. Clicking on this property brings up the “Record Sorting/Filtering” dialog. The “Record Filtering” section of the dialog allows setting up a filter to show only referred instances that match the specified criteria. You can specify these criteria by specifying a query (either choose the existing query or specify the custom one). For example, it is possible to show only open accounts of a client (the query will be `FIND Account WHERE Account.Status='Open'`).

TIP: using different filters you can display different referred instances of the same reference attribute. For example, you could show open accounts of a client on one form section and closed accounts on another form section – see [Adding/Editing Form Sections](#).

Existing query

If you select the “Existing query” radio button you must select the existing query (see [Adding/Editing Queries](#))

Custom query

If you select the “Custom query” radio button you must specify the query – press the Edit button located next to this option and specify the query details – see [Adding/Editing Queries](#).

Clicking on the attribute in the “Record Sorting” table allows sorting the list of references by the value of the attribute displayed in the column.

See also:

[Displaying references as a table](#)
[Displaying references as a tree](#)

Displaying references as a table

This section describes how to define settings of the “Grid” widget type When you click on the “Widget Settings” property the “Standard Grid Sattings” dialog is displayed. You can define the following settings on this dialog:

Items per page

Specify how many instances of the referred object will be shown in the table by default.

Width/Height

Specify the width/height of the reference table in pixels. The default width will accommodate all data in the table.

Allow inline editing

Tick this checkbox if you want to be able to add and edit instances of the referred objects directly inside the table (see the picture below):

The screenshot shows a Purchase Order form with the following details:

- Header:** Purchase Order, Complete order
- Number:** 6, State: New
- Customer:** Number 000002, First Name William, Last Name Cooper, Date of Birth 03/05/1967. An **Edit** button is present.
- Items:** A table showing purchase order items:

Product	Code	Price, \$	Quantity	Amount, \$		
HP Photosmart C718...	HP0006	294.50	1	294.50	<input type="button" value="Edit"/>	<input type="button" value="Delete"/>
HP iPAQ hx2190 PDA	HP0001	234.50	1	234.50	<input type="button" value="Edit"/>	<input type="button" value="Delete"/>

 Buttons at the bottom of the items section include: Back, Forward, Page 1 of 1, Refresh, Add New, Save Changes, and a count of 1 - 2 of 2.
- Summary:** Total Items: 2, Total Amount, \$: 529.00
- Timestamps:** Completed On: [empty], Last Updated On: 11/13/2014 16:57
- Buttons:** Save, Cancel

The table of Items on this picture shows Purchase Order Items on the form of the Purchase Order object. Note that Purchase Order Items can be edited directly on the form of the Purchase Order. If you click on the “Add New” button a new row will be inserted.

You can even add/edit references of the referred objects inline. In the example above each Purchase Order Item refers to a Product. To add/edit references inline you need to define a [shortcut](#) to the reference you want to edit inline and include this shortcut into the list of attributes to be displayed on the form. In this example Purchase Order Item defines a shortcut to the referred Product and this shortcut is included into the list of attributes displayed in the table of Purchase Order Items on the form of the Purchase

Order object. When a user clicks on the Product cell to edit it **Aware IM** will display a list of existing Products and the user will be able to pick a particular Product.

Use popup editor

This option is only available if inline editing is on. If the checkbox is ticked inline editing will be performed for the entire row by a special popup editor.

Show column menu

If you tick this checkbox each column header in the table will have a button that allows user to hide/show certain columns.

Show paging bar

If you tick this checkbox paging bar is displayed for the table. You can further control how paging bar is displayed if you click on the More... button

Select first record

If you tick this checkbox the first record in the table will be selected when the table is displayed. Using this option is especially useful if you also define a *default* item operation for the table (see below). In this case this operation will be automatically executed for the first record when the table is displayed.

Number rows

Tick this box to show item numbers next to each row

Operations with items

The Operations table shows operations that can be invoked with the instances of the referred object. The operation types are similar to those configured for [form operations](#).

Hyperlinks containing the names of the operations will be located next to the entry representing the instance in the list. User invokes the operation by pressing on the corresponding hyperlink (see the picture in the “Item Display Rules” section below). If any applicability conditions are defined for the operation the hyperlink will appear only for those instances that satisfy the applicability condition.

Press the Add button to define a new operation, Edit button to edit the existing operation and Delete button to delete the existing operation. One of the operations can be marked as a “default” operation. If such operation is defined it will be executed when the user clicks on any item of the record, not just the operation hyperlink. In addition, if “Select first record” option is ticked, the default operation will be automatically executed for the first record.

Attributes to display

This option allows you to select which attributes of the referred object will be displayed on the form. To specify which attributes will be displayed tick the “Displayed” checkbox next to the required attributes. Use the Up and Down arrow buttons to change the order in which attribute values will be displayed. You can also specify how the attribute will be

displayed – the value of the attribute only, the value and icon or the icon only. Icons are displayed according to the presentation rules for ICON elements – see [Common Properties](#).

Apart from the “Widget Settings” property you can set the following properties when using the “Grid” widget:

Description

This option allows you to define the description of the attribute. It will be displayed as a tip for the user.

Panel Operations/Buttons

This option allows you to define buttons that will be displayed on the toolbars around the table – see [Add/Edit Panel Operations](#) for details.

Item Display Rules

This option allows you to highlight certain items in the list of the referred instances by displaying them in different colors or font styles. Pressing the Item Display Rules button invokes the “Display Rules dialog”. In this dialog you can specify colors, fonts and other CSS properties of the highlighted items as well as conditions identifying which items will be highlighted. Conditions are specified in the green cells whereas colors and fonts are specified in the Style Dialog invoked by pressing the “Set Style” button. The following picture shows the example of an item rule. In this example the Customer object has a multiple reference to the PurchaseOrder object (the Orders attribute). Each referred order is displayed differently depending on the state of the order: If the state of the order is NEW it is displayed with a yellow background. The condition entered into the item rule is: PurchaseOrder.State = ‘NEW’. The style used for this condition is the yellow background color:

Purchase orders						
Number	Total Amount, \$	State	Completed On	First Name	Last Name	
7	1,449.00	New		Lucy	Jackson	
6	529.00	New		William	Cooper	
5	264.50	New		Jane	Crawford	
4	1,924.00	Completed	07/30/2008	Frank	Moore	
3	2,608.00	Completed	07/30/2008	Lucy	Jackson	

Displaying items 1 - 8 of 8

Grouping

Click on this property to group referred instances based on the specified attribute. All instances with the same value of the attribute will be displayed together. It will be possible to expand and collapse the node with these values and specify summaries per group

Reordering

Clicking on this property allows you to enable users to reorder items in the table. This is explained in detail in the “How to implement Item Reordering” section of the “How To” Guide.

Resizing

Select this property to allow users to resize the table and specify minimum and maximum sizes for the table

CSS Style and CSS class

These properties allow advanced users to customize the appearance of the table using CSS styles and classes. See the “How to use CSS” section in the How To Guide for more details.

Expansion of rows

Select this property to specify what happens when the row in the table is expanded. See [Add/Edit Queries](#) for more details.

Filters

Select this option to assign filters to certain columns in the table. See [Add/Edit Queries](#) for more details.

Script

Use this option to control behaviour of the table using Javascript. See Programmers Reference Guide for more details.

Displaying references as a tree

Select the “Tree” widget type to display references as a tree. In this tree each node representing a referred object may also have sub-nodes representing referred objects of this object and so on.

Most of the options that you can specify for the tree representation are the same as for the table representation. Tree-specific options are explained below:

Expand all levels

Tick this checkbox to get the tree to automatically expand nodes at all levels.

Tree contents

Clicking on this property brings up the “Tree Contents” dialog. There are two radio buttons in this dialog. Select the “Show all objects in the tree” radio button if you do not want to impose any limitations on which objects should be included in a tree. When you select this option all references of the encountered objects will be included in the tree.

Select the “Show types selected in the table below” radio button if you want to impose limitations on which business objects and attributes should be included in the tree. You will then need to define which objects you want the tree to show.

In the pane on the left you can choose which business objects will be included in the tree by ticking the box next to the object’s name. When you do this reference attributes of this object will be displayed in the right pane. You can either select that all reference attributes of the selected object will be considered when building a reference tree or select particular attributes by ticking a box next to the attribute’s name. You can also tick a box indicating whether the details of the selected object should be displayed in a tree. This may be useful if you want to consider reference attributes of the object in a tree, but you don’t actually want to display the details of the object itself.

One of the common examples of selecting particular references to be shown in a tree is when you have a hierarchical object and you want to display this hierarchy in a tree. In the example shown on the picture below the Part object has Components attribute that also refers to the Part object – in other words, a Part can have other Parts, which can have their own Parts etc. If you want the tree to show this hierarchy you would select the Part object and its Components attribute to be displayed in a tree, but not any other objects or attributes. The result is shown on the picture below:

Name:	Part1
Number:	23
Date:	

Components

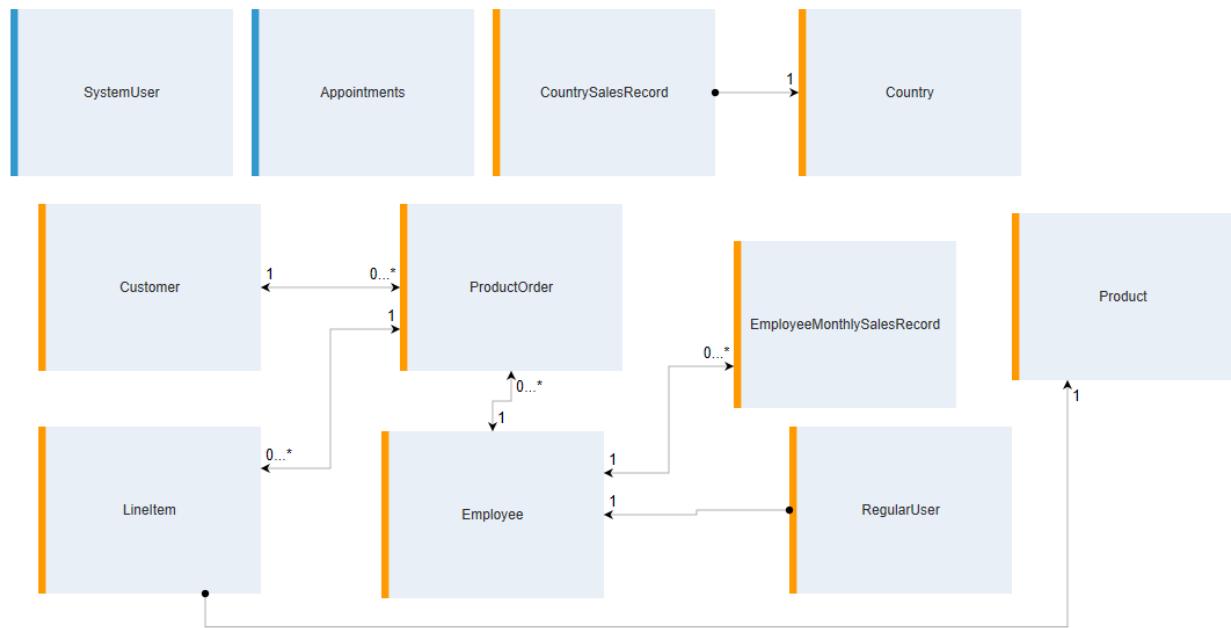
Name	Number	Date
Part2	24	
Part3	45667	07/10/08
Part4	345	07/10/08
Part5	45	
Part7	45566	

Add | **Add New** | **Delete All**

Note that inline editing is available for references of the first level when only one object is displayed in a tree (Part object in this case).

Diagram of Object Relationships

You can easily see all relationships between objects in your application if you right click on the business space version and select the “Relationships Diagram” from the popup menu (or select this menu item from the “Version” menu). You will see a picture that looks something like this:



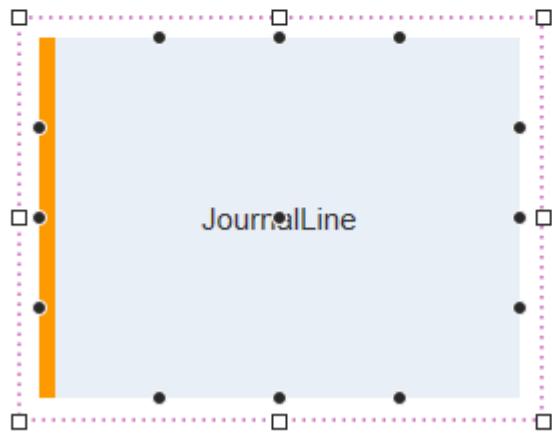
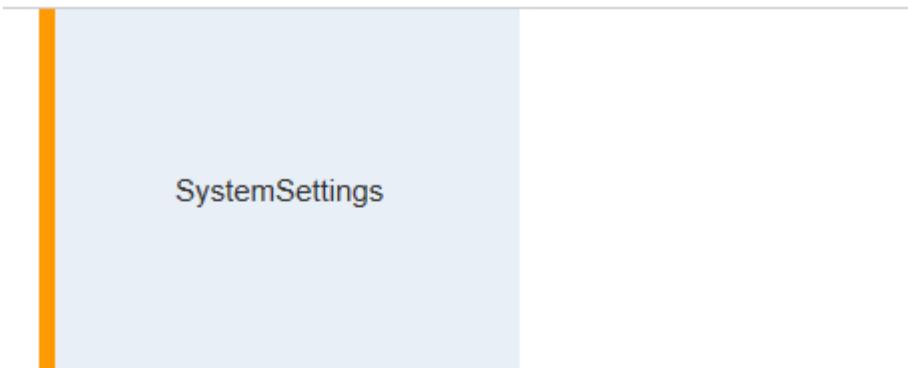
This shows all business objects and business object groups in the application – business object groups are shown with the blue edge. If there is a relationship between an object and another object or group you can see an arrow from one object to another. You can also see whether a relationship on either side is single or multiple (1 or 0...*). If you click on the relationship you can see relationship attributes in the objects that represent this relationship. You can drag objects around if necessary for better viewing and you can zoom in/zoom out if you click on the corresponding buttons in the toolbar.

If you click on the “Settings” button you can specify the height of the box displayed for each object and you can also remove some objects from the diagram by selecting those attribute that don’t need to be displayed. You can also click on the “Exclude non-referenced” button to exclude all objects/groups that do not have any relationships from the diagram.

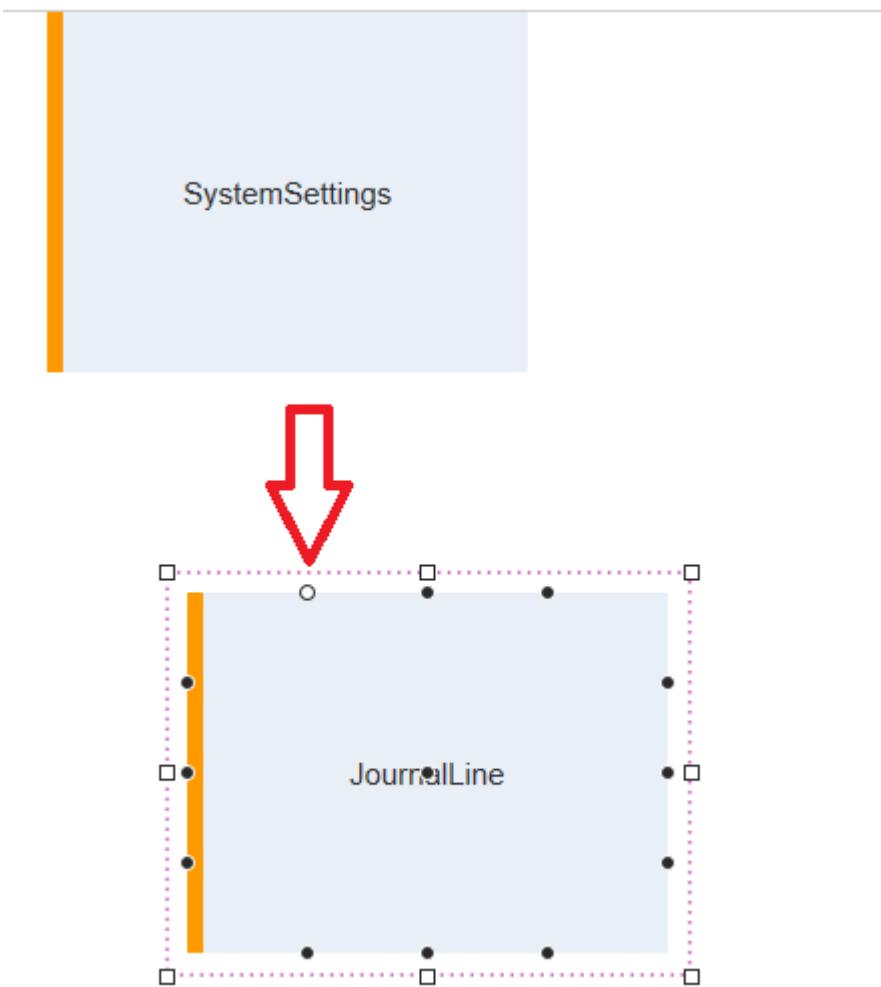
Probably the best thing about this feature is that you can create/delete relationships directly on the diagram. Creating a relationship can be done either by pressing the “Add relationship” button on the toolbar or directly dragging a connector between those objects that you want to create a relationship for.

When you create a relationship using the “Add relationship” button you need to select the objects you want to create a relationship for and then specify the name of the attribute either on the one side of the relationship or on both sides (if the relationship has matching attribute). You also need to specify the type of the relationship on each side and whether it is multiple or single.

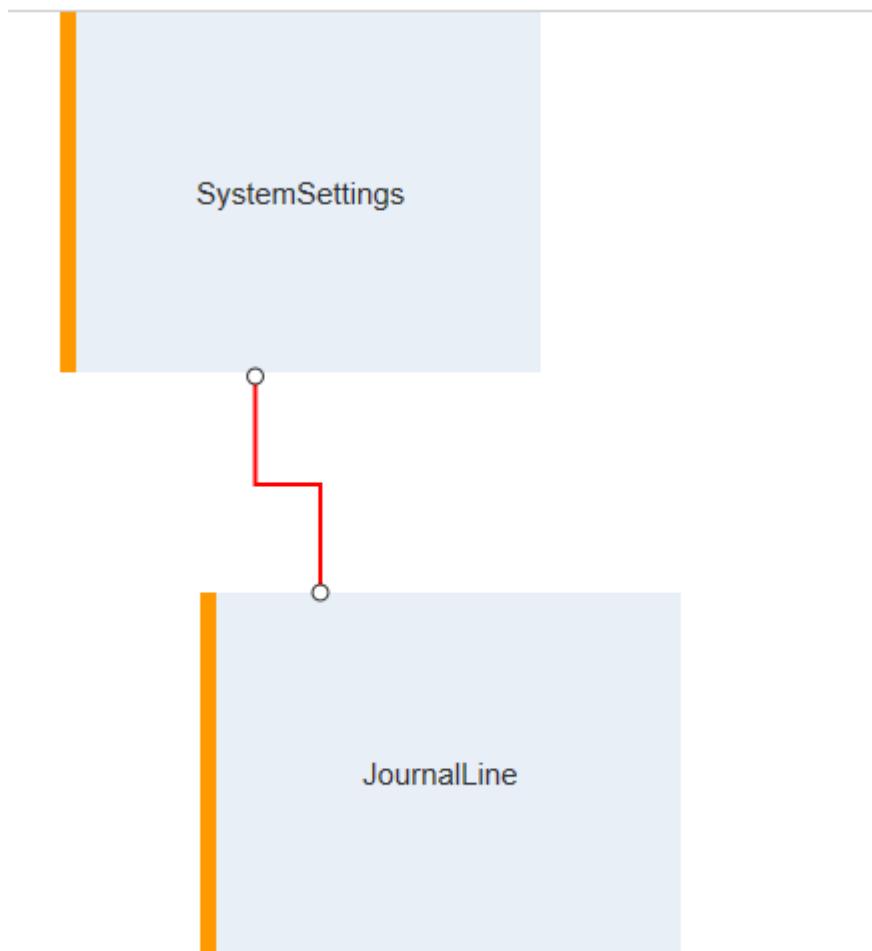
To create a relationship by dragging a connector click on one of the objects in the relationship – this will display black circles around the object to indicate that it is selected:



Then hover the mouse over one of the black circles:



and start dragging a connector to another object from this point:



When you release the mouse the dialog will popup where you can specify the remaining properties of the new relationship – attribute names, types and cardinality.

To delete a relationship click on the arrow representing the relationship and click on the "Delete" icon that pops up (or press the Delete key on the keyboard).

Setting Properties of Picture Attributes

The Picture attribute type represents images (pictures). When an attribute of this type is shown on a form of the business object that owns the attribute **Aware IM** generates the Browse button that allows the user to attach a particular image as an attribute value (only image files, such as .gif, .jpeg, .bmp files should be attached). The image is displayed on the form (see the example below):

Jane Allison

Main	Communication	Alerts	Signature
Number:	000001		
First Name:*	Jane		
Last Name:*	Allison		
Date Of Birth:*	12/10/1973	<input type="button" value="Calendar"/>	MM/dd/yyyy
Gender:*	<input type="radio"/> Male	<input checked="" type="radio"/> Female	
Email Address:	janec@hotmail.com		
Address:	321 Ninth Street Gadsden AL 35903-1618		
Phone:	(555) 555-5555	(999) 999-9999	



- [!\[\]\(8c95626997fa8ddaee697ecddb8491c1_img.jpg\) New email](#)
- [!\[\]\(d3ff89240648bb0e0665b7f53ddc1c92_img.jpg\) New letter](#)
- [!\[\]\(56d0bdea4e2622cf2dc983a654c248f5_img.jpg\) New note](#)
- [!\[\]\(b300927c01ecf4f6de9d251b31754631_img.jpg\) New alert](#)
- [!\[\]\(15d016f33603c832ddff8a0998941032_img.jpg\) Delete](#)

Most properties you need to specify for attributes of the Picture type are common to all attribute types – see [Common Properties](#). The properties specific to the Picture type are described below.

Picture represents signature

Tick this checkbox if a picture attribute stores an electronic signature of the user. If this option is on at runtime Aware IM will show the box in which the user can provide his signature by using the mouse (or fingers/stylus pen on mobile devices). The signature will then be stored as a picture in the attribute.

Stored in

You can specify where the images uploaded by the user for the picture attribute will be stored. By default all images are stored in the database (“The database” radio button), but you can also store images in the file system on disk (“File System” radio button). If you select the latter option images will be stored in the file system of the server where **Aware IM** is running. The exact location of the image is determined from the value of some other attribute in the object. You need to specify this attribute when you select the option. Usually you would provide business rules that would set the value of the file path into this attribute.

Max. file size

If specified the value indicates maximum image size that can be stored in this attribute. If the user uploads a larger image, the image will be automatically rejected.

Allowed extensions

This property specifies file extensions that can be stored in the attribute. If user uploads an image with a different extension it will be rejected.

Display settings

This property describes presentation settings specific to the picture:

Display picture as circle

Tick this checkbox to show the picture as a circle like on the form above

Thumbnail and actual representation

A picture can be represented on a form or in a query results as a smaller (thumbnail) version of the actual image. If you want to present a smaller version of the image you have two options:

- Load two different versions of the image and store them in different attributes of the object
- Load and store just one image and get Aware IM to scale it down automatically when displaying it on forms or query results

When you select the first option you need to provide the name of another attribute in the business object (of the Picture type) that would store the larger (actual size) version of the image. When you select the second option you can specify the scale in which the image will be displayed on forms and query results independently.

You can also tick the “Show actual representation when thumbnail is clicked” checkbox. If you do this **Aware IM** will show the larger (actual size) version of the image when the user clicks on the thumbnail. The larger version will be shown regardless of whether the larger image is stored in the same or different attribute. The larger image will be shown using the popular “lightbox” technology.

Setting Properties of Document Attributes

The Document attribute type represents document files. The term “document” here has relatively broad sense. Usually document files are reports in the PDF format or MS Word or MS Excel files, however, essentially any file can be treated as document (see also [Document Management](#)). When an attribute of this type is shown on a form of the business object that owns the attribute **Aware IM** generates the Browse button that allows the user to attach any file as the attribute value.

Most properties you need to specify for attributes of the Document type are common to all attribute types – see [Common Properties](#). The properties specific to the Document type are explained below:

Initial Value

The initial value property for attributes of the Document type are different from the Initial Value property of other attribute types explained in the [Common Properties](#) section. You can only initialize the attribute of the Document type with the name of a Document template defined in the business space version (see [Adding/Editing Document Templates](#)) or not initialise the attribute at all.

If you initialize the attribute with the name of a document template **Aware IM** will automatically generate a document from the document template when the business object owning the attribute is created (see [Document Generation](#)).

Stored in

You can specify where the documents will be stored. By default all documents are stored in the database (“The database” radio button), but you can also store documents in the file system on disk (“File System” radio button). If you select the latter option documents will be stored in the file system of the server where **Aware IM** is running. The exact location of the document is determined from the value of some other attribute in the object. You need to specify this attribute when you select the option. Usually you would provide business rules that would set the value of the file path into this attribute.

Max. file size

If specified the value indicates maximum image size that can be stored in this attribute. If the user uploads a larger document, the document will be automatically rejected.

Allowed extensions

This property specifies file extensions that can be stored in the attribute. If user uploads a document with a different extension it will be rejected.

 **NOTE:** If you select “Embedded Spreadsheet” from the list of allowed extensions you will be able to edit the document at runtime using the Excel-like spreadsheet interface. For more details about this please read the “How to work with embedded spreadsheets” section in the How To Guide.

Zoho editing

This checkbox allows users to edit documents in-place using Zoho editors (www.zoho.com) . Zoho provides powerful web-based editors to edit many types of documents – MS Word, MS Excel, MS Power Point, Open Office, RTF, HTML etc. The user edits the document using the browser and when he presses the Save button the modified document is automatically saved in **Aware IM**. The details are explained in the “How to let users edit documents” section in the How To Guide.

Office Online editing

This checkbox allows users to edit Microsoft Office documents in-place using Office Online editors. The user edits the document using the browser and changes are automatically saved in **Aware IM**. The details are explained in the “How to let users edit documents” section in the How To Guide.

Setting Properties of Shortcut Attributes

Attributes of the Shortcut type are necessary when you want to display the value of an attribute of the referred object on a business object form or in query results. For example, if there is an Employee object that refers to the Company object via the Employer attribute and the Company object has the Name attribute, it may be necessary to display the company name on a form of the Employee object. This may be achieved by defining an attribute of the Shortcut type in the Employee object called CompanyName. The path to the referred attribute will be Employer.Name. This path is called the *shortcut path*. In this example it needs to be defined as the property of the CompanyName attribute. The value of the attribute referred through the shortcut path is always displayed as an un-editable label on a business object form.

 **NOTE:** A shortcut path may only be via a single reference – multiple references are not acceptable as it is not clear the attribute value of which particular instance of the referred object should be displayed.

 **NOTE:** The Shortcut type is not available for attributes owned by notifications.

The following properties specific to the Shortcut type should be specified:

Path

This is the shortcut path explained above. It must start with the name of a single reference attribute defined in the business object followed by the name of the attribute in the referred object (note that nested references are allowed provided that all references mentioned in the path are single references). You can also press F3 to bring up the [Context Assistant](#) while typing the path.

Presentation Options

You can specify the label that will be displayed next to the attribute value of the referred object. By default it will be the name of the attribute. You can also optionally specify the description of the attribute that will appear underneath the attribute value.

Setting Properties of Yes/No Attributes

Attributes of the Yes/No type are useful when the attribute value is either Yes or No. Attributes of this type are either shown as checkboxes or as switches with the On and Off state. The properties that you can specify for the attributes of the Yes/No type are:

Initial Value

See [Common Properties](#). Allowed initial values are Yes, No, Y, N, On, Off.

Presentation Options

You can specify the label that will be displayed next to the checkbox or switch representing the attribute on the business object. By default it will be the name of the attribute. You can also optionally specify the description of the attribute that will appear underneath the input control of the attribute.

Adding/Editing Rules

Rules can be defined in a number of places in the Configuration Tool:

- When rules are attached to a business object (see [Business Rules as Carriers of Business Logic](#)). There are several ways to invoke the editor of rules attached to a business object:
- When rules are defined as process implementation or to handle process failure – see [Adding/Editing Processes](#).
- When rules are attached to a notification to specify what happens after the notification has been received or created.

Rules of a business object, process or notification can be managed on the corresponding tabs of the respective editor. For example, to edit rules triggered when an object is updated or created, open the business object for editing and go to the “Update Rules” tab. The following sections describe how to manage rules on these tabs.

[Working with Rule Collection](#)

[Setting Filtering Options](#)

[Context Assistant](#)

Working with Rule Collection

Rules (or rule collections) are displayed as a table where each row in the table displays the name of the rule and its textual representation. The table (with its toolbar) is displayed in the top half of the screen. When you select a particular rule the rule editor for the selected rule is displayed in the bottom half of the screen and the properties of the selected rule are displayed in the Selection Property window (see the picture below):

The screenshot shows the Rule Editor for a Customer Business Object. The main table lists several rules:

Name	Rule
Uniqueness of login ...	If EXISTS SystemUser WHERE (SystemUser.LoginName=ThisCustomer.LoginName AND SystemU...
Customer number	If Customer IS NEW Then Customer.CustomerNumber=MAX Customer.CustomerNumber+1
First letter	Customer.FirstLetter=CHARS_FROM_LEFT(Customer.LastName,1)
Default photo	If Customer.Photo IS UNDEFINED Then IMPORT DOCUMENT Customer.Photo FROM './samples...

A context help box provides information on rule syntax:

A rule consists of zero or more conditions connected with AND or OR and one or more actions. You can press F3 and F4 (functions) at any time while typing to bring up the Context Assistant.

IF

Condition 1	Customer IS NEW
-------------	-----------------

THEN

Action 1	Customer.CustomerNumber=MAX Customer.CustomerNumber+1
----------	---

The Properties window shows the following properties for the Customer business object:

Property	Value
Name	Customer
Category	Contains cust...
Description	Database: Aw...
Persistence	E-mail
Communication	[...]

The Rule window shows the properties for the selected rule:

Property	Value
General	
Name	Customer nu...
Description	Make sure th...
Enabled	<input checked="" type="checkbox"/>
Dynamic	<input type="checkbox"/>
Do not run	<input type="checkbox"/>
Form initia...	Automatic
Advanced	

To add a new rule click on the icon in the toolbar at the top to the table. The Rule Dialog will be displayed where you can specify the name of the new rule and then the new entry will appear in the table. You can then enter the text of the rule in the Rule Editor below and set its properties in the Properties window.

To edit an existing rule click on the rule entry in the table and modify the text of the rule in the Rule Editor below and/or set its properties in the Selection Properties window.

To delete a rule, click on the rule entry in the table and then click on the icon in the toolbar at the top of the table.

To change the order of rules in the rule collection, select the rule and press the Up or Down icons at the top of the table. Note that changing the order of rules in a collection is only relevant to rule collections implementing processes that have “Maintain rules order” flag checked – see [Adding/Editing Processes](#).

NOTE: If you are editing rules attached to a business object **Aware IM** checks the names of the objects used in rules. If you use an object name different from the name of the object that the rules are attached to, **Aware IM** may issue a warning message when the rules are saved. This behaviour safeguards you against mistakes when specifying object names in rules. If you intentionally specified a name different from the name of the object that the rules are attached to (for example, to use some other object in the [Context](#)) you may ignore the warning message.

Adding/Editing Individual Rules

The text of individual rules is specified in the Rule Editor displayed below the rule collection table when a particular rule is selected.

The Rule Editor has two tabs – [Standard View](#) and [Textual View](#). The Standard View and the Textual View tabs are two different ways of representing a rule. You can switch between the tabs to see how the same rule is represented in both views. Irrespective of which tab you are in, the following rule properties are always visible:

Adding/Editing Rule using Standard View

The Standard View tab of the Rule Editor allows specifying rules in a simpler format compared to the Textual View. Specifically it is not necessary to type “If” and “Then” keywords required by the [Rule Language](#).

The Standard View consists of two areas – the area where you specify rule conditions (displayed in green) and the area where you specify actions (displayed in yellow). The rule conditions area is the table where each row represents a single condition. A rule may have multiple conditions connected with AND or OR keywords. You can enter a condition by clicking on the row in the table and typing the text of the condition directly into the table. If a rule has more than one condition the conditions will be linked with the AND keyword by default. To change the keyword click on the last column in the table and select OR from the combo box that gets displayed. Note that AND or OR keywords can be entered as part of the condition as well (see the second example below). If your rule has more conditions than the number of rows currently displayed in the table click on the  icon at the bottom of the editor.

The Actions area is the table where each row represents a single action. To edit an action, click on the action row in the table. If your rule has more actions than the number of rows currently displayed in the table click on the  icon at the bottom of the editor.

At any time when editing rule conditions or rule actions you can press F3 or F4 to bring up the [Context Assistant](#).

Let us consider some examples:

```
If Policy.ExpiryDate < CURRENT_DATE AND Policy.Owner IS DEFINED
Then
    SEND ReminderLetter TO Policy.Owner
    Policy.LetterSent = 'Yes'
```

To enter this rule in the Standard Form tab you would need to enter the following conditions into the conditions table:

1. Policy.ExpiryDate < CURRENT_DATE (AND)
2. Policy.Owner IS DEFINED

Note that the AND keyword displayed in brackets will be automatically added by **Aware IM** into the last column of the conditions table.

The following actions would need to be entered into the Actions table:

1. SEND ReminderLetter TO Policy.Owner
2. Policy.LetterSent = 'Yes'

Let us look at another example:

```
If (Policy.Owner.Age > 70 AND Policy.Owner.Exempt = 'No') OR
    (Policy.Owner.PostCode < 2030 AND Policy.Garage= 'No') Then
    Policy.Premium = 300
```

To enter this rule in the Standard Form tab you would need to enter the following conditions into the conditions table:

1. Policy.Owner.Age > 70 AND Policy.Owner.Exempt = 'No' (OR)
2. Policy.Owner.PostCode < 2030 AND Policy.Garage= 'No'

Note that the AND keywords in the first and second conditions are entered as part of the conditions whereas the OR keyword displayed in brackets must be set in the last column of the conditions table.

 **NOTE:** You cannot enter rules that have “Else” statement using the Standard View – use the Textual View instead.

Adding/Editing Rule using Textual View

The Textual Form of the Rule dialog allows users to enter rules exactly as they are specified in the [Rule Language](#). If the rule has syntax error the error message will be displayed at the bottom part of the tab and the location of the error will be highlighted.

At any time when editing rule conditions or rule actions you can press F3 or F4 to bring up the [Context Assistant](#).

 **NOTE:** You can use comments anywhere inside rules specified in the Textual View. Comments are specified between /* and */ symbols, for example:
IF SomeCondition THEN
/* ActionOne */
ActionTwo

Comments in rules are ignored when the rule is evaluated.

Rule Properties

The following properties can be specified in the Selection Properties window:

Name

This is the mandatory name of the rule. Any identifier is allowed.

Description

This is the description of the rule. Providing a description is highly recommended. Any description if defined is included into the generated documentation for the business space version – see [Generating Documentation](#). To provide the description of the rule, click on the Description button next to the rule's name. The Configuration Tool will display the Description dialog – enter the description and press OK.

Enabled

Ticking this checkbox will enable or disable a rule. When the rule is disabled it does not participate in the evaluation of rules by the Rule Engine.

Priority

The rule priorities are described in details in the [Rule Priorities](#) section. By default **Aware IM** will assign a priority to the rule based on the rule actions. Actions that modify attributes will have the highest priority whereas actions that call pre-defined operations (such as FIND, SEND etc) will have lower priority while actions that initialise documents from templates will have the lowest priority. You can set rule priority explicitly and override automatic detection of priorities.

While loop

The rules supporting the semantics of a “while” statement are explained in detail in the [While Semantics](#) section. If you tick the “while loop” checkbox, the conditions of the rule will be checked repeatedly – immediately after the execution of the rule's actions.

Form initialization

Initialization rules are explained in detail in the [Initialization Rules section](#). Basically when the user creates an instance of a business object the appropriate form of the business object is displayed. The form is initialized with values calculated after evaluation of certain rules attached to the business object. Only initialization rules are evaluated. You can get **Aware IM** to automatically determine which rules are considered

to be initialization rules by selecting the “Automatic” option (default) or you can explicitly indicate whether the rule should be evaluated during form initialization or not. Note that these options are only available for rules attached to a business object.

Dynamic

Sometimes it may be necessary to dynamically re-calculate attribute values on forms while the user is making changes. For example, you may have a calculation rule that calculates value of an attribute based on values of other attributes and you want the user to see the results of re-calculation immediately after he makes a change that affects the calculation. In this case it is necessary to mark the rule that performs the calculation as “dynamic”, so that **Aware IM** executes this rule dynamically while the form is being changed.

Do not run on server

If you mark the rule as “dynamic” it will be executed both when form is recalculated and on the server. Sometimes it may be necessary to execute rule only when form is recalculated and do not execute it on the server. The typical scenario when this may be necessary is when you want to initialize some attribute with a value after the user makes a selection in a drop down. But at the same time you want the user to be able to override the initial value if necessary. The rule that initializes the value based on some other attribute has to be dynamic and for the user to be able to override the initial value you need to make sure that the rule doesn’t run on the server

Don’t check referred

This checkbox controls whether the rule will be recognized as a cross-reference rule. See [Cross-reference Rules](#) for details and the example of a scenario when turning off cross-reference rules might be useful.

Rule Filter Dialog

To invoke the Rule Filter dialog where you can specify which rules will be shown click on the  icon in the toolbar at the top of the table. The following options can be specified:

Rule name

Select this option if you want to view only rules that have the specified text in their names. You must also provide the text to filter by, whether you want the search for the names to be case sensitive and whether you want to match rules with the names exactly equal to the specified text or containing the specified text.

Rule text

Select this option if you want to view only rules that have the specified text anywhere in their textual expression. You must also provide the text to filter by, whether you want the search for this text to be case sensitive and whether you want to match rules with textual expressions exactly equal to the specified text or containing the specified text.

Show auto-generated rules

Select this option if you want to view rules generated by the Configuration Tool automatically. When you define attributes of business objects and notifications (see [Adding/Editing Attributes](#)) the Configuration Tool may generate certain rules behind the scenes. Rules are automatically generated when:

- An attribute has an initial value.
- An attribute has choices.
- The “Value must be provided” option for an attribute is turned on.
- An attribute is “calculated”.
- An attribute has upper or lower limits.

Show rule priorities

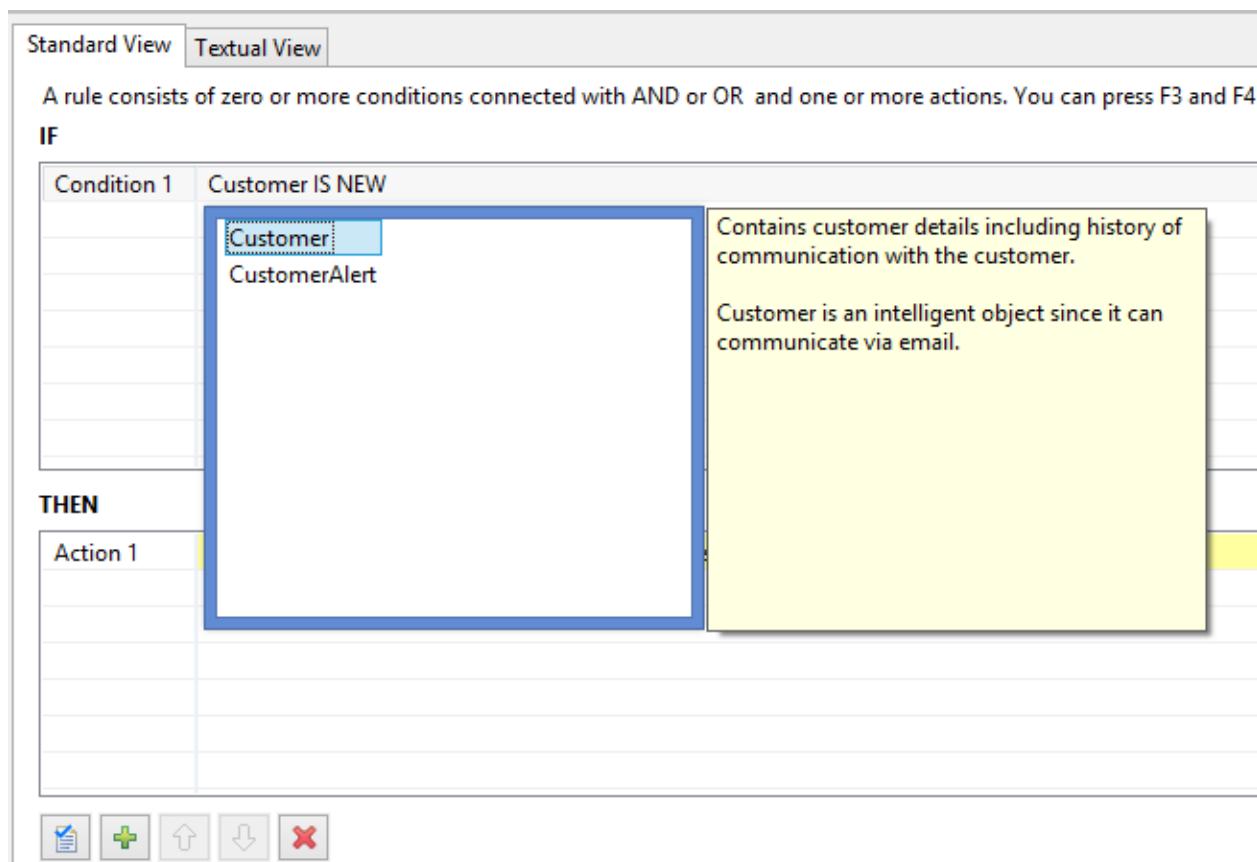
Select this option if you want the table of rules to have a special column that shows rule priorities

Show dynamic rules

Select this option if you want the table of rules to have a special column that shows whether the rule is “dynamic” – see the “Dynamic” property above.

Context Assistant

The Context Assistant is a little pop-up window that helps you enter and edit expressions of the [Rule Language](#). The Context Assistant window comes up when you press F3 while typing text of a rule or tag expression. The Rule Editor with the Context Assistant open is shown on the picture below:



The main window of the Context Assistant contains prompts relevant to the text of the rule expression currently being typed – note on the picture above the current text of the rule expression is “Cu” so the Context Assistant window contains prompts of the existing pre-defined operations and processes starting with “Cu”. The yellow window to the right of the Context Assistant’s prompts window contains the explanation of the prompt selected in the prompts window – the currently selected prompt is the `Customer` object, and so the explanation window contains the description of this object.

The Context Assistant may be very useful if you want to type in the names of business objects, attributes, processes etc without having to leave the rule editor and open the corresponding node in the Elements Tree or the corresponding element editor. The Context Assistant is also a very good help if you are not very familiar with the Rule Language as it automatically suggests the right Rule Language construct when you type in your rule expression. It also has a list of all expressions and pre-defined actions used in the Rule Language as well as the list of all functions (all accompanied by the appropriate explanation).

To use the Context Assistant press F3 while you are typing your Rule Language expression. The Context Assistant will display a list of prompts relevant to your current text. Press the Arrow Down button on the keypad to move to the prompted items in the Context Assistant window. As you are moving between the items the explanation window will show the explanation of the currently selected item (if there is any). To

select the item press Enter – the text of the item will appear in the text of your Rule Language expression. You can also click on a prompt item with a mouse to select it and see its explanation or double click on the item to get it to appear in the text of the expression.

If you press F4 instead of F3 the Context Assistant displayed will have a list of all functions that can be used in rules.

Adding/Editing Processes

The following section describes how to work with the editor of processes when adding a new process or editing an existing one. Processes are described in the [Processes as Links between User Interface and Business Logic section](#).

The editor of processes can be started as described in the [Working with Configuration Elements](#) section. It has two tabs – Action Rules and Failure Rules. Properties of the process are displayed in the Element Properties window. Action and Failure Rules represent rule collections, which can be edited using the Rule Editor For details how to work with the Rule Collection see [Working with Rule Collection Editor](#).

Action rules determine what the process will do (unless the process is implemented by a custom software component – see below). Failure rules determine what happens (if anything) if a process fails. Failure rules are explained in the [Process Failure Rules](#) section.

The following properties can be specified for a process:

Name

Specify the name of the process uniquely identifying it within the business space version. The following restrictions apply:

- The name must start with a character (not digit) or underscore symbol. All other symbols must be characters (including underscore) or digits. Space symbols are not allowed.
- The name must be unique among the names of other processes defined in the business space version.

Description

Specify the description of the process. Providing a description is highly recommended. Any description if defined is included into the generated documentation for the business space version – see [Generating Documentation](#).

Category

You can group processes by category. Processes belonging to a particular category are grouped in the Elements Tree. Enter a new category or select from the list of existing

ones. You can apply the same category to several processes at once if you paste them under this category in the Elements Tree.

Process Input

Click on this property to bring up the “Process Input” dialog and specify business objects and/or business object groups (if any) required by the process.

Instances of the business objects that the process works with may come from two sources:

1. The process itself may look for the instances of the business objects it needs by executing [FIND](#) action of the Rule Language.
2. The instances of the business objects the process needs may be written into the Context just before the process starts (see [Context of Rule Execution](#)) so when the process starts these instances are immediately available for the process to use in its implementation rules. These are the instances of the business objects declared as process input.

To define business objects or business object groups as process input select the objects or groups in the left list box and press the Right arrow button to move the selected objects or groups into the right list box. Similarly if you want to delete certain business objects or groups from the process input select the objects or groups in the right list box and press the Left arrow button to move them into the left list box.

Implementation

The following options are available:

- *Rules* – select this radio button if you will define rules that implement the process (at least one rule must be defined). Use Action Rules tab to define the rules – see [Working with Rule Collection Editor](#).
- *Custom Software Component* – select this radio button if the process is implemented by a piece of code – see “Aware IM Programmer’s Reference”. If you select this option you will also need to provide the fully qualified name of the Java class that implements the process, for example “com.mycompany.MyClass”.

User name

Enter any name that will be displayed to the user to represent a process. Currently only used in the list of active processes or when a process becomes a background process.

Allow cancel

Aware IM will automatically add the Cancel button when a process runs, so that the user can abort the execution of the process. Sometimes it may be necessary to disallow the user to cancel a process. In this case you need to untick this checkbox.

Handles “Forgotten Password” Functionality

Tick this box if you want the process to handle the “forgotten password” functionality. In this case the process will be called when the user clicks on the “Forgot your password”

link on the [login form](#), or if the “forgotten password” URL is invoked directly. The process can ask the user a security question, verify the answer and reset the password or do something else. Note, there can only be one process that handles the “forgotten password” functionality.

Run in the background

If a process takes a long time to execute (such as, for example, large import process or a process handling large queries in batches) it is possible to run such a process in the background. The user will be able to continue working with the system while the process is running in the background. The user will be notified when the process completes or when it requires interaction with the user. Here you can specify a number of seconds that the system has to wait before it starts running the process in the background.

Single tab mode

By default all intermediate process operations are performed in a popup window. For example, consider this process that allows user to create a new object and then redisplays its form for editing:

```
ENTER NEW Object  
VIEW Object
```

The first and all subsequent actions except the last one are considered to be intermediate actions. Depending on the nature of the last action it can be treated as an intermediate one or as the final one. The last action that expects input from the user is still an intermediate action, but if the action just displays the results and does not expect input from the user, it is considered to be the final one. The `VIEW` action does not expect input from the user, so it is the final one in this case. In most cases intermediate actions are displayed in a popup window. The final action is displayed according to the designated output of the process, specified either in a form/query operation or a menu command (depending on where the process is used). You can also specify that intermediate actions be displayed in the current tab rather than a popup window. This option is useful for applications running on a mobile phone where popup windows can be problematic.

Display under

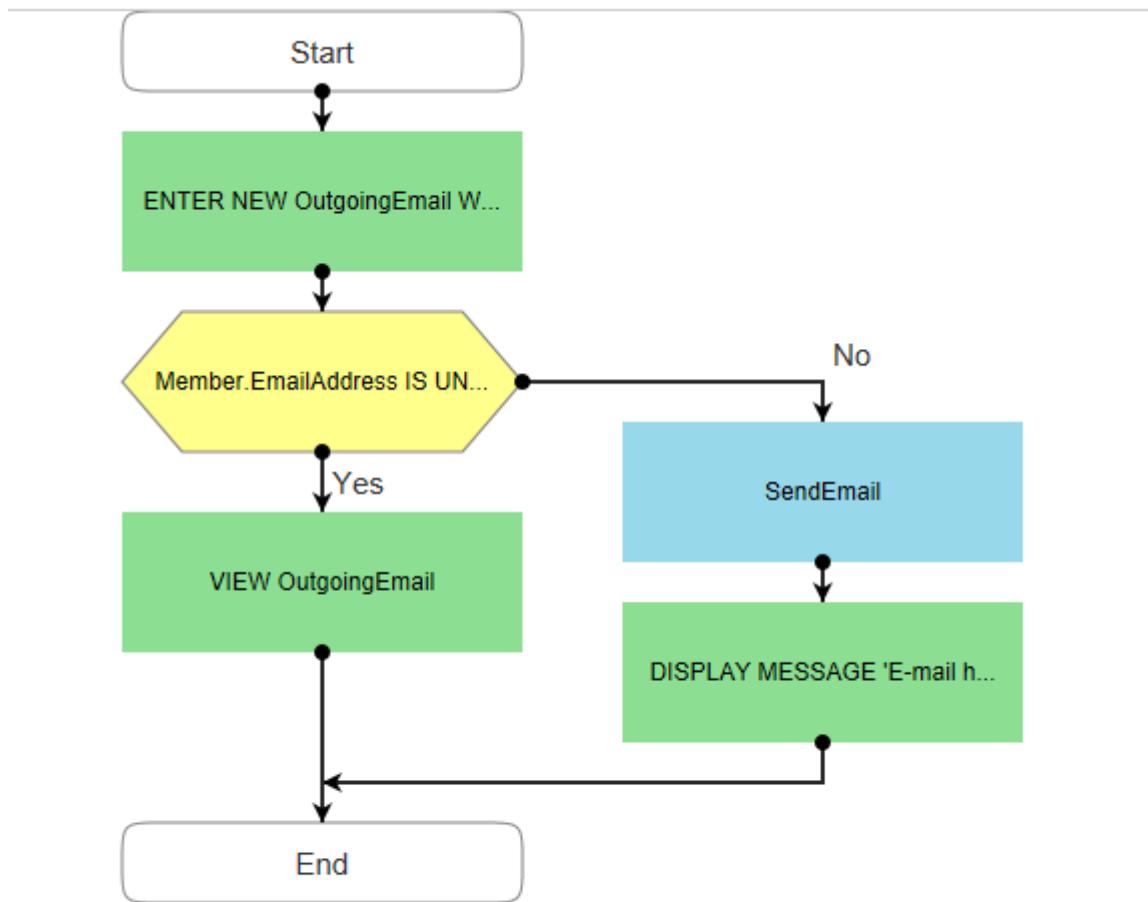
You can get **Aware IM** to display the process node in the Elements Tree under a node of some other process. If you want this select the process under which the current process should be displayed

Isolation level

This property allows specifying database transaction isolation level that will be used when the process executes. Transaction isolation level is an advanced subject and its description is beyond the scope of this document. You can read this article [https://en.wikipedia.org/wiki/Isolation_\(database_systems\)](https://en.wikipedia.org/wiki/Isolation_(database_systems)) for more details. If you don't specify the isolation level, the default level (“read committed”) will be used.

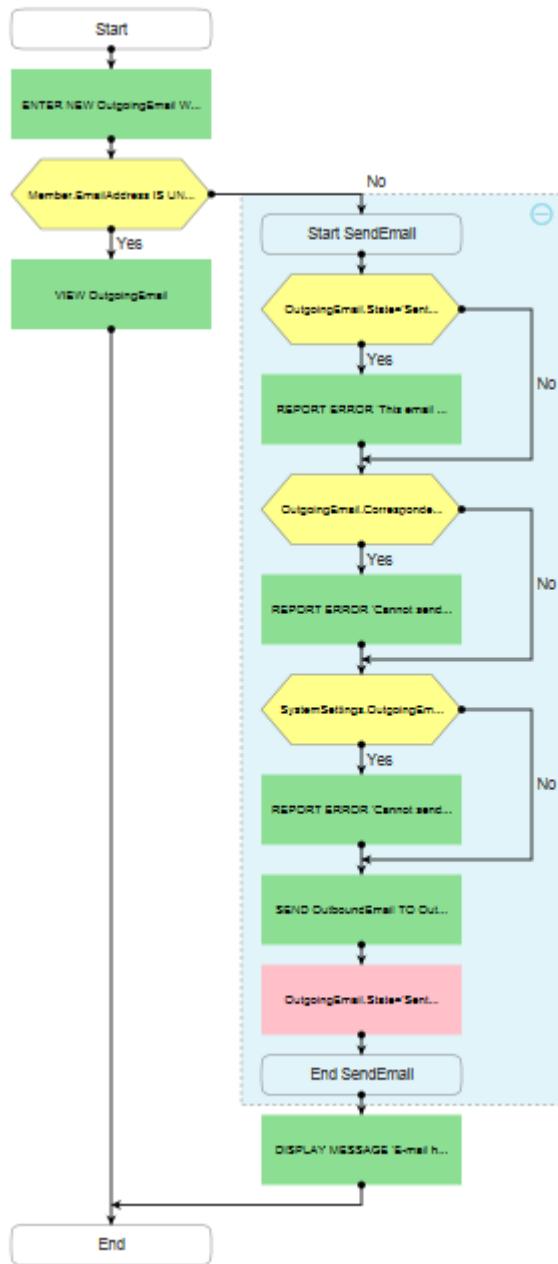
Process Diagrams

If you click on the “Diagram” tab at the bottom of the process editor you will see the flow chart of the process rules as shown on the picture below.



The diagram shows conditions and actions of the rules of the process. You can click on the condition or action and edit it directly on the diagram (the full text of the action or condition is displayed at the bottom of the screen and you can edit it there).

If a process calls another process (sub-process) it is displayed as a blue box on the diagram. You can double click on this box (or click “Expand” at the bottom of the screen) to see the rules of the sub-process on the same diagram as shown on this picture:



To collapse the rules of the sub-process click on the “-“ icon in the top right corner of the sub-process. You can also move actions and conditions around by pressing the arrow buttons in the toolbar and customize the appearance of the diagram by pressing the “Settings” button on the toolbar.

Adding/Editing Business Object Groups

The following section describes how to work with the editor of business object groups when adding a new group or editing an existing one. Business object groups are described in the [Business Object Groups](#) section.

The editor of business object groups can be started as described in [Working with Configuration Elements](#). The following properties of a business object group must be specified:

Name

Specify the name of the business object group uniquely identifying it within the business space version. The following restrictions apply:

- a. The name must start with a character (not digit) or underscore symbol. All other symbols in the name must be either characters (including underscore symbol) or digits. No spaces or special symbols are allowed.
- b. The name must be unique among the names of other business objects, business object groups and notifications.
- c. The name cannot start with one of the instance prefixes – This, That, Added, Removed, LoggedIn or Changed.
- d. The name cannot be one of the reserved names – File, Day, Question, EmailSender, ReceivedEmail, IncomingEmail.
- e. The name must not be the name of the basic attribute types – Number, Date, Duration, Timestamp, Shortcut, Document or Picture.

Description

Specify a description of the business object group. Providing a description is highly recommended. Any description if defined is included into the generated documentation for the business space version – see [Generating Documentation](#).

Group Members

These are business objects that the group contains. At least one business object must be defined (most business object groups will have at least two members). To define business objects as group members select the objects in the left list box containing all business objects defined in the business space version (you can use SHIFT and CONTROL keys to select multiple objects) and press the Right arrow button to move the selected objects into the right list box. Similarly if you want to delete certain business objects select the objects in the right list box and press the Left arrow button to move them into the left list box.

Presentations

Presentations can be defined to provide a custom layout of the attributes of a business object group members when the instance(s) of the group's members are displayed by a query or by a process. The presentation concept for a business object group is exactly

the same as the one for a business object. The presentation defined for a business object group applies to all members of the group. See [Defining Presentations](#) for details.

Adding/Editing Queries

The following section describes how to work with the editor of queries when adding a new query or editing an existing one. Queries are used in the Operation Mode to search the system's data for instances of some business object or business object group that match some condition(s). Queries can be run by the user or used by [FIND](#), [PICK FROM EXEC_SP](#) or [DISPLAY](#) actions of the Rule Language. See also [Configuring Queries](#).

The editor of queries can be started as described in the [Working with Configuration Elements](#) section. It contains 2 tabs – the Standard View and the Textual View. The tabs represent different ways of specifying a query.

- The Standard View tab provides a convenient user interface for specifying query conditions. However, not all queries can be specified using the Standard View. See also [Specifying Query Using Standard View](#).
- Where it is not possible to specify a query using the Standard View it is possible to specify a query using the Textual View. The Textual View tab allows entering the [FIND](#) or the [EXEC SP](#) actions of the Rule Language. See [Specifying Query Using Textual View](#).

The preview of how the query will look like in the browser is displayed underneath the query editor. Any changes you make to the query are immediately reflected in the preview. You can turn embedded preview on or off by clicking on the  icon in the toolbar above the query editor. The settings of the preview (such as the theme used and font size) can be specified by clicking on the  icon. To see query preview in the standalone browser click on the  icon.

To apply a particular presentation style to a query, select the  icon in the toolbar. For more details about styles see [Form and Grid Styles](#) section.

The following properties of a query can be specified:

Name

Specify the name of the query uniquely identifying it within the business space version. The name must be unique among the names of other queries defined in the business space version. Any symbols (including spaces) are allowed.

Category

You can group queries by category. Queries belonging to a particular category are grouped in the Elements Tree. Enter a new category or select from the list of existing

ones. You can apply the same category to several queries at once if you paste them under this category in the Elements Tree.

Description

Specify a description of the query. Any description if defined is included into the generated documentation for the business space version – see [Generating Documentation..](#)

Panel Operations

The buttons will be displayed at the top, bottom, left or right of the query. Alternatively they can be temporarily added to the application menu or put in the “tools area” of the panel header. The menu will allow users to perform certain operations from the query – start a process, display a document and so on. The concept is very similar to the [panel operations of the form](#).

Some specific operations available for queries include Exporting query results in CSV, XLSX and PDF formats.

Panel Header

This is exactly the same as defining [panel header for object forms](#).

Item Display Rules

Specify conditions for displaying entries in the results table in different colors and font styles (this is similar to defining item rules for references – see “[Item Display Rules](#)”).

Auto Refresh

Aware IM will automatically refresh query results whenever an object shown in query results is modified, or when a process invoked by a query operation completes. Sometimes it may be necessary to refresh the query results screen after some other object is modified or some other process completes. The “Auto-Refresh” options allow you to specify such objects and/or processes as well as define a time interval for periodic automatic refresh.

Resizing

Click on the “Resizing” property to allow/disallow the user to resize the query results panel at run time and/or specify size constraints. The Resizing Options dialog will be displayed. Tick the “Resize Width” checkbox to allow user to change width of the panel; tick the “Resize Height” checkbox to allow user to change the height. Specifying size constraints can be useful if your application is displayed on different screen sizes and resolutions. For example, if you specify min. width scroll bars will be displayed on small screens, but not on the large ones.

CSS style and CSS class

Here you can assign CSS style and class to the query to customise its appearance. See the “How to use CSS” section in the How To Guide for more details.

Tour

The “Tour” feature allows configurators to add explanation to the elements of the query results screen, so that the user can understand the screen better. The explanation of the element is displayed to the user at the bottom of the screen with the marker pointing to the element of the screen being displayed. The user can jump between the elements of the screen and Aware IM automatically scrolls to the element being explained and displays the marker for the element. For more details about tours see the “How to use the Screen Tour feature” in the How To Guide.

Script

For users who are familiar with Javascript this dialog allows specifying additional parameters when queries are initialized and displayed. See Programmers Reference Guide for more details.

Displaying Query Results

The “Display As” property of the query determines how the instances of business objects found by the query are displayed in the Operation Mode. When you click on this property the “Display Query Results” dialog is displayed. You have to select the radio button indicating how the query will be presented (“Standard Grid”, “Custom”, “Chart” and so on) and then define settings specific to each type of the presentation. Sometimes these settings are specified in the dialog and sometimes you can define query properties in the Element Properties window that are specific to a particular type of query presentation.

Standard Grid

Select this option if you want **Aware IM** to display the found instances in a standard manner where every instance is displayed as a row in a table – see [Standard Form of Query Results](#).

If you select this option you can also specify the following:

Attributes to display

You can specify which attributes of the business object or group will be displayed in the table. To do this tick the checkbox next to the required attributes. Use the Up and Down arrow buttons to change the order in which attribute values will be displayed on the standard screen. You can also specify how the attribute will be displayed – the value of the attribute only, the value and icon or the icon only. Icons are displayed according to presentation rules for icon elements – see [Common Properties](#). You can also specify width of each column in pixels or percents (to specify width in percents add % symbol, for example 50%), column alignment and whether or not the attribute will be editable (provided “Inline editing” checkbox is ticked – see below).

The dialog displayed when you click the “Edit...” button allows you to specify the following additional properties of the column:

- Column Label – the default label for the column is the one defined for the attribute, but you can override this value and provide query-specific label
- Display format – you can specify query-specific format of the attribute display. For example, you can define a dollar symbol in front of the number - #\$#.00
- ID – you can define a unique id of the column to be used in the Tour feature

- Use Attribute Styles – if an attribute has presentation rules for STYLE elements (see [Common Properties](#)) you can get the query to display the attribute with these styles
- Lock - lock a particular column of the grid so that it is always displayed on the screen even when you scroll the screen
- Column Display – you can hide certain columns initially (with or without conditions). The user can then turn the display of the column on if necessary (Column Menu must be turned on for the grid)
- Screen Responsiveness – these options help to make the grid responsive to screen size changes. You can turn visibility of the column on or off depending on the available screen size. You can also make the column bigger or smaller.
- Column Grouping – you can group a number of column headers under a certain name. When you select the same group name to a number of columns all columns with the same name will be displayed under the header with this group name (see the picture below)
- Summary - you can specify a “summary” that will be displayed at the bottom of the grid for this column. This could be useful when, for example, you want to calculate a sum total of values displayed by the query and display it at the bottom of the table. When entering a summary you can use expressions in tags and HTML. For example, the following summary will display sum total of account balances found by a query in bold and right aligned:

```
<p align='right'><b>Total balance: <<SUM  
Account.Balance>></b></p>
```

Company Name	Contact Info		Location	
	Contact Title	Contact Name	Country	City
Alfreds Futterkiste	Sales Representative	Maria Anders	Germany	Berlin
Ana Trujillo Emparedados y helados	Owner	Ana Trujillo	Mexico	México D.F.
Antonio Moreno Taquería	Owner	Antonio Moreno	Mexico	México D.F.

 **TIP:** If you want to display values of attributes of the referred instances you will need to define shortcut attributes that refer to the required attributes – see [Reference Attributes](#) and [Setting Properties of Shortcut Attributes](#).

Calculated columns

You can define “pseudo” columns that will only be used to display calculations based on the values of other columns. If the calculation is only displayed in a particular query you don’t need to go through the trouble of defining a special calculated attribute and a rule to calculate this attribute. Instead you can just define a calculated column in the query. This technique is also much more efficient performance-wise, as the calculations will be embedded inside the SQL that is generated when the query runs. To do this you need to click on the “Add Calculation” link above the table of displayed attributes. You should then provide the name of the pseudo column (has to be unique among all other displayed columns) and the calculation to perform, for example: Obj.Attr1 + Obj.Attr2

Operations with records

You can also define operations that the user can invoke with the instances of the business object shown in query results. The operation types are exactly the same as those that can be invoked from a form of a business object (see [Adding/Editing Form Operations](#)). Each operation is represented as a hyperlink that the user can click to invoke the operation. Operations defined here will be located next to the query items. One of the operations can be designated as a *default* operation. The default operation will be executed if the user clicks anywhere on the row of data – not only on the icon representing the operation.

Items per Page

Specify the number of instances to display on each page (if there are more instances found by the query than the specified number, other instances may be navigated to using the traversal buttons automatically generated in the standard query results screen).

NOTE: If you select Unlimited as number items per page the query will be displayed without any paging at all. The user will be able to scroll through very large sets of data without having to list the pages. Aware IM will automatically download the required data from the server during scrolling.

Width, Height

Specify the width and height of the query results table in pixels. If you do not specify any values the results table will occupy all available width and the height will be calculated automatically.

Stretch to the bottom of the screen

If this option is selected Aware IM will automatically stretch the grid showing query results, so that its paging bar is aligned with the bottom of the screen.

Allow inline editing

Tick this box if you want to enable user to modify the instances of the objects found by the query directly in the table. This is similar to inline editing of references.

Use popup editor

This option is only available if inline editing is on. There are two ways inline editing can be done – using the standard editor and using the popup editor. The standard editor lets you edit each cell individually while the popup editor displays a popup window for the entire row. With the standard editor changes are saved after the user leaves the current cell and with the popup editor the changes are saved only when the user clicks on the Update button for the entire row.

Number rows

Tick this box to show item numbers next to each row

Show column menu

If you tick this checkbox each column header in the table will have a button that allows user to hide/show certain columns.

Show paging bar

If you tick this checkbox paging bar is displayed for the table. You can further control how paging bar is displayed if you click on the More... button

Display paging bar only when necessary

If you tick this checkbox paging bar will be displayed only if query results have multiple pages ("Show paging bar" checkbox must be ticked)

Select first record

If you tick this checkbox the first record in the table will be selected when the table is displayed. Using this option is especially useful if you also define a *default* item operation for the query. In this case this operation will be automatically executed for the first record when the query is displayed.

Show previous and next buttons/Show buttons with page numbers/Show input control to enter page number to navigate to/Allow user selecting size of the page returned by the query (from the More dialog)

These are all different options of the pagebar control. Their meaning is self-explanatory.

Fetch records for all pages at once (More dialog)

If you tick this checkbox **Aware IM** will display all records found by the query on a single page – no matter how many there are. This option is especially useful for the offline mode. If the user wants to edit records before he goes offline he can load all records while the connection with the server is still available. Thus paging will not be necessary while offline because paging requires connection with the server. See the “How to support offline mode” section in the How To Guide for more details about the offline mode.

Mobile style rendering of inline edits and filtering on mobile devices

If screen real estate is limited **Aware IM** can use a different user interface for inline editing and filters. This option should be turned on if the query with inline editing and/or filtering is to be used on mobile phones.

There are also some properties specific to the Standard presentation available in the Element Properties window for the query:

Filters

Click on this property to show one or more text boxes above the query results table (see the picture – note the text boxes under the First Name and Last Name columns). If the user enters the value into the text box and presses Enter the query results will be filtered according to the entered value..

		First Name	Last Name	
		<input type="text"/>	<input type="text"/>	
	Jane	Allison		
	James	Blake		
	Robert	Broom		
	William	Cooper		
<input type="button" value=" <"/> <input type="button" value="<"/> <input type="button" value="1"/> <input type="button" value=">"/> <input type="button" value="> "/>				

You can select from the following sub-options:

Show filter button in the corresponding column header

Rather than displaying a text box in a separate row as on the picture above selecting this option will only display a filter button in the column header. The user can click on the button and choose various filtering options.

Show filters as a separate row at the top of the grid

This shows text boxes in a separate row as shown on the picture above but does not include the filter button next to the text box. The user can only filter using the text boxes.

Show filters both in the column header and in a separate row

This option is shown on the picture above. The filters are displayed in a separate row and the user can filter both by using text boxes and also the filter button next to the text box.

Filter attributes

You can select which attributes will be filterable. For those that are not **Aware IM** will not display the filter button and/or filter text box.

Grouping

Click this property to group displayed instances based on the specified attribute. All instances with the same value of the attribute will be displayed together. It will be possible to expand and collapse the node with these values (see the picture below – on this picture issues are grouped based on the value of the “Status” attribute).

Type	Num...	Title	Priority	Opened On	Assigned To
<input checked="" type="checkbox"/> Open (10 Items)					
Bug	00026	Change HTML of the splash screen	Low	01/31/2016 00:00	Sam Trevor
Bug	00024	Show Stopper: Loan calculator is broken	Critical	01/31/2016 00:00	Sam Trevor
Bug	00023	Refresh of grids does not work	High	01/31/2016 00:00	Sam Trevor
Task	00022	New version: add support for radar charts	Normal	01/30/2016 00:00	Sam Trevor
Task	00021	New version: add support for gauge charts	Normal	01/30/2016 00:00	Sam Trevor
Task	00020	New version: add support for summary colu...	Normal	01/30/2016 00:00	Sam Trevor
Task	00019	New version: add support for background color	Normal	01/30/2016 00:00	Sam Trevor
Task	00018	New version: add support for slider fields	Normal	01/29/2016 00:00	Sam Trevor
Task	00014	Improve curve generation algorithm	Normal	01/11/2016 00:00	Sam Trevor
Bug	00025	Refresh of grids does not work	High	01/31/2016 00:00	Sam Trevor
<input type="checkbox"/> Closed (10 Items)					
Task	00007	Implement path calculation	Normal	01/03/2016 00:00	Sam Trevor
Duplicate	00016	Type in the startup screen	Low	01/13/2016 00:00	Sam Trevor
<input type="button" value="◀"/>	<input type="button" value="◀"/>	<input checked="" type="button" value="1"/>	<input type="button" value="2"/>	<input type="button" value="▶"/>	<input type="button" value="▶"/>
1-20 of 26					<input type="button" value="⟳"/>

You can also optionally display a summary for each group. Usually this applies to number attributes. For example, if your query displays account balances you can display sub-total of balances per each group. The style of the summary can be specified in the Presentation column. You can refer to the value of the summary using the {Value} construct, for example: Total balance in a group is {Value}

Expansion of rows

Clicking on this property allows you to specify what happens when the row in the grid is expanded (if anything). The following options are available:

Do not allow expansion of grid rows

This is the default option. The user cannot expand rows

Show values of attributes using template

If this option is selected **Aware IM** will show the specified HTML template. Usually you would display values of attributes (some long text, for example) here, such as on the picture below that shows the HTML message of the email communication:

		First Name	Last Name	Contact Time	Subject		
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Francis	McDougal	06/01/2017 10:25	Support call reply		
Message: Reported the solution back to the customer. Problem resolved.							
▶	<input type="checkbox"/>	Jane	Allison	03/02/2016 09:00	Support call		
▶	<input type="checkbox"/>	Rosemary	Flint	12/02/2015 13:20	Support call reply		
▶	<input type="checkbox"/>	Leo	Crawford	11/01/2015 14:10	Support call reply		
▶	<input type="checkbox"/>	Rosemary	Flint	10/01/2015 11:15	Support call reply		
▶	<input type="checkbox"/>	Mary	Lewis	10/01/2015 11:15	Support call reply		
▶	<input type="checkbox"/>	Francis	McDougal	10/01/2015 11:15	Support call reply		

Show results of the operation below

When this option is selected Aware IM will execute the specified operation when the row is expanded. This is a really powerful option that allows you to define forms inside grids, related grids (grid hierarchy and so on). The picture below shows the form of the customer whose record has been expanded:

	Number	First Name	Last Name	Date Of Birth	Address	
	000001	Jane	Allison	12/10/1973	321 Ninth Street Gadsden ...	
	000007	James	Blake	08/08/1966	15731 Gilbert Chandler AZ...	
<input type="checkbox"/>	000020	Robert	Broom	06/06/1972	624 Prairie St Augusta IL 6...	

Robert Broom

Main Communication Alerts Signature

Number: 000020

First Name:* Robert

Last Name:* Broom

New email **New letter** **New note** **New alert**

1 - 25 of 27 items

Reordering

Clicking on this property allows you to enable users to reorder items in the table. This is explained in detail in the “How to implement Item Reordering” section of the “How To” Guide.

When mouse over record

This dialog allows you to specify what happens when the user hovers the mouse over the record in the query results table. There is an option to display a short summary of the record that displays not only attributes already shown by the query but also attributes not shown initially.

Custom Presentation

Select the Custom radio button on the “Display Query Results” dialog if you want the results of the query to be presented in a custom manner. There are two alternative ways of using the custom presentation:

1. Use a presentation of the business object or business object group that the query is looking for – see [Defining Presentations](#). The results of the query will be displayed according to this presentation. To use this option you need to select the “Display Presentation” radio button and then select the presentation you want in the “Presentation” combo box.
2. Provide an HTML code that will display the data returned by the query (called *data template*). The rest of this section will be describing this approach, as it is very powerful and versatile.

If you want to display query results using an HTML template, you need to select the “Display custom data template” radio button and then provide the HTML code or select from the list of predefined templates. The HTML code is displayed for every row of data that the query returns.

Within the body of your HTML code you can refer to the attributes being displayed by the query. The name of the attribute must be enclosed in curly brackets, for example, {Subject}.

Below you will find an HTML fragment from the Sales Portal sample application that displays query results of an object that has FirstName, LastName, Title and Photo attributes.:

```
<div class="nwd-employee">
  <div class="nwd-employee-wrapper">
    <div class="nwd-employee-list-image">
      {Photo}
    </div>
    <dl class="nwd-employee-list-details">
      <dt class="nwd-employee-name">{FirstName} {LastName}</dt>
      <dd class="nwd-employee-title">{Title}</dd>
    </dl>
  </div>
</div>
```

The result is shown on the picture below:

TEAM MEMBERS



Andrew Fuller
VICE PRESIDENT, SALES



Anne Dodsworth
SALES REPRESENTATIVE



Janet Leverling
SALES REPRESENTATIVE

The following options are available:

Use custom data template

If this option is selected you can specify any HTML fragment you like – depending on your CSS styles it will be displayed either as a vertical list as in the picture above or as a horizontal list.

With this template you can some options from the standard presentation, such as paging bar and automatic selection of the first record.

Here you can also tick the “Display mobile scroll view” option. This option is especially useful for mobile phones. If this option is selected **Aware IM** will show the template of one record at a time and the user will be able to swipe back and forth to the next/previous record.

Use custom mobile template

This template is displayed by a different widget compared to the first option. This widget can only display vertical lists but it also supports certain features not available if you select the first option.

The features specifically supported by this widget are

- infinite scrolling
- Grouping of items based on the value of some attribute (if “Support item grouping” checkbox is ticked)
- Ability to fix the grouping headers during scrolling (if “Fixed headers” checkbox is ticked)
- Item operations assigned to a single button (if item operations are defined using the Menu button)
- Simple filtering (if Filters are defined using the Menu button)
- Multiple selection using checkboxes

This template is especially useful for mobile phones. The picture below shows an example of such template with grouping and operation button:

The screenshot shows a contact list interface with a search bar at the top. Below the search bar, the contacts are grouped by initial:

- A**: Jane Allison (janec@hotmail.com), 12 contacts. Contact photo: woman with glasses smiling.
- B**: James Blake (jamesb@gmail.com), 8 contacts. Contact photo: man smiling.
- C**: Robert Broom (robb@gmail.com), 8 contacts. Contact photo: man with grey hair and beard.
- C**: Leo Crawford (leoc@gmail.com), 9 contacts. Contact photo: man talking on a phone.

Each contact entry includes a checkbox icon, a contact photo, the contact's name, their email address, and the number of contacts associated with them. To the right of each entry is a small square button with three horizontal lines, likely a menu or edit button.

The following properties specific to the custom presentation of query results are available in the Element Properties window of the query:

Operations with items

For non-mobile templates operations are displayed in the context menu when the user clicks on an item with the right mouse button). Default operation is performed when an item is clicked. For mobile templates all item operations are assigned to a button (you

can control the icon displayed for this button). When the user taps this button a popup menu with operations is displayed.

Filters

For non-mobile templates filters are displayed as text boxes – either in the toolbar at the top, bottom or inside the default panel header of the query. For mobile templates only a single filter can be displayed at the top of the query.

Calendar/Scheduler Presentation

Select this “Calendar” radio button on the “Display Query Results” dialog if you want the results of the query to be presented in a calendar-like fashion (see [Calendar Form of Query Results](#)). You can only specify this option if a query queries on object of the [Appointment](#) type. You can specify the following options:

Width/Height

Width and height of the calendar/scheduler in pixels

Stretch to the bottom of the screen

If this is ticked the height of the calendar will be automatically calculated to occupy the entire screen

Working Day Starts (Finishes) At

Specify the time when working day starts and finishes. All hours outside of this range will be shaded.

List of views

You can specify which views will be shown on the calendar/scheduler. The user will be able to switch between the selected views at runtime

Default view

Specify the view of the calendar that will be shown when the calendar is displayed.

Major tick interval

This option is valid for “Day” and “Week” views only. It specifies the duration of the main time interval in these views in minutes (an hour by default)

Minor ticks

This option is valid for “Day”, “Week” and “Timeline” views only. It specifies the number of “ticks” for the main time interval (major tick)

Date format

Format of dates displayed in the view

Major time format

Format of time displayed for the main time interval of the view

Minor time format

Format of time displayed for the minor ticks of the view

Creating and Editing Appointments

Choose between 3 options:

Popup editing

When this option is selected **Aware IM** will open a predefined popup form for the Appointment object. Note that this form will be created by **Aware IM** on the fly – it WILL NOT use any of the forms that you have defined for the object. This is useful when you are working with the calendar in the offline mode since **Aware IM** does not have to ask the server for the layout of the form. You can, however, select which attributes will be displayed on the popup form by clicking on the “Attributes to edit” button. See the “How to support offline mode” section in the How To Guide for more details about the offline mode.

Process

Select this option if you do not need to support the offline mode and you want to fully control the layout of your form. The creation process is supposed to create the Appointment object using any of its forms (and possibly do something else as well). The editing process is supposed to take the Appointment object as input and edit the object using any of its forms (and possibly do something else as well)

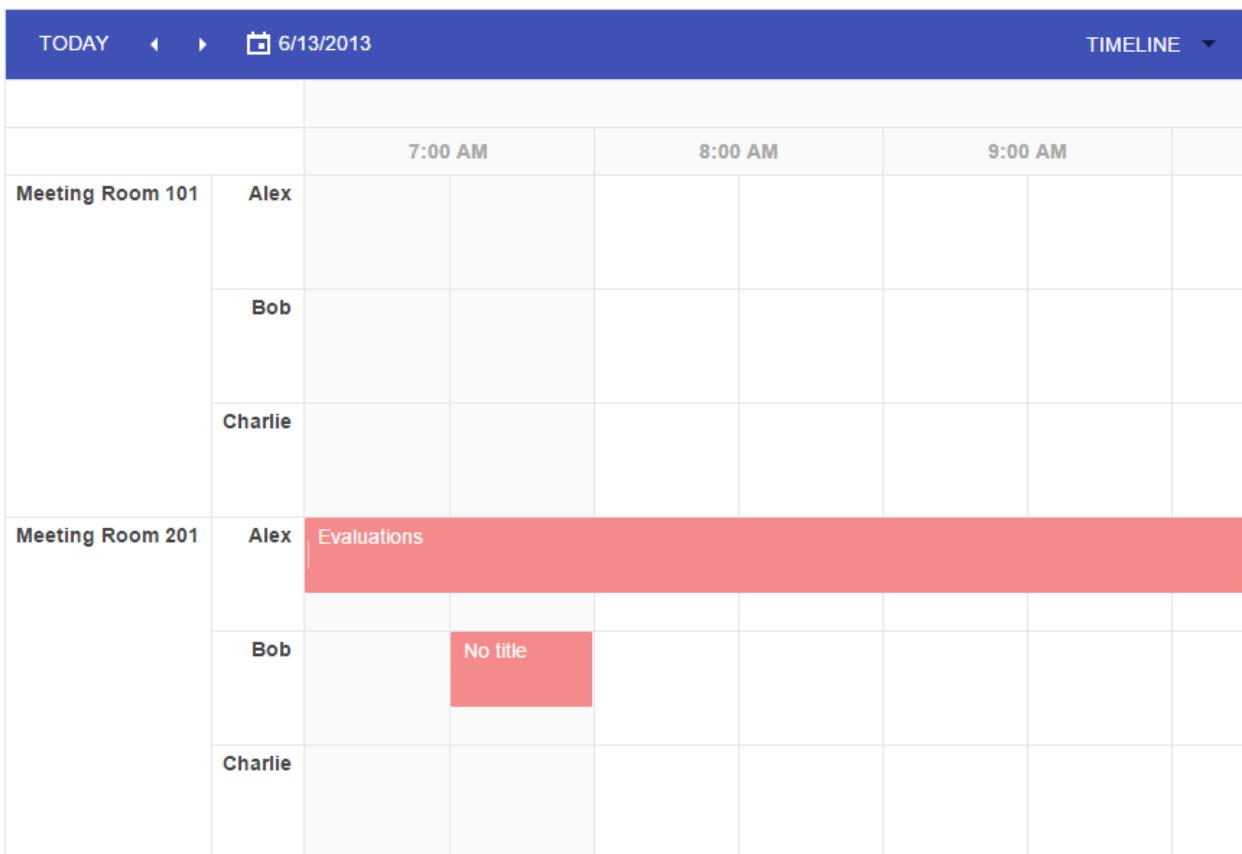
Not allowed

Selecting this option will disable creation and/or editing of appointments

Resources for timeline views

Timeline views show appointments allocated to “resources” – for example, day or week schedule for a particular person(s). “Resources” must be represented as reference attributes of the Appointments object shown on the scheduler. For example, if an appointment is for a particular staff member there must be a reference attribute that links the Appointment with this staff member. At run time Aware IM will show all appointments of a particular staff member on one timeline and all appointments of another staff member – on another timeline. So you just need to provide a reference attribute that links appointments with its resources.

You can provide up to two different resources. For example, you may show meetings of a company per room and per staff member as shown on the picture below. Here each appointment has two reference attributes – one for the staff member and one for the room:



Other Settings dialog:

The following options are available after you click on the Other Settings dialog:

Vertical orientation

Tick this option to display calendar/scheduler in the vertical orientation – with days on the left rather than at the top

Allow moving events/resizing appointments

Tick these options to allow user to move and resize appointments on the calendar/scheduler

Allow deleting appointments

If this option is selected **Aware IM** will display a little icon that allows user to delete the appointment.

Show working hours only

If this option is selected **Aware IM** will only show working hours as specified by the Working Day Starts At/Ends At values. Other hours will not be shown.

Fetch all calendar records at once

If this option is selected **Aware IM** will get ALL appointments of the calendar from the server when the calendar is displayed. Otherwise, it will only get appointments for the current page displayed by the calendar and other appointments will be retrieved only when the user moves to the next or previous page. The latter delivers better performance but is not suitable in the offline mode when there is no connection with the server. Therefore, this option is only recommended for the offline mode. See the “How to support offline mode” section in the How To Guide for more details about the offline mode.

Mobile style rendering on mobile devices

If screen real estate is limited **Aware IM** can use a slightly different user interface for the calendar/scheduler. This option should be turned on if the calendar/scheduler is to be used on mobile phones.

First Day of the Week

Specify the day that the week should start with.

Row Height

Height of the calendar row.

Column Width

Width of the calendar column

Starting Date

These options specify which date the calendar/scheduler should show the appointments for when it is first displayed. You can specify the current date, the date of the first record found by the query or a specific date.

Operations for the context menu

Here you can define operations that will be shown on a popup menu when the user presses right mouse button on some appointment in the calendar. The selected appointment will be placed in the Context of the operation.

Panel Operations property (Element Properties window)

Most panel operations are similar to the ones described in the [Adding/Editing Panel Operations](#) section. However, there are some operations specific to the calendar/scheduler – these are described below.

Synchronization with Calendar

Select this operation if you want your users to be able to synchronize their **Aware IM** calendar with a third-party Calendar (Google, Outlook, Exchange and others – see full list of supported calendars here: <https://www.cronofy.com/>). When the **Aware IM** calendar is displayed it will show a button that will allow users to synchronize their calendar using either one-way (from a third-party calendar to the **Aware IM** calendar or the other way around) or two-way synchronization.

For more details about this please see the How To Guide

Synchronization with Google Calendar

Select this operation if you want your users to be able to synchronize their **Aware IM** calendar with the Google Calendar. When the **Aware IM** calendar is displayed it will show a button that will allow users to synchronize their calendar using either one-way (from Google Calendar to the **Aware IM** calendar or the other way around) or two-way synchronization.

You also need to register your **Aware IM** application with Google and specify your client id and secret by clicking on the Settings button next to the checkbox. For more details see the How To Guide.

 **NOTE:** Synchronization with the Google calendar has been superceeded with the Synchronization with a third-party calendar using Cronofy API – see the “Syncornization with Calendar” section above. For more details see the How To Guide.

Import/export from/to iCal files

Select these operations if you want to import files in the ICS format (iCal) into your **Aware IM** calendar or export files in this format from your **Aware IM** calendar. This can be useful if you want to exchange calendar contents with other popular calendar programs such as MS Outlook and others.

Export to PDF

This operation exports the calendar in the PDF format

Chart Presentation

Select the “Chart” radio button on the “Display Query Results” dialog if you want the results of the query to be presented as a chart. The chart will display the value of a certain attribute of the business object the query is looking for on the X-axis and the value of another attribute on the Y-axis. Thus, instances of the business object returned by the query will supply data for the chart. The following options are available when displaying the query results as a chart:

Width/Height

Width and height of the chart in pixels

Stretch to the bottom of the screen

If this is ticked the height of the chart will be automatically calculated to occupy the entire screen

Show chart title

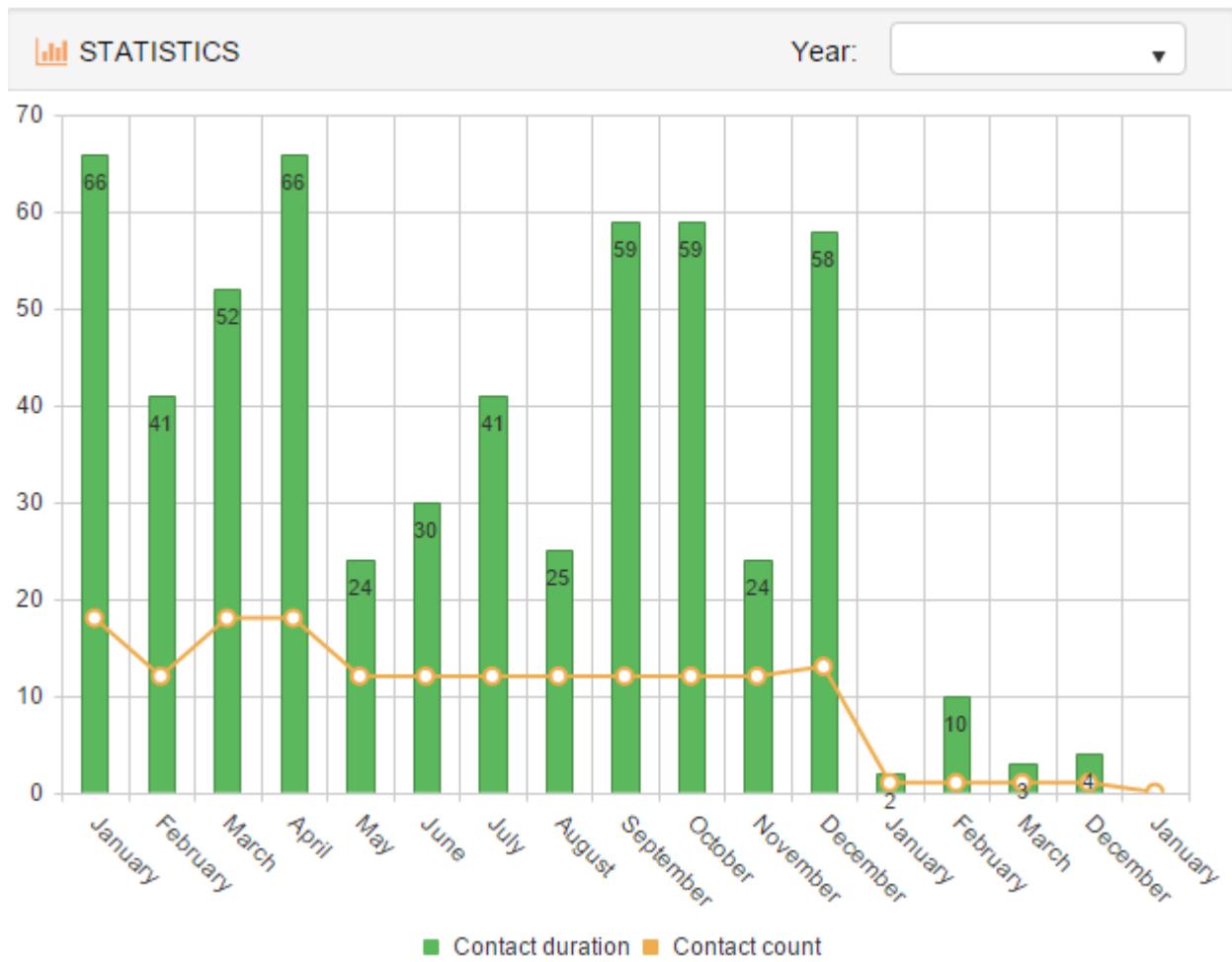
If this option is ticked the title of the chart will be displayed at the top or bottom of the chart. You can also select the font with which the title will be displayed.

Chart Type

Select the type of the chart – Standard, Pie, Donut or Radar.

Standard chart

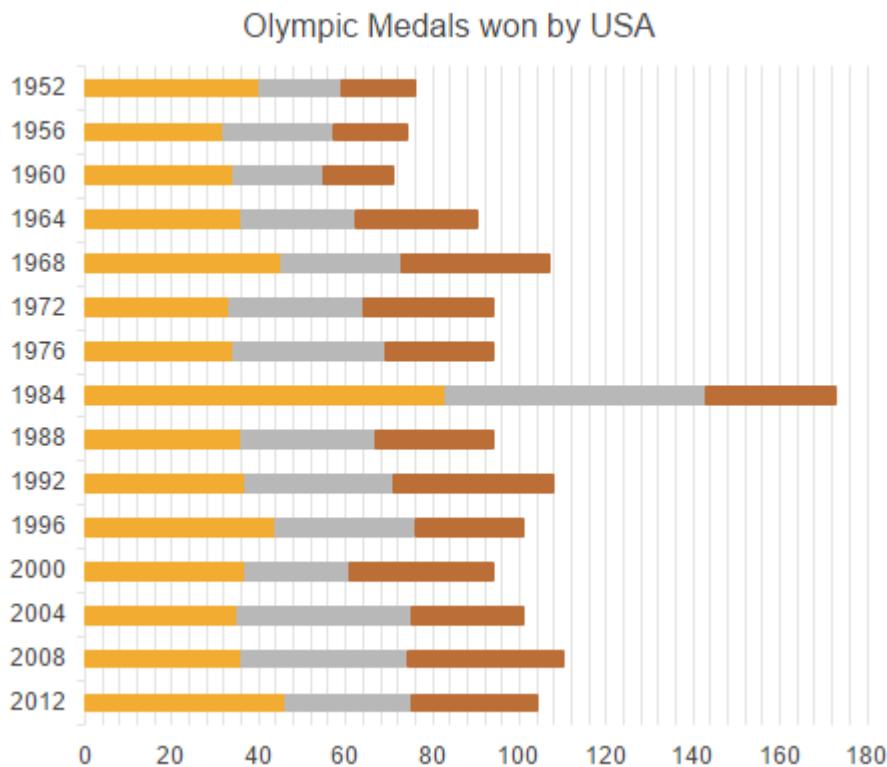
The “Standard” chart includes Bar and Line charts. You can define several series of bars and lines displayed on the single chart. The picture below shows a chart with two series – one bar and one line.



When you select the Standard chart you have to define the attribute shown on the X axis and then define one or more series displayed on the chart. For each series you have to select Bar or Line type and then define the attribute that will be shown on the Y axis for this series. You can also specify the color of the series here.

You can add and delete series by clicking the Add and Delete button. Clicking on the Edit button allows you to specify additional options for the selected series:

- Invisibility condition – a condition when the series is not displayed. You can use tag expressions that refer to the object shown by the chart
- Label – whether or not labels will be displayed for the series and where. Labels display Y values shown by the chart. On the picture above the green bar series includes labels shown “inside” the bars
- Stacked bars – if this is ticked bars are stacked on top of each other (see below)

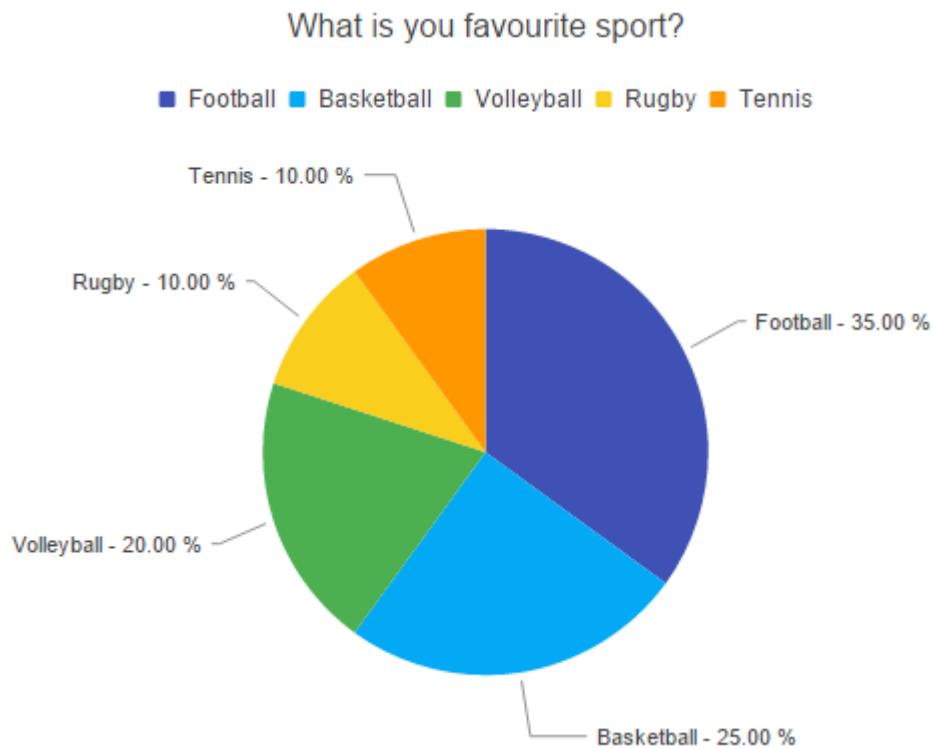


- Flip X and Y axis- if ticked X and Y axis are flipped as on the stacked bars picture above
- Opacity – opacity of the bar as a number between 0 and 1
- Gap – distance between bars of the same series as percentage of the bar width
- Spacing – distance between bars of the different series as percentage of the bar width
- Display format – a format with which numbers of the Y axis are displayed. This allows you to override the number format defined for the attribute itself.
- Aggregate function – **Aware IM** can aggregate different Y values for the same X value. For example, if a chart shows sales records for different people, **Aware IM** can aggregate all sales values for the same person and display just an aggregate value on the chart. In addition, if X-axis of the series represents a date, **Aware IM** can automatically aggregate values even if dates are different. Whether two different dates are considered the same depends on the value of the “Base Unit” specified for the X axis. For example, if the value is MONTHS, then all dates belonging to the same month of the same year are considered equal and are aggregated.. The aggregation feature often frees up developer from performing aggregate calculations using rules (and possibly storing the results in some intermediate object to be shown on the chart instead of the original object)
- Show markers, dashed and smooth line, line width – various self explanatory options of the Line series

Note that it is possible to display additional series on the chart using the criteria defined by an additional attribute. Consider a scenario when you have to display product sales per month. The X axis displays a month and Y axis – total number of sales for the month. However, you also want to display sales per product where each product is represented by its own series. In this case you will define one series with Y attribute representing sales quantity and you will also select the “additional” attribute – a reference to the product as an “alternative” method for defining series.

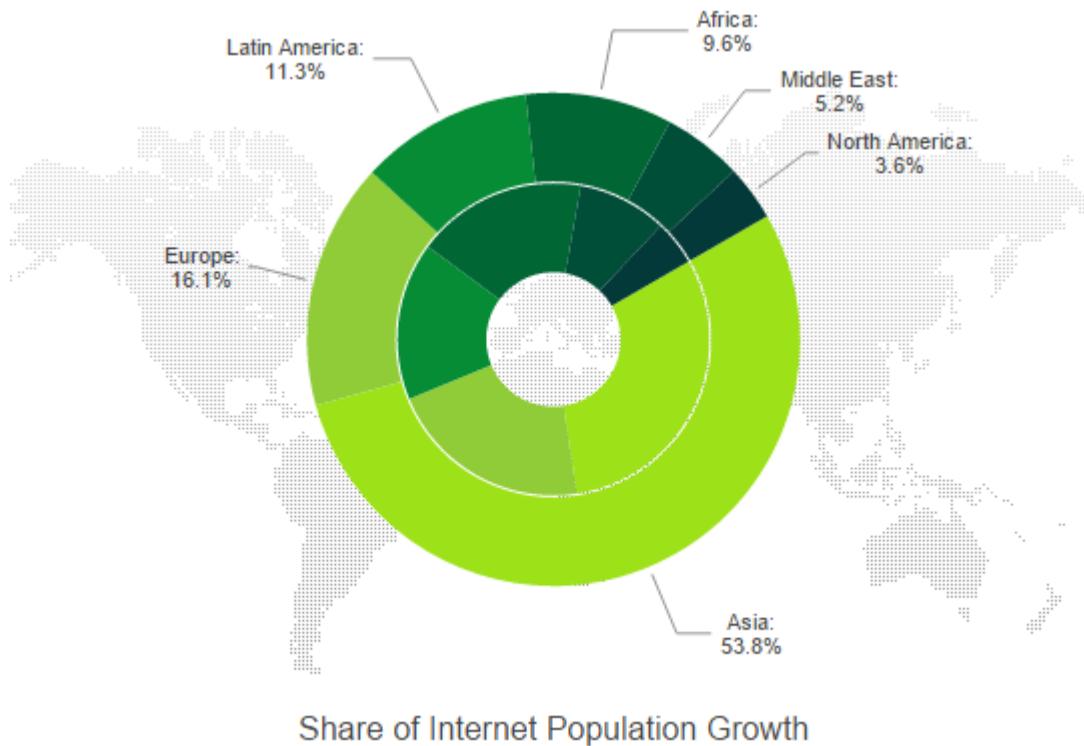
Pie chart

This chart type represents pie charts (shown below). You cannot define series for this chart type, but you can define colors of the pie, as well as properties of the labels:



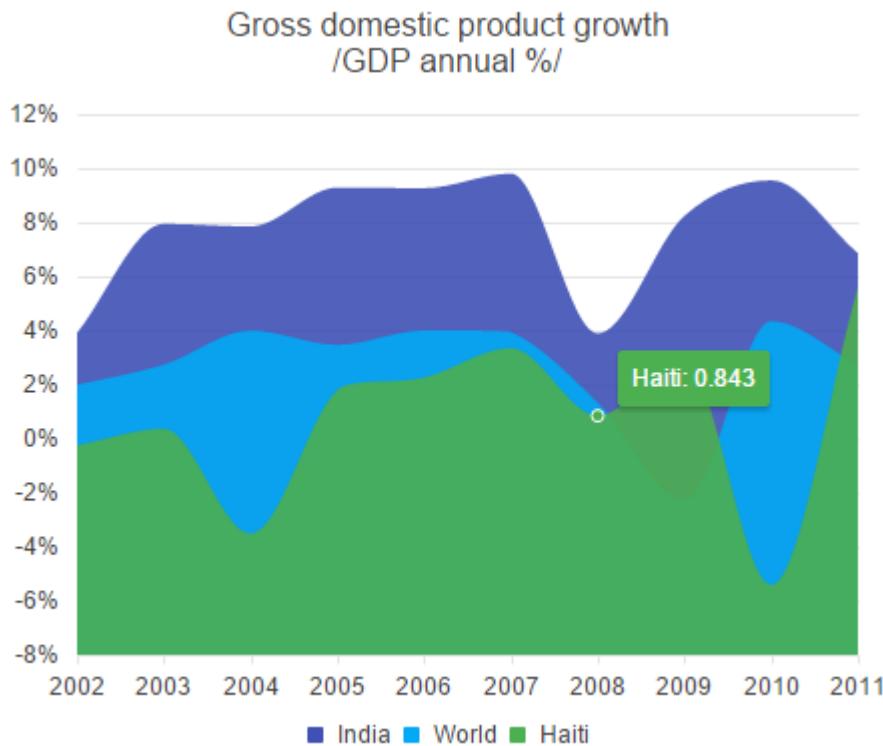
Donut chart

The donut chart is shown below. You can define series for this chart type. Each series represents a ring of the donut.



Area chart

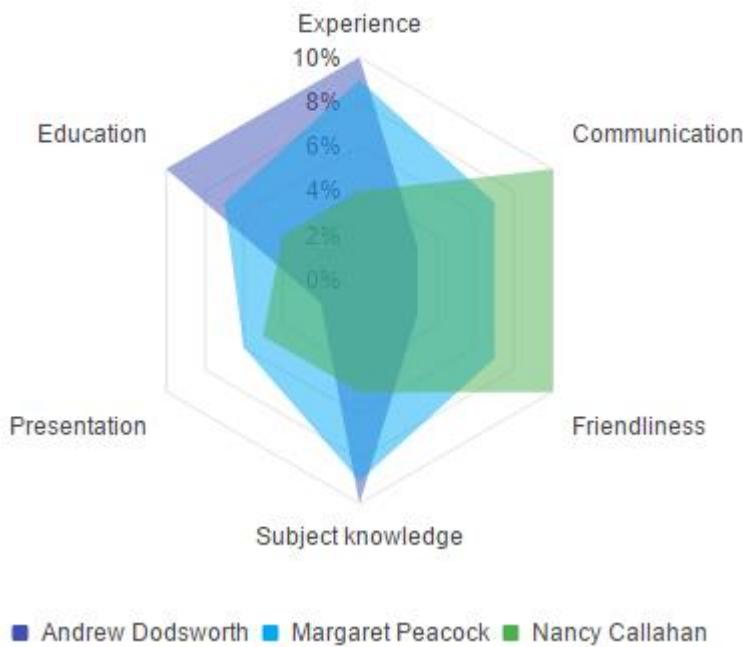
The area chart is shown below. You can define series for this chart type. Each series represents filled area on the chart.



Radar chart

The radar chart is shown below. You can define series for this chart type. Each series represents an area on the radar

Employment candidate review



■ Andrew Dodsworth ■ Margaret Peacock ■ Nancy Callahan

Axis Properties

You can specify the following properties of the X and Y axis:

Title

Title of the axis displayed near the axis

Format

If the axis displays dates or numbers you can specify how the values will be formatted. By default values will be displayed using the format specified in the attribute that the axis shows

Min. Value / Max. Value

By default **Aware IM** will automatically determine min. and max. values that the axis will show based on the available records. However, you can override the default behaviour. For example, if you want the axis to always start with 0 irrespective of the values shown you can specify 0 as min. value for the axis.

Number of ticks

By default this number is determined automatically but you can override the default and provide your own value.

Base unit for dates

This value is related to the aggregate calculations for dates explained in the properties of series section. It determines which dates will be considered "equal" for the purpose of

aggregation. For example, if you select “weeks” then values for all dates in the same week will be aggregated

Legend

If you select this property the chart will show the “legend” describing each series at the specified position on the chart – for example, in the radar chart above the legend is displayed at the bottom of the chart.

Tip

Tick this option if you want **Aware IM** to display a tip when the user hovers the mouse over the value on the chart. You can select the format of the display:

{SeriesName} refers to the name of the current series;
{YValue}, {XValue} refer to the current values.

Other Settings Dialog

The following properties can be specified if you click on the Other Settings button:

Inset Padding

Padding that will be added to the chart area

Background Color, Background Image,

Select these options to specify background color or image of the chart

Border Color

You can specify a color of the border around the chart area

Opacity

Opacity of the chart area as the number between 0 and 1.

Pan and Zoom support

If this option is ticked the chart will support panning and zooming.

Chart ID

You can assign any value as the chart id. You can then use this value in the SAVE SCREEN action if you want to capture the chart in a file or in a PDF document.

Gantt Presentation

Select the “Gantt” radio button if you want the results of the query to be presented as Gantt chart. This option is only enabled if the query looks for objects that are members of the GanttTask group (the group is created automatically when you add support for Gantt objects into your application). See the “How to add Gantt chart to your application” article in the How To Guide for more details. See also the [video tutorial](#) about Gantt charts.

Kanban Boards

A query can be used to display Kanban Boards in Aware IM. A picture of a Kanban board from the Issue Resolution sample application is presented below:

Kanban Board

Open Issues	Closed Issues	Deferred Issues
9 items	16 items	1 items
Refresh of grids does not work Oct 31 2017	Print dialog looks untidy Oct 18 2017	New version: add support for gauge charts Oct 30 2017
Refresh of grids does not work Oct 31 2017	Typo in the startup screen Oct 13 2017	
Change HTML of the splash screen Oct 31 2017	Fix computer in the demo room Oct 13 2017	
New version: add support for background color Oct 30 2017	System not working Oct 11 2017	
New version: add support for summary column for grids Oct 30 2017	Perform network maintenance Oct 10 2017	
New version: add support for radar charts Oct 30 2017	Update resources in the build Oct 07 2017	
New version: add support for slider fields Oct 29 2017	Release the new version Oct 07 2017	
Improve curve generation algorithm Oct 11 2017	Loan calculator is not working properly Oct 06 2017	
Show Stopper: Loan calculator is broken Oct 01 2017	Customer management does not work Oct 04 2017	
+ New Issue	Unable to login with my credentials Oct 03 2017	

Here a query that retrieves all issues in the system as shown as 3 Kanban columns – open issues, closed issues and deferred issues (Status attribute of the Issue object has the value of Open, Closed and Deferred respectively). The user can move an issue from one column to the other, thus changing its status. For all the details of how to define Kanban boards in Aware IM please watch the [video tutorial](#).

Specifying Query Using Standard View

The Standard View tab provides a convenient user interface for defining simple queries.

To define a query using the Standard View, follow the steps below:

1. Specify the name of the business object or business object group that the query will be looking for in the “Business object or group” drop down of the editor. If you want the query to perform a search using business object form click on the “Use form” property in the Element Properties window and select the form of the business object – see [Searching for Data Using Forms](#).

2. If the query looks for all instances of the business object or business object group or if you have specified that the query would perform a search using forms, you can skip this step. Otherwise you must provide the conditions that the instances of the business object or group must match for the query to find them. To specify the query conditions do the following:
 - a. Click on the “Attribute/Expression” cell in the first row of the “Matching Criteria” table. In the combo box that appears select an attribute of the business object or an attribute of the referred object.
 - b. Click on the “Criterion” cell in the table. In the combo box that appears select the criterion you want.
 - c. Click on the “Value/Expression” cell in the table and type in the value that the selected attribute will be compared with using the selected criterion. For example, if you selected Account.Balance in the “Attribute/Expression” cell, “>” in the “Criterion” cell and entered 1000 in the “Value/Epression” cell the query will look for all instances of the Account object with account balances greater than 1000.
 - d. If the query uses more than one condition specify other conditions in other rows of the table. By default the conditions will be linked with the AND keyword. If you want to link the conditions with the OR keyword click on the “Link” cell and select OR from the combo box displayed
 - e. If the query uses more conditions than the number of rows available in the table click on the  icon at the top of the table. If you want to delete a condition select the condition by clicking on any cell in the condition’s row and click on the  icon.
3. You can optionally sort instances found by the query. You can sort by the value of the attribute(s) of the business object that the query is looking for. If you specify several attributes then the instances will be sorted by the value of the first attribute. If there are equal entries they will be sorted by the value of the second attribute and so on. You can also specify whether sorting will be performed in the ascending or descending order.
 - a. To specify the attribute to sort by tick the checkbox next to the attribute name in the “Sorting of Results” table.
 - b. To specify the order of sorting click on the Order cell in the table and choose “Ascending” or “Descending”.
 - c. To change the order of entries select the entry and press the Up or Down buttons at the top of the editor.
4. You can also specify that the query should return only a certain number of instances (the first ones). This option is usually used in conjunction with sorting – you can sort the instances found by the query and then return the first “n” instances. To specify the number of instances to return select the “Return first” radio button in the “Return Results” section and specify the number in the text box next to the radio button.



NOTE: You can use the [ID attribute](#) in the query conditions and sorting.

NOTE: One of the expressions that you can select when defining query conditions is "Ask at run time". This expression indicates that the value of the attribute should be entered by the user when the query is run (see [Queries that Require User's Input](#)). Note that if you look at such a query in the Rule Form, the corresponding condition will be shown with the question mark, for example:

```
FIND Forum WHERE Forum.Title=?Title
```

When a user runs this query **Aware IM** will prompt the user to enter the value of the Forum Title and then display the result. The string after the question mark indicates the text that will be displayed when **Aware IM** prompts for the value of the attribute. By default this text is equal to the name of the attribute, but you can change it to anything you like on the [Textual View](#) tab (if a text has spaces enclose the text in apostrophe).

Specifying Query Using Textual View

The Textual View tab of the query editor allows specifying a query using the syntax of the [FIND](#) or [EXEC_SP](#) actions of the Rule Language. This may be necessary if a query cannot be specified using the Standard View. Some users may also find it quicker to specify queries using this form. Using the [EXEC_SP](#) action allows advanced users to execute SQL queries of any complexity from either native or external database.

To specify a query using the Textual View tab enter the name of the query and optionally its description as specified in [Adding/Editing Queries](#) and enter the text of the [FIND](#) or [EXEC_SP](#) actions in the main pane of the tab. Note that you cannot use any other action or Rule Language construct when defining a query.

You can specify how instances of the business object will be displayed in the Operation Mode by clicking on the Display As property and specifying the display options on the Display Query Results dialog – see [Adding/Editing Queries](#).

Adding/Editing Notifications

The following section describes how to work with the editor of notifications when adding a new notification or editing an existing one. Notifications are described in the [Communication with Other Systems](#) section.

The editor of notifications can be started as described in the [Working with Configuration Elements](#) section. The following properties should be specified:

Name

Specify the name of the notification uniquely identifying it within the business space version. The following restrictions apply:

- a. The name must start with a character (not digit) or underscore symbol. All other symbols in the name must be either characters (including underscore symbol) or digits. No spaces or special symbols are allowed.
- b. The name must be unique among the names of other business objects, business object groups and notifications.
- c. The name cannot start with one of the instance prefixes – This, That, Added, Removed, LoggedIn or Changed.
- d. The name cannot be one of the reserved names – File, Day, Question, EmailSender, ReceivedEmail, IncomingEmail.
- e. The name cannot be the name of the basic attribute types – Number, Date, Duration, Timestamp, Shortcut, Document or Picture.

Attributes

Any notification must have at least one attribute defined. Attributes are defined and displayed in the Attributes table of the Attributes tab.

- a. To add a new attribute, click on the  icon at the top of the Attributes table. See [Adding/Editing Attributes](#) for details how to add attributes of the specific types.
- b. To edit/view an existing attribute select the attribute in the table and change its properties in the Selection Properties window. See [Adding/Editing Attributes](#) for details how to edit attributes of the specific types.
- c. To delete an existing attribute click on the attribute you want to delete in the Attributes table and click on the  icon at the top of the Attributes table

Description

Specify any text that describes what the notification is for, when it is sent etc. Providing a description is not mandatory but is highly recommended. Any description if defined is included into the generated documentation for the business space version – see [Generating Documentation](#).

Adding/Editing Document Templates

The following section describes how to work with the editor of document templates when adding a new document template or editing an existing one. Document templates are described in the [Document Generation](#) section.

The editor of document templates can be started as described in the [Working with Configuration Elements](#) section. The following properties should be specified:

Name

Specify the name of the document template uniquely identifying it within the business space version. The name of the document template must be unique among the names of other document templates defined in the business space version. Any identifier is acceptable as a name. Space symbols in the name are allowed.

Description

Specify any text that describes what the document template is for, how it is used etc. Providing a description is not mandatory but is highly recommended. Any description if defined is included into the generated documentation for the business space version – see [Generating Documentation](#).

Type

Select the type of the document template from the “Type” combo box. **Aware IM** comes with the following pre-defined types:

- *Report* – the document template represents a report. This type is different from other types of the document templates in the way **Aware IM** handles it when it creates a document from a document template – see [Reports](#).
- *Text document* – the document template represents an ASCII text.
- *MS Excel document* – the document template represents a Microsoft Excel file (.XLS).
- *MS Word document* – the document template represents a Microsoft Word file (.doc) – this document type is not available under Linux and Mac OS X operating systems.
- *MS Word document (XML format)*
 - this document type represents an MS Word document saved in the XML format. It can be used as a replacement for MS Word documents on Linux and Mac OS X operating systems if an Aware IM server is running on the above platform and the client browsers are running on the Windows platform. In this case the XML file will be displayed in the browser properly using MS Word.
- *HTML document* – the document template represents an HTML file.

In addition to the pre-defined types it is possible to plug-in custom types – see “Aware IM Programmer’s Reference”.

NOTE: If a document type is not supported on a particular platform it is possible to define an alternative document that **Aware IM** will automatically use instead of the original document on the unsupported platform. The alternative document must have the same name as the original document followed by the suffix *Alternative*. For example, if we defined the document *OutgoingLetter* of the MS-Word type (not supported on non-Windows platforms) and we want the configured application to work both on Windows and non-Windows platforms we can define the alternative document *OutgoingLetterAlternative* in the format supported on this platform (for example, plain text). We can define more than one alternative document for different platforms, for example *OutgoingLetterAlternativeMac* etc.

Data shown in the document template

The options of this property determine the source of data that **Aware IM** should use when generating documents from document templates. This data is used to replace the contents of tags used in the document template (if any) with the appropriate attribute values (see [Document Generation](#)). The following options can be specified:

Determined at run time

This option indicates that the data should be determined from the context of the document template usage. For example, the user can select certain instance(s) of a business object and run the report using these instances as the data source. Or some attribute of a business object of the Document type initialises itself with the document template – in this case the document will use the data of this business object's instance – see [Setting Properties of Document Attributes](#).

All instances of the specified business object

This option indicates that regardless of how the document template is used, it will use all instances of the specified business object as its data source. If you select this option you must select the name of the business object as well.

Run query

This option indicates that **Aware IM** should always run the specified query and use the instances of the business objects that it finds as the data source for the document generation. If you select this option you must also specify whether **Aware IM** should run one of the queries already defined in the business space version (select the “Existing query” radio button and select the query from the combo box) or it should run the query specifically created for this purpose (select the “Custom query” radio button and press the Edit button to define the query – see [Adding/Editing Queries](#)).

End user access

The options of this property determine whether the document or report will be accessible for viewing/editing by end users – see [User Defined Documents and Reports](#).

Design of the document

If you select the “Report” document type Aware IM will display the [Report Designer](#) in the working area of the editor. You can design the layout of the report using the Report Designer.

For all other types of document templates you should create the design of the document using the appropriate software (for example, create Word document using Microsoft Word software) and import this document into the editor (see below).

Import

Importing a layout of a document template can be useful if you want to re-use the same layout in a different document template. Layouts of reports can also be re-used in presentations of business objects and business object groups – see [Defining Presentations](#). To import the existing layout of the document template click on the  icon at the top of the editor. Depending on the type of the document template either the File Selection Dialog or the Directory Selection dialog will be displayed. Specify the name of the import file or the directory that contains the single layout file of the appropriate type and any resources (such as images).

Export

Exporting a layout of a document template can be useful if you want to re-use the same layout in a different document template. Layouts of reports can also be re-used in presentations of business objects and business object groups – see [Defining Presentations](#). To export the existing layout of the document template click on the  icon at the top of the editor. Depending on the type of the document template either the File Selection Dialog or the Directory Selection dialog will be displayed. Specify the name of the file or the directory to export the layout file and any resources of the document template (such as images for HTML templates or reports) into.

Adding/Editing Access Levels

The following section describes how to work with the editor of access levels when adding a new access level or editing an existing one. When the user logs into the application in the Operation Mode she is assigned a particular access level that determines which elements of the business space version (such as business objects, their attributes, processes etc) she will be able to access. Access levels are described in more detail in the [Access Level](#) section.

[Working with Access Level Editor](#) section describes how access levels can be specified in the Configuration Tool.

Working with Access Level Editor

The editor of access levels can be started as described in the [Working with Configuration Elements](#) section. Before you start specifying access restrictions you must provide the name of the access level. The following restrictions apply:

- The name must be unique among the names of other access levels
- The name must start with a character or underscore symbol. All other symbols may be characters (including underscore symbol) or digits. Spaces within a name are not allowed.

You can also optionally provide a description of an access level. Providing a description is not mandatory but is highly recommended. Any description if defined is included into the generated documentation for the business space version – see [Generating Documentation](#). To provide the description press the Description button next to the name and type in the description in the dialog that appears.

The editor of access levels contains a tree with those elements of the business space version that you can set access to – Business Objects and their attributes, Processes, Queries, Document Templates and Services. The “Access” column in the tree specifies access restrictions of the corresponding element in this Access Level. You can edit column directly – click on the cell and select the appropriate values from the drop down of available values. Most elements support the following values:

Full access

This value indicates that there are no restrictions to the element represented by the selected row (this is the default access assigned to any newly created element, except for the Guest access level where the default value is “Not available”).

Not available

This value indicates that an element represented by the selected row is not visible or accessible to the users of this access level. With this access level **Aware IM** will automatically remove the element from any user interface that deals with the element – menus, operations and forms. For example, if you specify that a business object is not available, any operations that create or edit such an object will be removed from the corresponding menus and toolbars; if you specify that an attribute is not available it will be automatically removed from all forms that show this attribute.

In addition to the above values business objects and attribute support the following values:

Read only

If you set this value to a business object it indicates that all attributes of the business object are read-only – their values can be seen by the user but not changed. Also the user will not be able to create instances of the business object. If you set this value to an attribute, this particular attribute will not be editable on all forms where it is present.

Creator: full access (business objects only)

This value indicates that instances of the business object represented by the selected row will only be visible to those users who created the instances in the first place. All users of this access level will be able to create instances of the business object but they will not be even aware that there are instances of the same business object created by other users – when they search for the business object the system will only return the instances created by them, so they will only be able to edit their own instances.

Creator: modify only (business objects only)

This value should only be used for business objects that are members of the SystemUsers group. It indicates that the users are allowed only modify attribute values of the instance of the object that represents themselves (in Change Login Details operation) but they cannot create instances representing others.

Attribute level (business objects only)

This value indicates that there are no access restrictions as far as the business object represented by the selected row is concerned but there are access restrictions to the attributes of the business object. You cannot choose this value – the Configuration Tool sets it automatically after access restrictions have been set for the attributes of the business object.

Creator only (attributes only)

This value indicates that the attribute is fully accessible to the user that created the instance of the business object in the first place; for other users the attribute is not available (not visible) at all.

Creator – full access; others – read only (attributes only)

This value indicates that the attribute is fully accessible to the user that created the instance of the business object and read-only for all other users

Clicking on the “Make All Accessible” button applies the “Full Access” level to the selected row and all its sub-elements (if any). This can be used to make all attributes of a business object accessible.

Adding/Editing Visual Perspectives

The following section describes how to work with the editor of visual perspectives when adding a new visual perspective or editing the existing one. A visual perspective defines how the screen of the application looks like to the user in the Operation Mode (see [Visual Perspective](#)).

The typical screen layout of an application in the Operation Mode is shown in the [User Interface](#) section. As explained in this section the screen layout may consist of several areas (frames):

- Banner
- Top bar
- Footer
- Main page
- Status Pane
- Left Pane
- Right Pane

Each frame may consist of one or more *tabs* and each tab may contain one or more *content panels*.

The editor of visual perspectives allows configurators to customize the appearance of frames, tabs and content panels. It is also possible to define several such screen layouts for the system and switch between them when necessary.

See also [Working with Visual Perspective Editor](#)

Working with Visual Perspective Editor

The editor of visual perspectives can be started as described in the [Working with Configuration Elements](#) section.

The working area of the editor contains a tree structure of a visual perspective – it lists all the frames of the perspective. You expand the frame to see its tabs (or menu). For each tab you can see its contents panels and for each menu you can see its menu items. You can select any element in this structure and set its properties in the Selection Properties window. The properties of the visual perspective itself can be specified at any time in the Element Property window.

The bottom half of the editor shows how the screen defined by the current properties of the visual perspective looks like in the Operation Mode (“embedded preview”). Any changes you make to the visual perspective’s properties are immediately reflected on the preview. To turn the preview on or off click on the  icon in the toolbar at the top of the editor. To see how the preview looks in the standalone browser click on the  icon.

The following properties of a visual perspective can be specified:

Name

Specify the name of the visual perspective. The name must be unique among the names of other visual perspectives defined in the business space version. Any identifier is acceptable.

Description

Description of the visual perspective

Used in login

This property controls whether the visual perspective will be automatically used by Aware IM when a user with a particular access level logs in from the device of a particular platform (desktop, mobile phone or tablet). When you click on this property the “Used in Login” dialog will be displayed. Tick the “Aware IM will display this visual perspective when a user logs in” checkbox if you want **Aware IM** to use the perspective when the user logs in. If you do not select this option the visual perspective can only be used by another visual perspective when it makes a switch of perspectives (see below) or by rules in processes.

If you do select this option you can also specify the following options:

Access levels radio buttons

If this perspective should be used only when users belonging to certain access levels log in select the “Aware IM will display this perspective for users access levels selected below” radio button (by default the visual perspective applies to all access levels) and select the access levels you want the visual perspective to apply to.

Platform support

You can specify that the visual perspective should only be used when the user logs in from devices of the selected type – desktops, tablets or mobile phones

 **NOTE:** For guidelines how to use **Aware IM** applications for mobile phones and tablets see the “Mobile Applications” document.

Initialization process

Tick this checkbox if you want **Aware IM** to run the specified process immediately after the user logs in but before the visual perspective is displayed. If the process fails (for example by issuing the [REPORT ERROR](#) action), the system will automatically logout the user and display the appropriate error message. The initialization process can be used in the visual perspective of the system administrator to perform automatic initialization of the system with some default values (for example, automatically create and set the default values into the SystemSettings object if it has not been initialized yet – see [Setting Initial Values of the Information System](#)). Another initialization process can be used in visual perspectives of non-administrator users to check whether the system is initialized and issue an error if it is not.

First command

Define this property if you want **Aware IM** to run the specified command immediately after the visual perspective has been displayed. You then need to specify the command to run in much the same way as you specify menu commands.

Background process

Define this property if you want **Aware IM** to periodically run the specified process in the background with the specified frequency. The background processes can be very effectively used in the combination with the [DISPLAY MESSAGE ASYNCH action](#) to display tips, adverts, check for new messages etc.

Theme

Using the drop down of this property you can choose the theme in which the visual perspective will be displayed. The theme includes a combination of colors, fonts, visual style, images etc. **Aware IM** comes with a number of pre-defined themes but you can also include your own themes.

Aware IM uses the Kendo UI library (see <http://www.telerik.com/kendo-ui>) and the themes used are the themes designed for this library. New themes are being created all the time and made available to the general public. If you find new themes for the Kendo UI library you can integrate them into **Aware IM** (or you can create your own themes if you are familiar with the HTML and CSS technologies).

See the How To Guide for more details on how to integrate custom themes into **Aware IM**.

 **NOTE:** It is also possible to define themes for the currently logged in user. You need to expose the predefined `Theme` attribute of the user object, so that it is possible to modify and save the value of this attribute. **Aware IM** will automatically populate the choices for this attribute with available themes. Once a particular theme is saved for a particular user, this theme will be used when this user logs in.

Font size

Themes depend on the font size used. If you change the font size themes will adapt accordingly and will still look good. You can choose the font size for your theme here.

Mobile transitions

Tick this checkbox to display animation when one page replaces another page. This is especially useful for mobile applications

Tour

Select this command from the menu to enable the “tour” feature for the visual perspective. The “Tour” feature allows configurators to add explanation to the elements of the visual perspective, so that the user can understand the screen better. The explanation of the element is displayed to the user at the bottom of the screen with the marker pointing to the element of the screen being displayed. The user can jump

between the elements of the screen and Aware IM automatically scrolls to the element being explained and displays the marker for the element. For more details about tours see the “How to use the Screen Tour feature” in the How To Guide.

Turn off Aware IM Copyright

Tick this checkbox if you want to completely remove Aware IM logo and copyright message from the visual perspective – note that this feature is only available in the Developer Edition.

See also:

[Defining Frame Properties](#)

[Defining Tab Properties](#)

[Defining Content Panel Properties](#)

[Defining Layout of Content Panels](#)

[Setting Menu Properties](#)

Defining Frame Properties

Most frames consist of one or more pages (*tabs*). The user can switch between tabs to display a particular page. Each tab consists of one or more *content panels* that can be laid out vertically, horizontally or on a grid. Each content panel can display an HTML page or invoke an Aware IM command and display its results, for example, run a query or start a process. The following picture displays the home page of the CRM sample application. It has the following frames defined – the “top bar” frame at the top showing the toolbar of system operations, the left frame containing the application menu, the status bar at the bottom and the main frame. The main frame consists of several tabs. The currently active tab (Dashboard) consists of 5 content panels each showing the results of different queries, displaying calendar for this month, a list of customers, current alerts etc.

The screenshot displays the Aware IM 8.4 CRM application interface. The left sidebar contains a menu with links to Customers, Communication, Alerts, Diary, Staff, Instant messaging, Logout, and About. The main dashboard includes sections for 'MOST ACTIVE CUSTOMERS' (listing Jane Allison, Rosemary Flint, Francis McDougal, and Leo Crawford), 'STATISTICS' (a bar chart showing contact duration and count by month), 'ALERTS' (a table listing two alerts with edit and delete icons), and 'COMPANY SCHEDULE - this month' (a calendar view for January 2016).

Customer	Email	Contacts
Jane Allison	janec@hotmail.com	12 contacts
Rosemary Flint	rosemaryf@gmail.com	9 contacts
Francis McDougal	francism@gmail.com	9 contacts
Leo Crawford	leoc@gmail.com	9 contacts

Month	Contact Duration	Contact Count
January	66	18
February	41	12
March	52	18
April	66	18
May	24	12
June	30	12
July	41	12
August	25	12
September	59	12
October	59	12
November	24	12
December	58	12
January	2	2
February	11	2
March	3	2
December	4	2
January	2	2

Alert On	Subject	Action
05/06/2014	Reminder to pay subscri...	
05/03/2014	Reminder to pay subscri...	

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
27	28	29	30	31	01	02

To define how a frame will look like within your visual perspective you need to select the frame you want to edit, define its properties and specify its contents. The following properties of a frame can be specified in the Selection Properties window:

Visible

Tick this checkbox if the frame should be visible in the visual perspective (note that the Main Frame is always visible)

Displays

Certain frames, such as left or right frames, can contain either an application menu or content panels. You can specify what the frame will contain.

Title

Specify the title of the frame. The title will be displayed in a special window at the top of the frame.

Show Borders

Tick this checkbox to display borders around the frame.

Can be resized

Tick this checkbox to allow the user to resize the frame.

Collapsible

Tick this checkbox to allow the user to minimize (“collapse”) the frame by clicking on the special icon. Once the frame is minimized it will be displayed as a narrow window with an icon to restore the frame to its previous size.

Show tab even if it is the only one

If this checkbox is ticked **Aware IM** will always show a tab even if there is only one tab defined for the frame (if the checkbox is unticked **Aware IM** will not show tab when there is one tab defined).

Tab bar location

Tabs can be displayed at the top, bottom, left or right of the page.

Mobile style tabs

Tick this option to display tabs in the style appropriate for mobile phones – with big font and with the top icon alignment.

Show offline mode switch

If your application supports offline mode you can include the switch for this mode in the top bar or status frames. By turning the switch on or off the user will switch between the offline and online modes. See the “How to support offline mode” section in the How To Guide for more details about the offline mode.

Background

You can specify background properties of the frame. You can either specify the background color or image or if you are familiar with CSS you can specify advanced background properties using the CSS dialog.

Invisibility condition

You can specify that for certain screen sizes the frame should be invisible. This option is one of the main implementation of the “responsiveness” feature. Please watch the [video tutorial](#) about this feature for more details.

Initial size, maximum size, minimum size

You can specify the initial size of the frame. If you allow resizing the frame you can also specify maximum and minimum size that the frame can be resized to.

Defining Tab Properties

To add a tab click on the  at the top of the editor. You can then specify the following properties of the tab:

Title

Title of the tab. This title will be displayed on the tab.

Layout

Specify the layout of the content panels within a tab – see [Defining Layout of the Content Panels](#).

Closable

If this checkbox is ticked the user will be able to close the tab.

icon

You can provide an icon that will be displayed on the tab. You can either provide an icon file or refer to a CSS class. See “How to use icons fonts to display an icon for a button” section in the How To Guide.

ID

Specify unique ID of the tab. This ID can be used in the tour feature.

Tour

Specify whether the tab will have a tour

Condition when invisible

You can display a tab conditionally and specify a condition under which the tab will be invisible. The condition should usually check attributes of either the [SystemSettings](#) object or logged in user. You can also define conditions that depend on the screen size as part of the “responsiveness” feature. Please watch the [video tutorial](#) about this feature for more details.

Badge

Click on this button to display a “badge” for the tab. A badge is a little icon on top of the tab usually showing a number (for example, a number of unread messages for the current user). This number is constantly refreshed – it can be changed by the rules and

the number will then be displayed. When specifying badge properties you have to define an expression for the number (or text) displayed on the badge (usually the value of the attribute that stores this number). You can then specify the background color of the badge as well as the refresh rate and tooltip.

Defining Content Panel Properties

At least one content panel must be defined for the tab. You can add more content panels by clicking on the  icon located at the top of the editor. If there is more than one content panel they will be displayed according to the selection of the “Layout” property (see [Defining Layout of Content Panels](#))

There are many properties of content panels – some of them are specific to the layout selected for the tab. The following properties of a content panel are common to all layouts:

Name

Specify the name of the content panel. Every content panel must have a unique name. This name will be displayed in the caption of the content panel if “Display title” checkbox is ticked (see below).

Contents

This is the most important property of the content panel. It defines what the content panel will contain. When you click on the button next to the property the dialog with the following options will be displayed:

Display HTML string

Select this radio button if you want **Aware IM** to display the specified HTML text. Click on the HTML button to enter the HTML text. This is explained in more detail a little later in this section.

Display HTML Page

Select this radio button if you want to provide custom HTML page to be displayed inside the content panel. If you select this option you must also import the HTML page and any page resources such as images. To import the page, press the Import button. The Directory Selection Dialog will be displayed – specify the name of the directory that must contain a single file with the .html extension and any resources that the page may have. You can also export the existing page into a directory by pressing the Export button and specifying the directory where the existing HTML page and all its resources will be written.

 **TIP:** You can use tag expressions that refer to the `SystemSettings` object or `LoggedInRegularUser` in the HTML page, for example `<<SystemSettings.Logo>>`.

Display results of query

Select this option if you want **Aware IM** to run the specified query and display its results inside the content panel. For example, if you are configuring an application that manages forums you may want to display a list of available forums immediately after the user logs in. This can be done by specifying a query that finds and displays all available forums. If you select this option you must also select the query to run from the list of all configured queries (this radio button is really a shortcut to specify a “Run Query” command using the “Command” radio button – see below).

Display results of process

Select this option if you want **Aware IM** to run the specified process and display its results inside the content panel.

Command

Select this option if you want **Aware IM** to run the specified command and display its results inside the content panel. You must click on the button next to the radio button to specify which command to run.

Display empty page

Select this option if you do not want **Aware IM** to display anything inside the content panel. This option can be useful if you use the content panel as the target for some other content panel.

Width

Specify the width of the content panel in pixels or percent (for some layouts only). If you do not specify the width the content panel will occupy all available width.

Height

Specify the height of the content panel in pixels. If you do not specify the height it will be calculated automatically based on the contents of the panel.

Target

If you have more than one content panel defined for a tab you can designate one content panel to be the target for the other one. This means that if the user clicks on some hyperlink inside one content panel, the results of this click will be displayed in another content panel. For example, you can get one content panel to display the results of a query. If the user clicks on the entry in the query results table the form for the instance of the business object represented by this entry can be shown underneath the query results table. You can also specify other targets for the panel. The following options are available:

Default (blank value)

The target is the panel itself, i.e. when the user clicks on a hyperlink the results will be displayed in this content panel replacing the current contents.

New Tab

When the user clicks on a hyperlink the results will be shown in a new tab (this requires that the “Always show tab” checkbox is ticked). **Aware IM** will create the tab automatically and the user will be able to close the tab whenever she wants.

Full Screen

When the user clicks on a hyperlink the results will be shown inside the main frame replacing the current contents – including any tabs and content panels (they will disappear).

Popup window

When the user clicks on a hyperlink the results will be shown in a popup window. The user won't be able to access elements of the screen outside the window until he closes the window.

Modeless window

When the user clicks on a hyperlink the results will be shown in a modeless window. The user will be able to access all other parts of the system outside the window. The window can be resized, repositioned or closed at any time. The user can open as many modeless windows as he likes

Name of a content panel

When the user clicks on a hyperlink the results will be shown inside the selected content panel replacing its contents.

Display title

Select this option if you want **Aware IM** to display the title in the caption of the content panel. Normally you will not need to tick this box if you display query results or a form inside the content panel because these already include their own captions.

Collapsible

Tick this checkbox if you want the user to be able to collapse and expand the content panel. This will force the caption to be shown with a little icon in the top right corner to collapse/expand the panel.

Show borders

Tick this checkbox to display borders around the content panel.

Can be hidden

Tick this checkbox if you want the user to be able to hide the content panel. If this checkbox is ticked for at least one content panel of the layout end users will be able to control which content panels in the layout are visible. When the user clicks on the right mouse button anywhere inside the layout the pop-up menu will be displayed. This menu will have the following options:

- *Control Dashboard*

Selecting this menu item will open a popup window with the list of all content panels. The user will be able to turn visibility of each panel on or off (provided that the “Can be hidden” property of the panel is on).

- *Save Current Settings*

Selecting this menu item will allow user to save current visibility settings for the next session (the settings will be saved per user)

- *Restore Default Settings*

Selecting this option will restore the default settings as specified by the configurator

Hidden initially

Tick this checkbox if you want the panel to be hidden initially. This option only works if the “Can be hidden” checkbox is ticked.

Outer margins/Inner margins

You can define outer and inner margins of the content panel.

Device visibility

You can specify that the content panel should be invisible on certain types of devices and visible on others.

Refresh Info

If a content panel has HTML content (static HTML or imported HTML) you can define conditions when this information is refreshed. Other types of content do not need this option because they usually include queries or forms that have their own auto-refresh settings. The way you define auto-refresh information for HTML content panels is very much the same as how you define it for queries and forms.

CSS class

You can further customise the appearance of the content panel by assigning a CSS class to it. See the “How to use CSS” section in the How To Guide for more details.

Scripts

For users familiar with Javascript you can provide your own script here to override the configuration of the panel that **Aware IM** generates. See Programmers Reference Guide for more details.

Defining Content Panel with Static HTML Content

This section describes in more detail how you can define a content panel with static HTML. As explained before you just need to provide HTML of your content and **Aware IM** will display this HTML.

 **TIP:** You can use tag expressions that refer to the `SystemSettings` object or `LoggedInRegularUser` in this HTML, for example `<>SystemSettings.Logo<>`.

However, what if you want to provide input controls in your HTML? Defining HTML tags for input controls is not difficult, but, you wouldn't know how to interact with the server – how to initialise your controls and how to submit entered data to the server. **Aware IM** makes it easy to define such controls as part of your HTML.

When you select “Static HTML” as contents for your panel **Aware IM** displays a dialog where you can enter your HTML text. On the right-hand side of the dialog there is a section called “Predefined elements” that allows you to specify the following widgets as part of your HTML text:

- Input controls (text fields and combo boxes)
- Buttons
- Calendar
- Google Map

You define the above widgets not as HTML, but by selecting its properties directly in the dialog. Once you finish defining these properties **Aware IM** generates a special HTML element that contains all the properties that you have specified, and adds this element to your HTML text. You do not have to understand what's inside this element – all you need to know is that at run-time this element will work exactly as you have specified.

NOTE: You cannot EDIT the properties of the generated HTML element. If you want to change something in the definition of the element you have to delete it and create it again.

The following section describes the properties of these special HTML elements that you can define in the dialog.

Input Control element

Input controls are text fields or combo-boxes. When defining properties of these elements you must first specify where the resulting value entered by the user will be stored. Since there is usually no Context available for content panels you can only use some attribute of the System Settings or System User object (the user that is currently logged in). So you need to specify which object and which attribute of this object will store the entered value.

When the user submits the value it will be stored in the attribute you have specified and then **Aware IM** will execute the specified command. For example, you can define a text box to search the messages stored in the database (as in the toolbar of the CRM sample application). You can define a special attribute in the user object called "SearchFilter" and the following query:

```
FIND Message WHERE Message.Body CONTAINS  
LoggedInRegularUser.SearchFilter
```

You will provide the SearchFilter attribute as the attribute to store the entered value in and then you will provide the command to run the above query.

Display choices

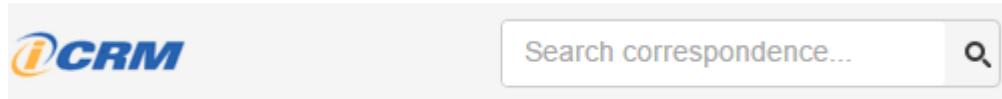
If the attribute definition that you have specified has choices you can tick this checkbox and **Aware IM** will display a combo-box instead of the textbox. You can also specify that the choices can be edited by the user.

Initial Value

If the attribute definition that you have specified has initial value defined you can tick this checkbox to display this initial value when the textbox is displayed

Trigger button class

This is only applicable for textboxes. The value is submitted when the user presses the Enter key. In addition you can define a button that will be displayed next to the text box. Clicking on this button will also submit the value.



Width

Width of the control in pixels

Undefined value

The text to be displayed when the control is empty (“Search correspondence” in the picture above)

Button element

This element displays a button that will execute the specified command when the user clicks on it. The button will be styled according to the currently used theme. You can define the following properties:

Command

A command that will be executed when the button is clicked

Button text

Text of the button (optional)

Icon CSS class

CSS class for the icon displayed on the button (optional). See “How to use icons fonts to display an icon for a button” section in the How To Guide.

Width

Width of the button in pixels

Calendar element

Calendar element displays a calendar that lets the user select a date. Just like the Input Control element the selected date is written into the specified attribute of the specified object and then the specified command will be executed. The properties of the element let you specify the object and attribute to store the date into, the command to execute after this and the initial view shown by the calendar.

Google Map element

Google Maps can be displayed as part of the business object presentation or form. However, displaying a map as part of your HTML is even more flexible and powerful. The properties that can be specified here are similar to defining Google Maps for object forms

Query for markers

You can define a query that will be run to display markers on the map. One of the attributes of the object that the query is searching for must store the address. This address will be marked on the map with a marker. Displaying markers on the map is optional.

Query for polygons

You can define a query that will be run to display polygons on the map. One of the attributes of the object that the query is searching for must store definition of the polygon in the KML format.

Map controls

By clicking on the Other Settings button you can define which controls will be present on the map.

Defining Layout of Content Panels

You can select among several layouts when arranging multiple content panels within a tab. The following layouts can be selected from the Layout dropdown:

[Responsive Grid \(Simple\)](#)

[Responsive Grid \(Nested\)](#)

[Vertical Anchor](#)

[Vertical Box](#)

[Horizontal](#)

[Column](#)

[Table](#)

[Border](#)

[Accordion](#)

 **TIP:** Click on the  icon at the top of the editor to see pictures and explanation of each layout Use preview to see how the layout looks in the browser.

Responsive Grid (Simple) Layout

In **Aware IM** there are two “responsive” layouts, i.e. layouts that can readjust themselves to the amount of screen real estate available on a particular device according to the rules you provide. This is important because you want your application to look good on all types of devices and screen sizes – big screens, smaller screens, tablets, mobile phones.

The first layout is a “simple” one. In this layout you just provide a list of the content panels that your screen will contain. The content panels will be displayed as a grid and you can define the number of rows and columns for this grid **for each device type**.

For example, let's say your screen has 12 content panels. On bigger screens you want to maximise the real estate and display these panels as a grid with 3 rows and 4 columns. On smaller screens you would display the layout as a grid with 3 columns and 4 rows. On tablets – 2 columns and 6 rows; and on phones – one column and 12 rows. See the picture below:



To implement this layout in your visual perspective all you have to do is select the Responsive Grid (simple) layout in the Layout dropdown, define your 12 content panels and then go to the Layout Properties tab. In this tab you need to define the number of columns for each device type. You would define 1 for phones (up to 768 pixels wide), 2 for tablets (up to 992 pixels wide), 3 for medium devices (up to 1200 pixels wide) and 4 for large devices (wider than 1200 pixels).

Responsive Grid (Nested) Layout

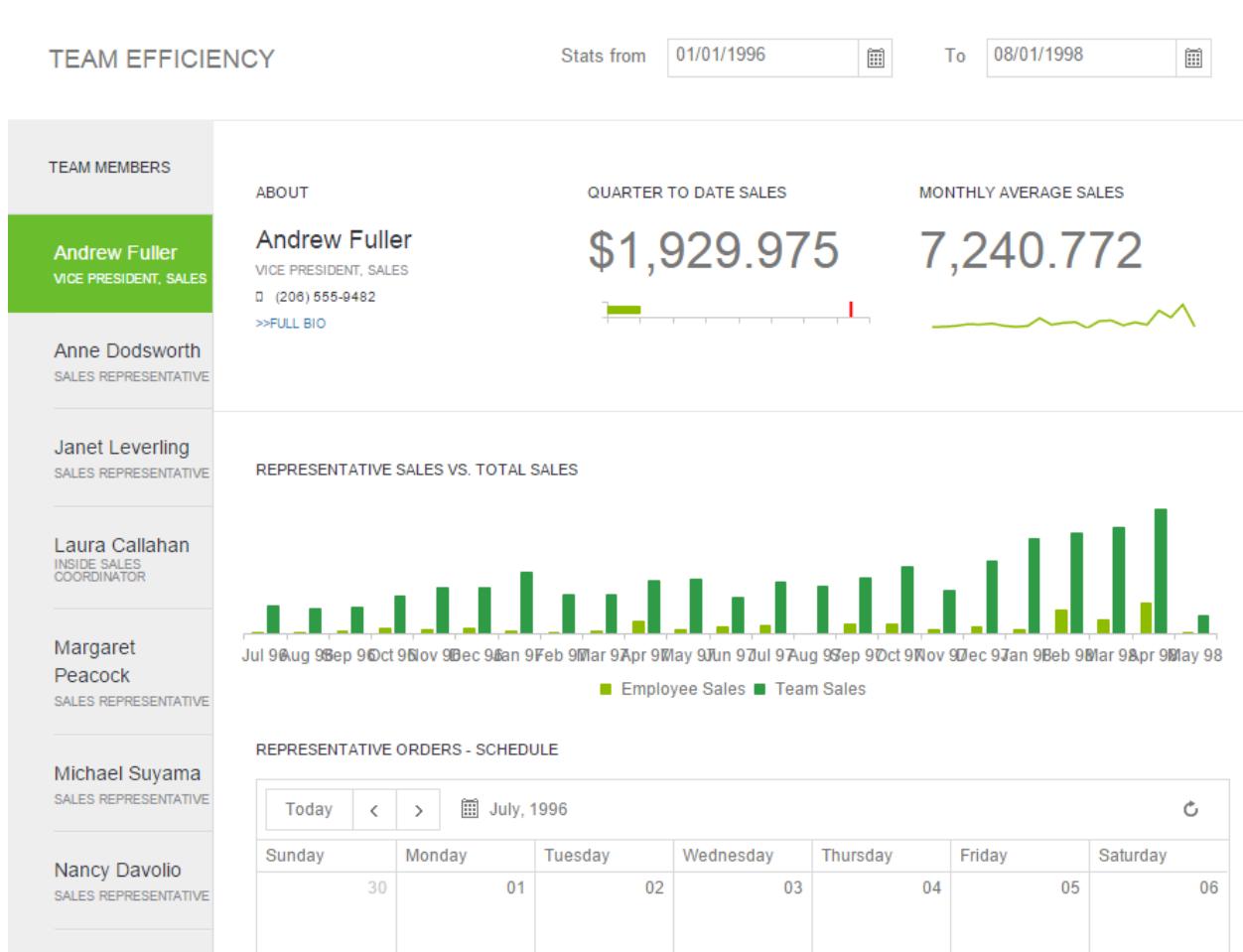
The simple layout is very useful but it only supports layouts that can be displayed as a single grid. With the responsive nested layout you can define more complicated layouts that consist of multiple nested grids – see the picture below:



This is where the “responsive nested” layout becomes useful. The Responsive Nested layout implements a popular “grid system” by the Twitter’s Bootstrap (see <http://getbootstrap.com/css/>). In this system you can define the width of your panel not as an absolute value in pixels but as a relative factor – a number from 1 to 12. A number of 12 indicates that the panel will always occupy all available width. A number of 1 indicates that the panel will occupy 1/12th of the available width.

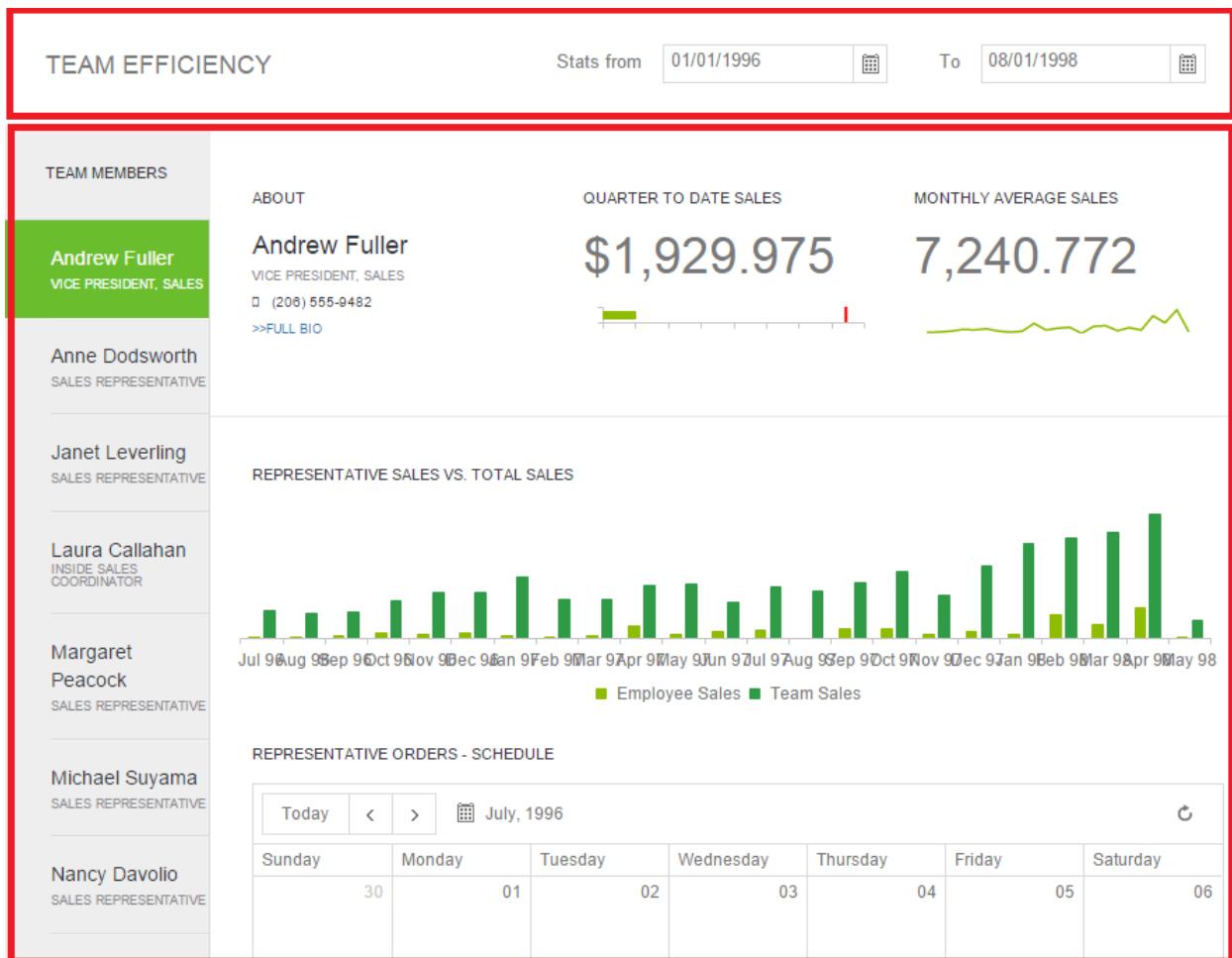
For each panel you can define this factor **for each device type** (see Responsive Grid (Simple) layout for the list of available device types. In addition you can define “parents” for content panels.

This is best illustrated by an example (from the Sales Portal sample application). Let’s say that we want our screen to look like this on devices with enough real estate – see picture below.

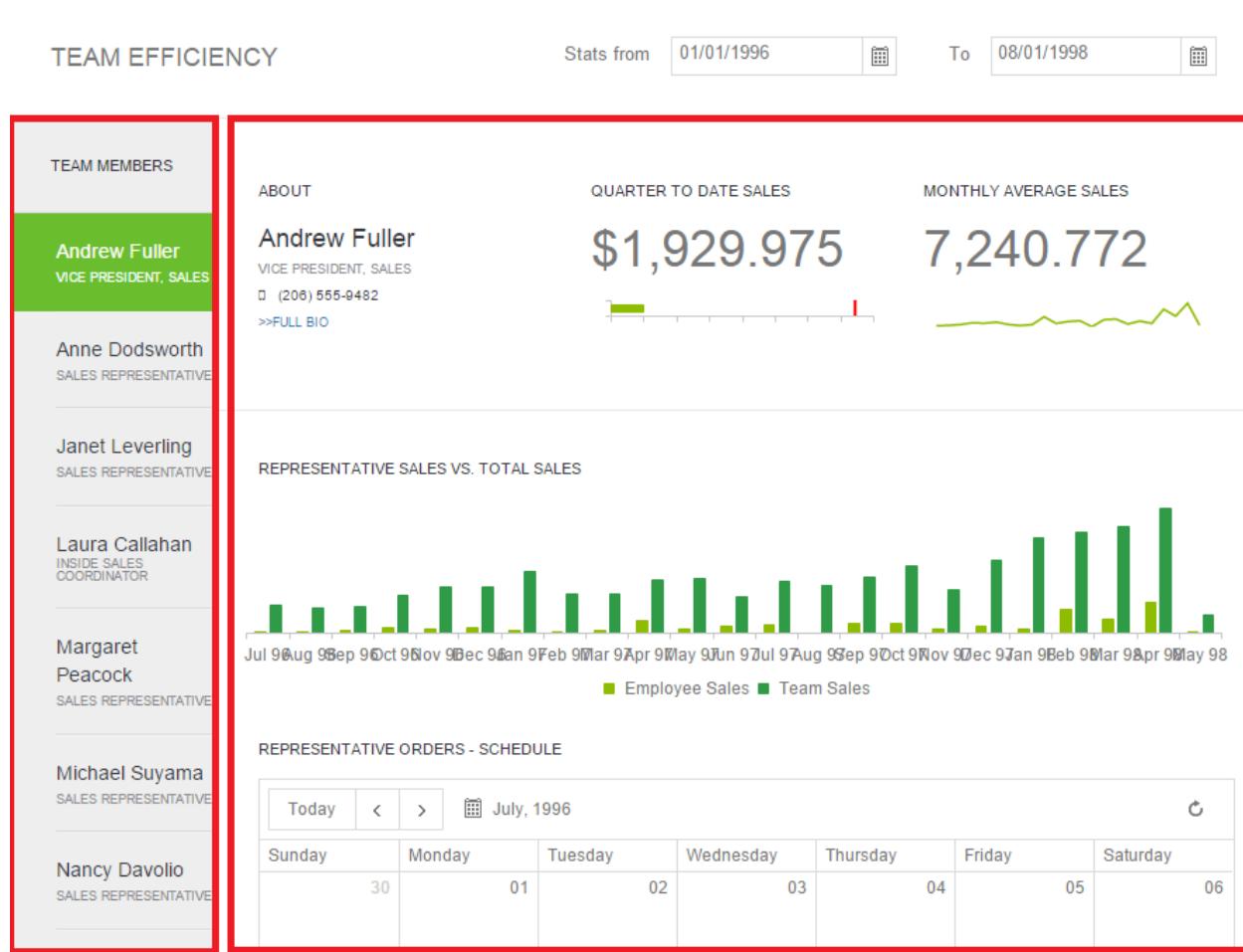


To implement it we first divide the screen into rows at the top level. Here we have the row that includes the title (Team Efficiency) and input controls (Starts From and To) and everything else. So we define two panels called Period Container and Main Content Container (highlighted with red boxes on the picture below).

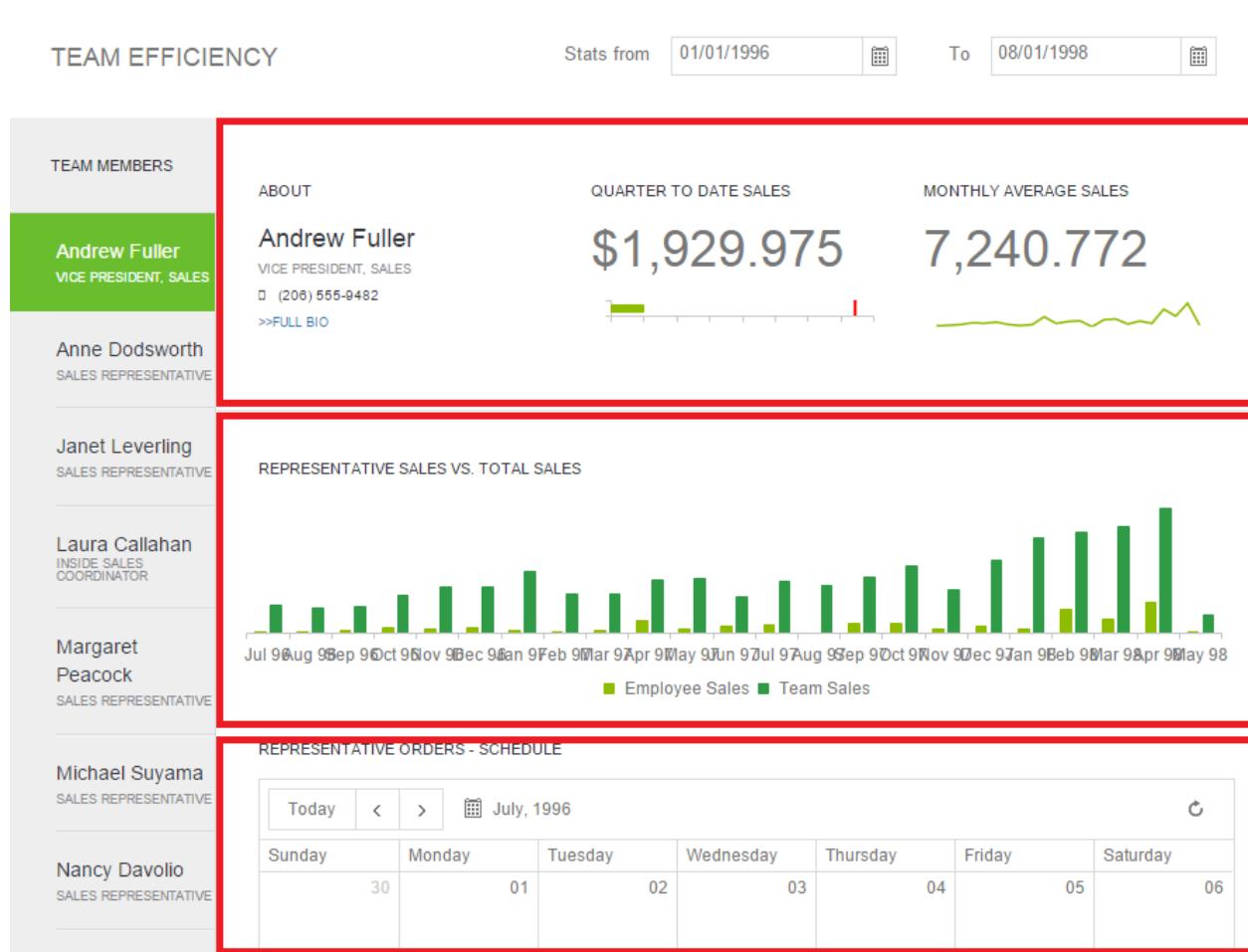
Within the Period Container we have two sub-panels – the title and input boxes. So we define two sub-panels underneath the Period Container Panel called Header and Filters. We want the title to occupy roughly 1/4th of the screen with filters occupying the rest. So we assign a factor of 3 to the Header sub-panel and the factor of 9 – to the Filters sub-panel. We define these factors for all device types. If there is not enough real estate to display the sub-panels side-by-side Aware IM will automatically display the filters underneath the title. We could also assign different factors for different devices – for example, we could assign a factor of 6 to both sub-panels on large devices and factors of 3 and 9 on smaller ones.



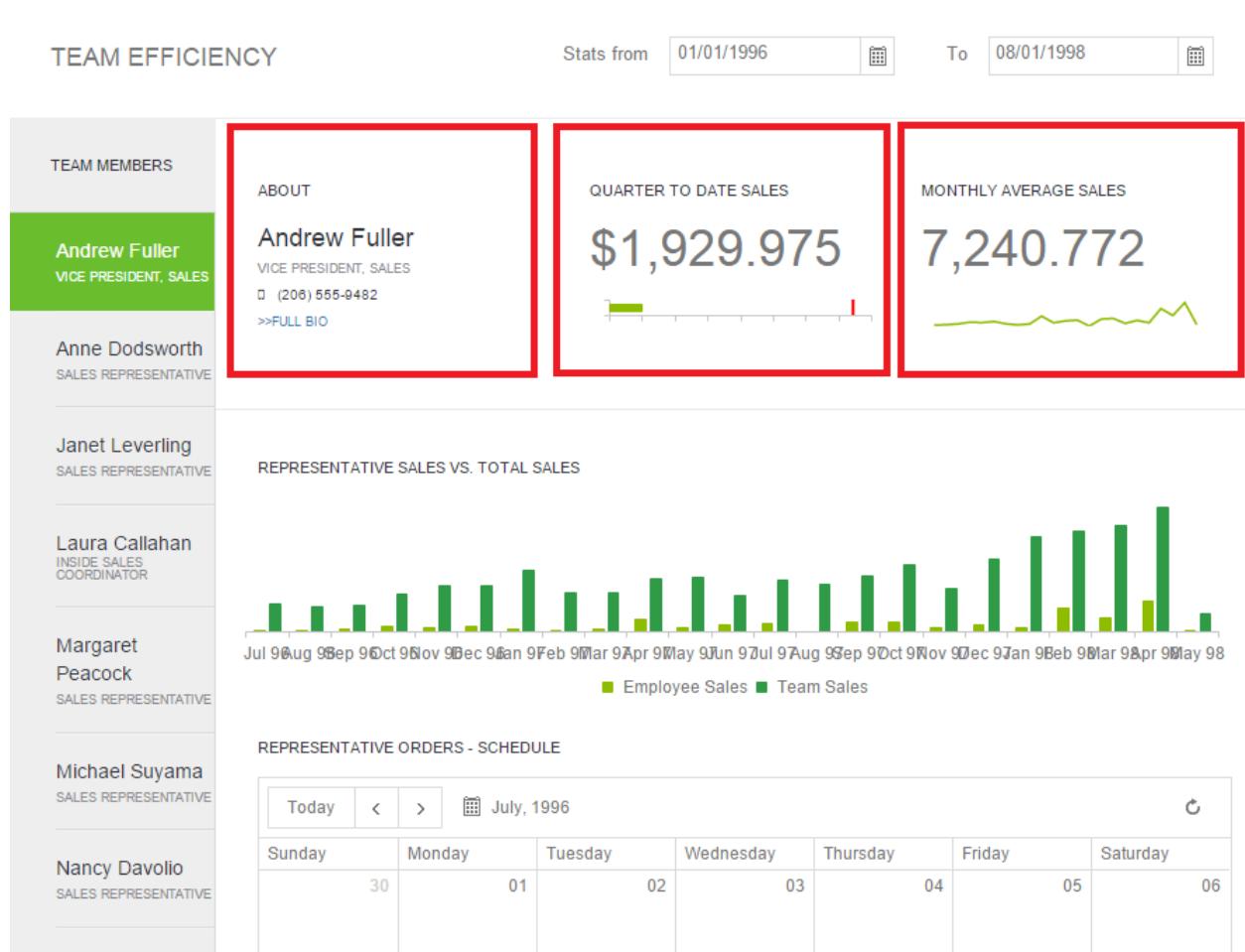
Let's now look at the Main Content panel. In this panel we have two columns – the list of employees on the left and the rest (see picture below). So we define two sub-panels for this panel called “Employee List” and “Employee Details Container”. We assign the factors of 2 and 10 to these panels respectively.



We then continue this process and look at the Employee Details Container. It consists of 3 rows: “Employee Stats Container”, “Employee Sales Chart” and “Employee Schedule” (see picture below). So we create 3 sub-panels underneath the Employee Details Container. We want them to occupy all available width so we assign a factor of 12 to each.



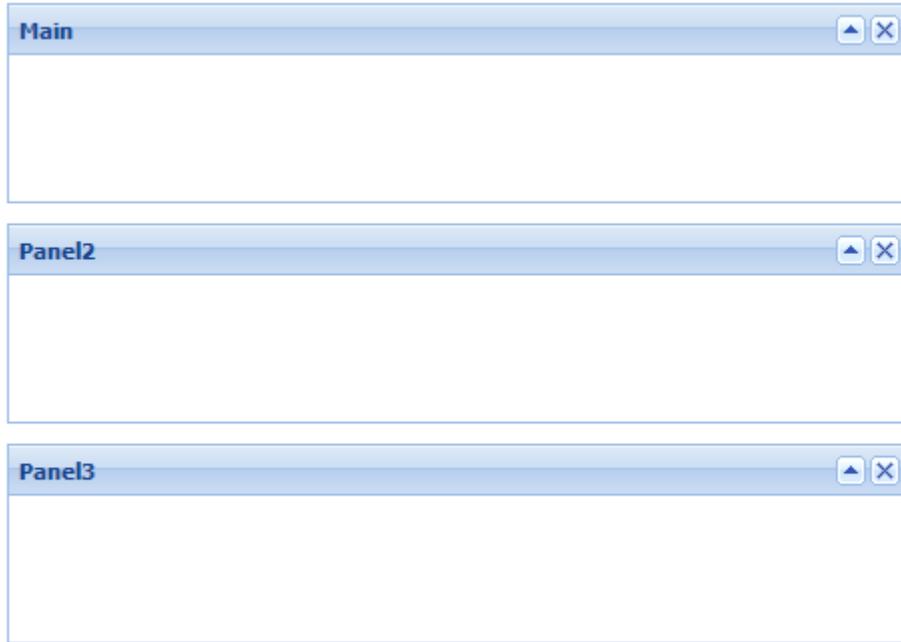
And finally we break the “Employee Stats Container” into sub-panels called “Bio”, “Quarter Sales” and “Average Sales” and assign equal factors of 4 for each of them (see the picture below):



You can check the behaviour and responsiveness of the Sales Portal sample application by displaying it on different devices or just resizing your browser screen.

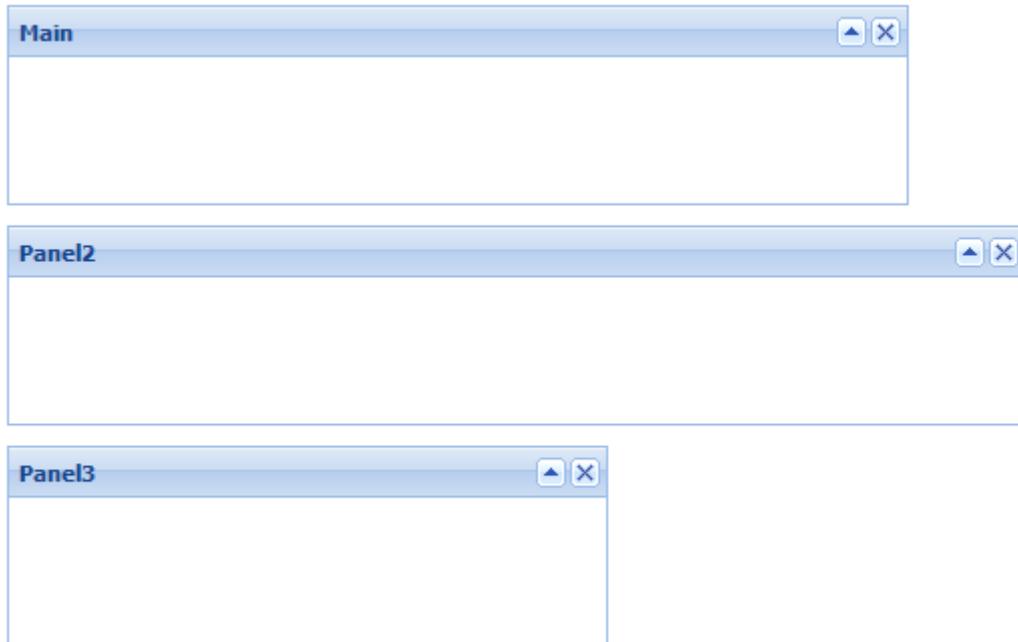
Vertical Anchor Layout

In a vertical layout content panels are placed underneath each other – see the picture below.



You can control width and height of each content panel individually or you can set the “Anchor” property of each content panel. The anchor indicates how much space the horizontal direction the content panel will occupy relative to the space occupied by the

On the picture below the width of the first panel is set to 450 pixels, the width of the third panel is set to 300 pixels and the anchor of the second panel is set to 40% (of the available width). The height for each panel is set to 100 pixels.



Vertical Box Layout

This layout arranges items vertically down a container. This layout optionally divides available vertical space between panels containing a numeric flex property.

The “Flex” property defines the ratio that this content panel occupies relative to other content panels. For example, if you have two content panels with flex values of 1 and 2, the total value is 3 and the first panel occupies 1/3 of the space and the second – 2/3 of the space (where “space” means width for the horizontal layout and height for the Vertical Box layout).

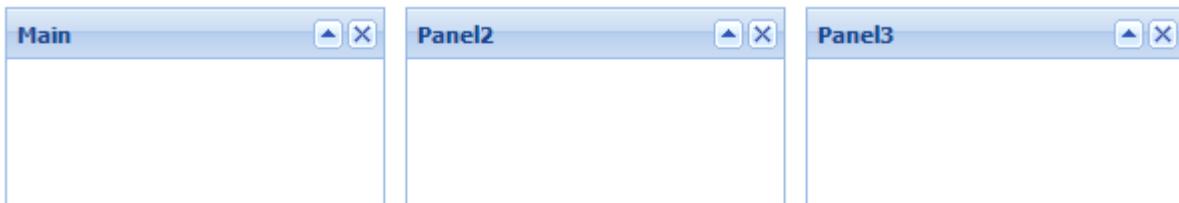
Each content panel with a flex value will be flexed vertically according to each panel's relative flex value compared to the sum of all panels with a flex value specified. In the example below the fourth button has flex=3 while others have flex=1.



It is also possible to specify how the panels should be aligned and packed. In the example shown panels are centre-aligned.

Horizontal Layout

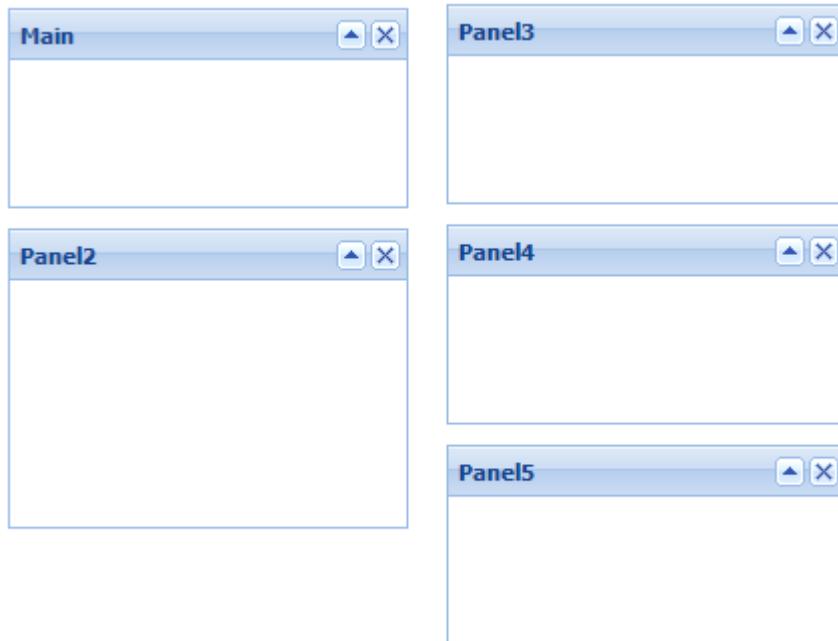
In the horizontal layout content panels are placed next to each other (see the picture below):



You can specify width and height of each individual content panel.

Column Layout

In the column layout content panels are arranged in columns (see the picture below).

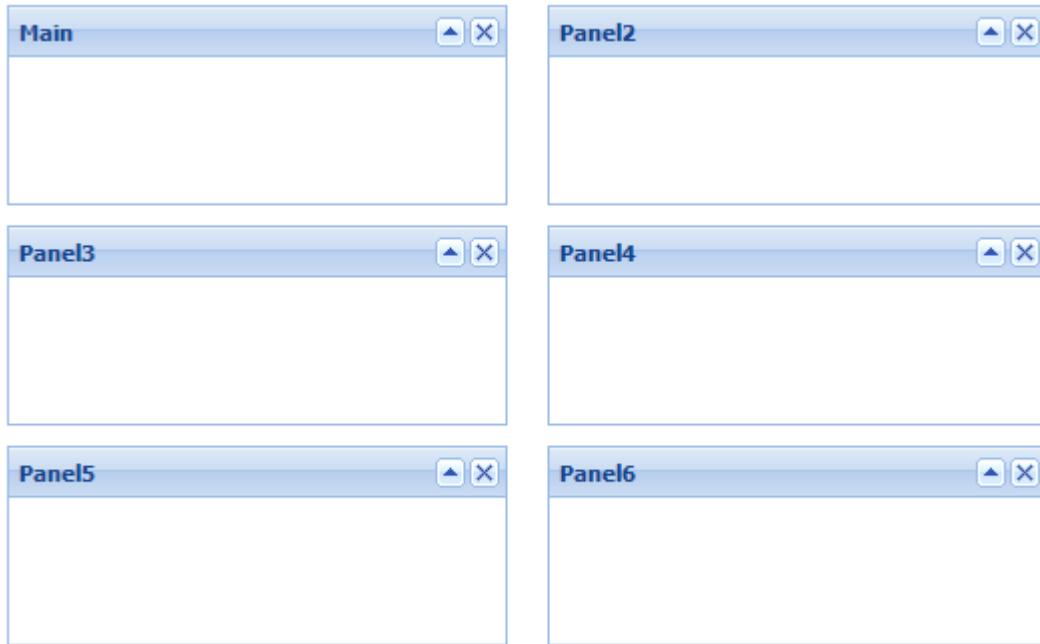


Note that each column is laid out independently of other columns. This means that there is no guarantee that the second content panel of the first column will line up nicely with the second content panel of the second column (it depends on the heights of the first panel in each column). To line up content panels in rows and columns use the [Table Layout](#).

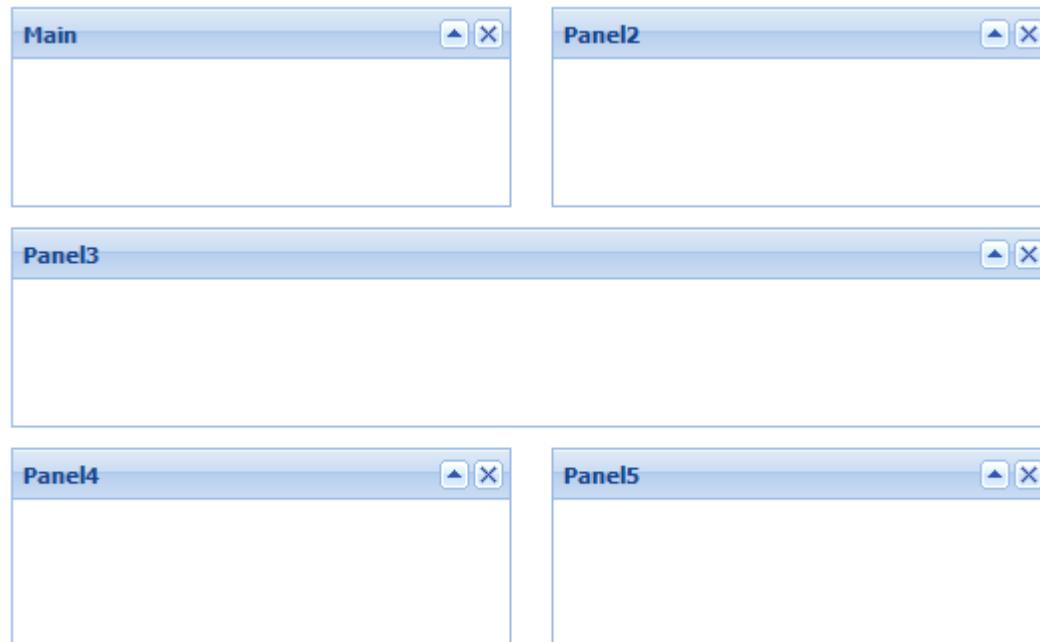
Aware IM traverses content panels from the top panel in the table of content panels to the bottom panel. Wherever there is a column break, **Aware IM** starts a new column. To indicate a column break select Yes for the “Last in Column” property of the last content panel in each column (you don’t have to do it for the last column). You can also indicate the column width of each column as a percentage of the available width. To do this set the corresponding value into the Column Width property of the content panel.

Table Layout

Table layout allows arranging content panels in a tabular fashion (see the picture below):



Unlike the Column Layout, panels in the table layout form not only columns but also rows. Panels belonging to the same row are aligned at the top. It is possible, however, to indicate that a particular panel spans several rows or columns by setting the corresponding properties of the content panel (see the picture below):



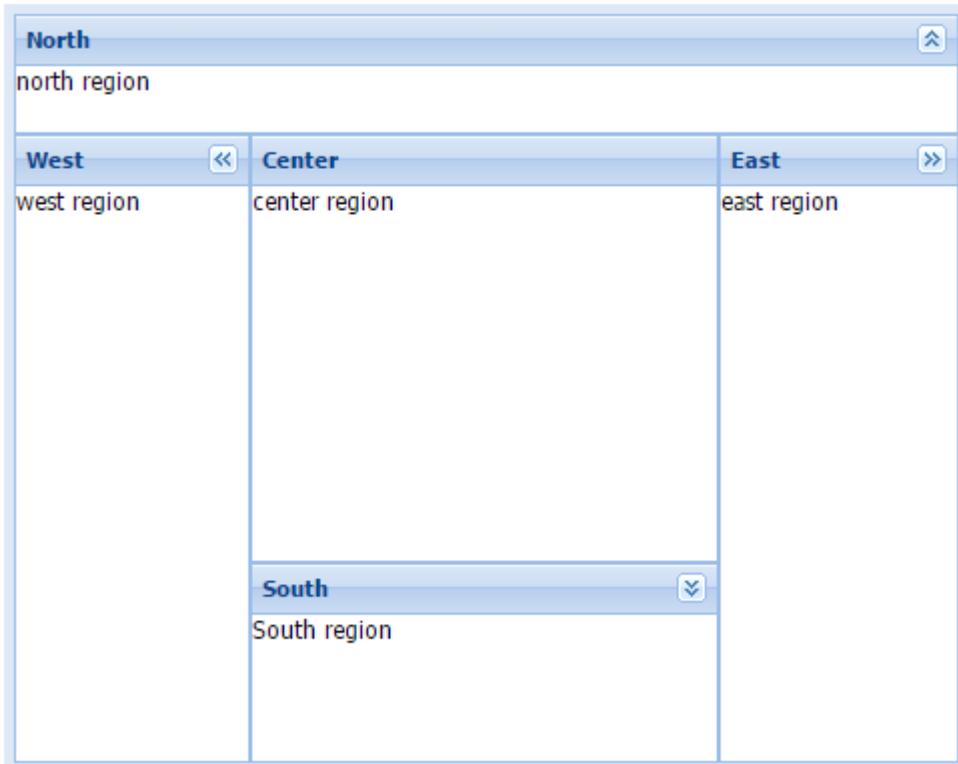
The content panel in the second row spans two columns.

When you select the Table layout you must also specify the number of columns in the table (in the Layout Properties tab). The panels are traversed “from left to right” – for example, the second panel in the table becomes the second in the row, the third panel becomes the first in the second row if the table has two columns or the third in the first row if the table has 3 columns. The following table shows the properties of the content panels for the picture above (the number of columns for the layout has been specified as 2):

Name	Width	Height	Column span	Row span
Main	250	100		
Panel2	250	100		
Panel3	520	100	2	
Panel4	250	100		
Panel5	250	100		

Border Layout

In a border layout the area of the container is divided into a fixed number of regions called 'centre', 'north', 'south' and 'west'. You must provide the contents of the centre region, whereas other regions are optional.

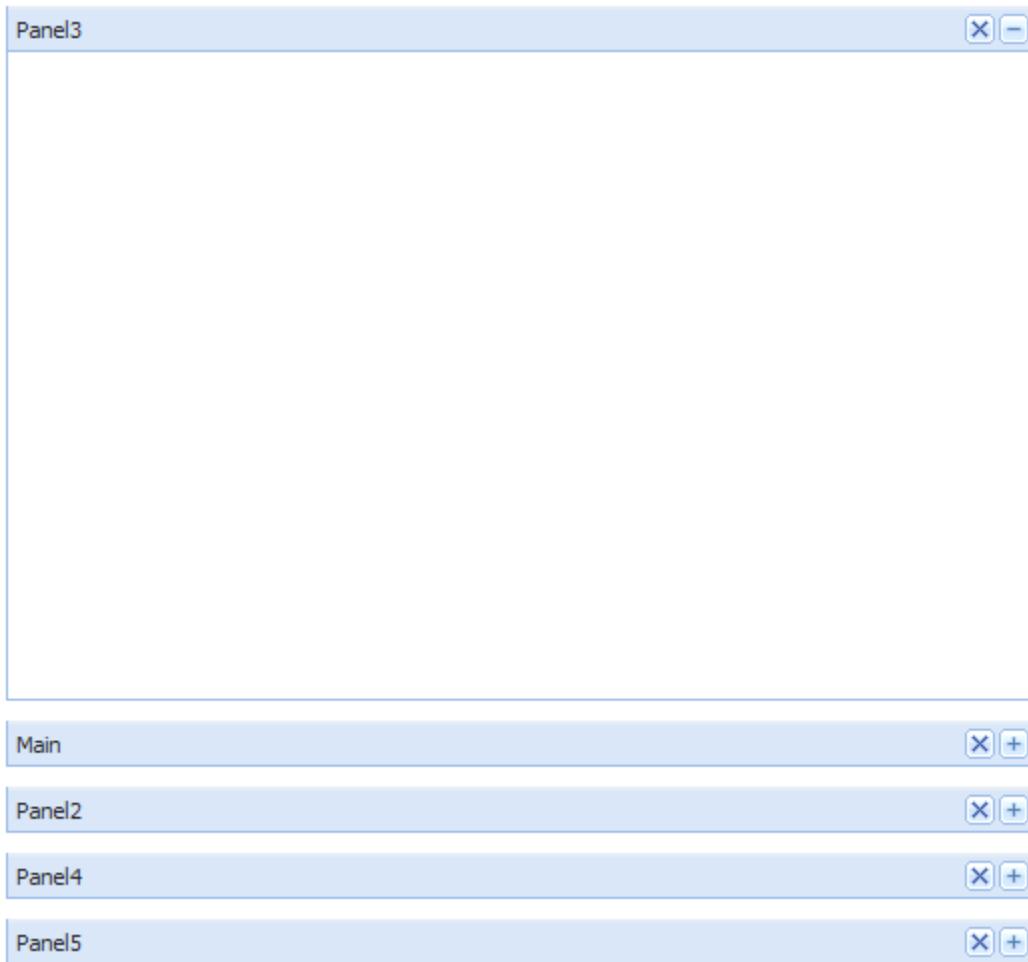


Accordion Layout

The Accordion layout is shown on the picture below:



Only one panel is active at a time, other panels are collapsed. When the user clicks on the “plus” icon to expand another panel it becomes active and is placed on top (see below):



Setting Menu Properties

The menu is the area of the screen in the Operation Mode where the user can select actions to be performed, such as starting a process, running a query, creating or modifying an instance of a business object etc.

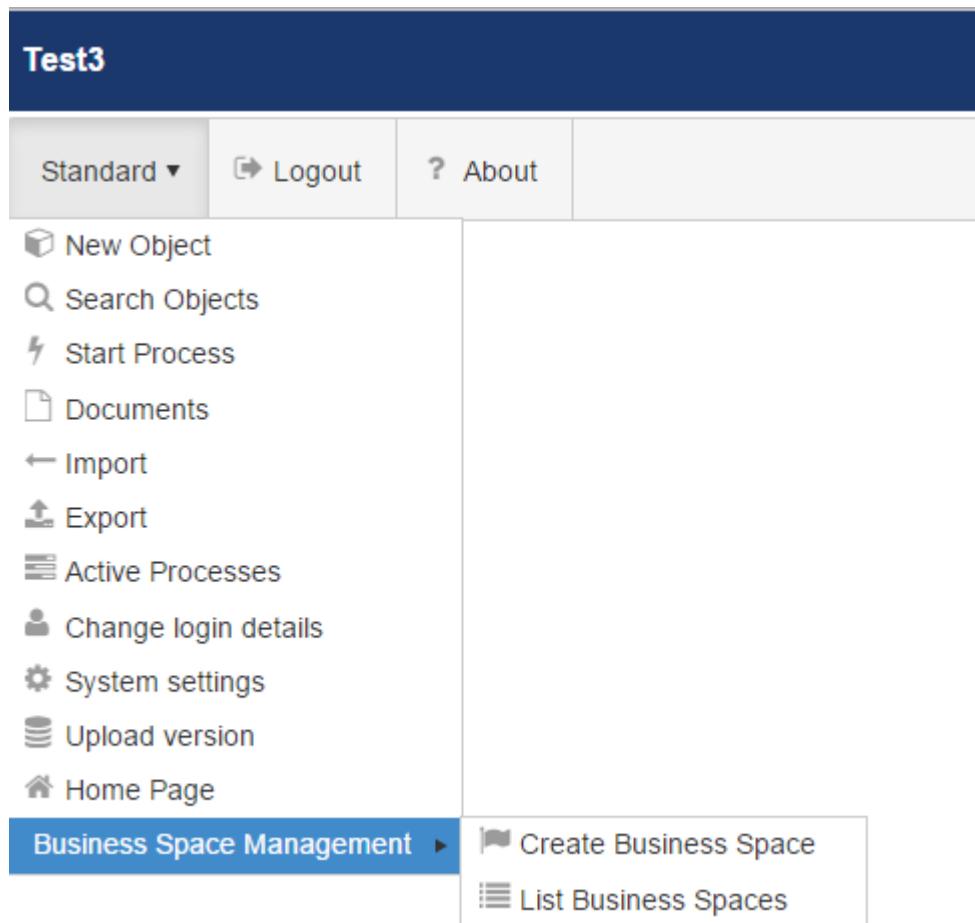
Some frames in a visual perspective (Top Bar, Left and Right) may contain a menu rather than tabs (you define this by specifying the “Displays” property of the frame). When you expand such a frame in the tree structure of the visual perspectives editor you see the entry for the menu. The following properties of the menu can be specified in the Selection Properties window when you select the menu entry:

Widget

Specify the type of the widget that will implement the menu. The following options are available:

Standard menu

This menu supports unlimited levels of hierarchy and can be vertical (if placed in the left or right frames) or horizontal (if placed in the Top Bar frame):



However you cannot add arbitrary HTML or input controls to this menu type.

Toolbar

This menu type supports only two levels of hierarchy, but it can include HTML items and input controls. It also supports right alignment of items:



This menu type can only be used in the Top Bar frame.

Panel Bar

This menu type also supports only two levels of hierarchy and can be used only in the left or right frames. Items of the second level pop down. You cannot use HTML or input controls for this menu:

The screenshot shows the Aware IM 8.4 application interface. On the left, there is a vertical **MENU** bar with the following items:

- Customers
- Communication** (selected, highlighted in blue)
- Find message
- Unsent e-mails
- Unsent letters
- Alerts
- Diary
- Staff
- Instant messaging
- Logout
- About

On the right, the main area displays a **Dashboard** with three tabs: **Dashboard**, **Customers**, and **Team Tasks**. The **Customers** tab is active. Below the tabs, there is a section titled **MOST ACTIVE CUSTOMERS** featuring four customer profiles:

Customer Profile	Name	Email Address	Number of Contacts
	Jane Allison	janec@hotmail.com	12 contacts
	Rosemary Flint	rosemaryf@gmail.com	9 contacts
	Francis McDougal	francism@gmail.com	9 contacts
	Leo Crawford	leoc@gmail.com	...

Tree

This menu type supports unlimited levels of hierarchy and can be used only in the left or right frames

The screenshot shows the Aware IM 8.4 application interface. On the left is a vertical navigation menu with the following items:

- Customers
- Communication
- Alerts
- Diary
- Staff
- Instant messaging** (selected)
- Who is online
- New message
- Broadcast
- Logout
- About

On the right is a dashboard area. At the top, there are three tabs: Dashboard (selected), Customers, and Correspondence. Below the tabs is a section titled "Company - this month" with a calendar view. The calendar shows the months of October and November. Key events are highlighted with yellow boxes and time labels:

	Mon	Tue	Wed
44	Oct 27, 2014		28
45		3	4 9:00am
46	10 6:00pm Night sh... +7 more	11 9:00am Server ... +3 more	
47	17	18	
48	24	25	
49	Dec 1	2	

Plain List

This menu type supports one level of hierarchy only. Can be useful for mobile phones menus.

Header

You can display a header above the menu (vertical menus only). Provide HTML of the header here

Footer

You can display a footer underneath the menu (vertical menus only). Provide HTML of the footer here

CSS class / CSS style

Customise the appearance of the menu further by assigning a CSS style or class to the menu. See the “How to use CSS” section in the How To Guide for more details.

Setting Menu Item Properties

A menu consists of menu items. You can add an item to a menu if you select the menu entry in the tree structure of the editor and click on the icon at the top of the editor. To delete the item click on the icon. The following properties of the menu item can be specified in the Selection Properties window:

Name

Specify the name of the menu item. Any text is acceptable.

Command

Click on this property to specify the command that will run when the item is selected. When you specify the command in most cases you also need to provide the settings specific to the selected command. The commands available and their settings are listed in the table below:

Command	Description of the action in the Operation Mode	Settings
Folder	The item represents a folder, which can only have child items and no actions.	None
Active Processes	Displays a list of the currently active processes (see Rules and Transactions).	None
Change Login Details	Brings up a form displaying attribute values of the currently logged in user so that she can change the login name, password etc.	None
Change Perspective	Switches visual perspectives by displaying the specified perspective.	Select the visual perspective to switch to from the list of perspectives defined in the business space version.
Configure User Defined Processes	This command is only available if the product includes the “User Defined Processes” option. This command allows administrators of the system to configure “User Defined Processes” module – define access levels and user friendly names of objects and attributes used in the module. For more details about user defined	None

	processes please watch the video tutorial .	
Create Business Space	Creates a new business space in the Operation Mode (see Working with Aware IM in Hosting Environment).	None
Create Document	Creates document(s) from the specified document template(s) (see Document Generation) If more than one document template is specified for this item Aware IM displays a choice of these document templates when the user selects the menu item. At run time the user will be able to define a query to be used as the data source for the resolution of tag expressions (see Document Generation)	Select the document template(s) to be used by the action by selecting them from the list of all document templates available in the business space version.
Create Object	Brings up a form for the specified business object to create a new instance of this object (see Business Object Form) If more than one business object is specified for this item Aware IM displays a choice of these business objects when the user selects the menu item.	Select the business object(s) to be used by the action by selecting them from the list of all business objects available in the business space version.
Create Process	Allows end users to define their own processes (“user defined processes”). This command is only available if the product includes the “User Defined Processes” option	None
Export	Exports instances of the specified business object into a file on disk (see Export and Import) If more than one business object is specified for this item Aware IM displays a choice of these business objects when the user selects the menu item.	Select the business object(s) to be used by the action by selecting them from the list of all business objects available in the business space version.
Execute Javascript	Executes the specified Javascript	Specify the Javascript to execute
Go Back	Goes back to the previous screen (especially useful for mobile phones).	None
Home Page	Displays the initial page (which is usually shown immediately after the	None

	user logs in) – see also Setting Main Page Properties .	
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[Other menu items](#)

Import	Imports instances of the specified business object into the system from a file on disk (see Export and Import) If more than one business object is specified for this item Aware IM displays a choice of these business objects when the user selects the menu item.	Select the business object(s) to be used by the action by selecting them from the list of all business objects available in the business space version.
Input Control	Allows adding text boxes and combo-boxes to the menu of the toolbar type.	Very similar to defining text boxes and combo-boxes for content panels with static HTML
List Business Spaces	Lists existing business spaces in the Operation Mode and allows deleting or changing properties of the selected business space (see Working with Aware IM in Hosting Environment).	None
List Business Space Versions	Lists all existing business space versions of the current business space in the Operation Mode and allows deleting or changing properties of the selected business space versions (see Working with Aware IM in Hosting Environment).	None
Locale Editing	Allow users to edit locale strings. This can be useful if end users need the ability to customise strings for their application. This command is only available if the product includes the “User Defined Processes” option. For more details about user defined processes please watch the video tutorial .	None
Login	Displays the screen allowing users to enter their credentials (user name and password) to log into the application.	None
Logout	Logs out of the application.	Specify the URL of the page that will be

		displayed after the logout is complete. By default this is the page that just shows a message that the logout has been completed.
Manage Import/Export Templates	This command allows end users to define their own templates for importing or exporting data in Aware IM . See this video tutorial for more details about import/export templates.	
Manage Import/Export Templates Events	For every run of import/export templates Aware IM creates an event. This command allows users to see these events. For more details about import/export templates see this video tutorial .	
Manage E-mail Templates	This command is only available if the product includes the “User Defined Processes” option. Allows end users to create, edit and delete e-mail templates to be used when defining their processes. For more details about user defined processes please watch the video tutorial .	None
Manage Queries	Allows end users to add, edit and delete their own queries (see Building Query in the Operation Mode).	None
Manage Processes	This command is only available if the product includes the “User Defined Processes” option. Allows end users to edit, delete, copy, export, import and lock their processes. For more details about user defined processes please watch the video tutorial .	None
Manage Process Events	This command is only available if the product includes the “User Defined Processes” option. Aware IM creates an event record every time a user-defined process is executed. This command allows users to view these records. For	None

	more details about user defined processes please watch the video tutorial .	
Publish Business Space Version	Uploads the business space version from a file into the Aware IM server in the Operation Mode (see Working with Aware IM in Hosting Environment).	None
Register User	Registers a new user. The action will bring up a form to fill out and create an instance of a user object when the form is submitted. This action may be useful for “guest” users who want to register with the system – see Adding/Editing Access Levels .	Select the business object (must be a member of the SystemUsers group) that will be created by the action.
Run Query	Runs the specified query and displays the instances found by the query (see Running Query in the Operation Mode) If more than one query is specified for this item Aware IM displays a choice of these queries when the user selects the menu item.	Select the query(ies) to be used by the action by selecting them from the list of all queries available in the business space version.
Run User Defined Queries	Allows end users to execute the queries they have defined (see “Manage Queries” operation above)	None
Run User Defined Processes	This option allows users to run processes that they define provided that the trigger of the processes allows running them from the menu. For more details about user defined processes please watch the video tutorial .	
Search Objects	Shows the screen which allows the user to search for all instances of the selected business object, run the existing query or build a new query (see Running Query in the Operation Mode).	None
Slide In Left Frame/Slide In Right Frame	These commands can only be used for the top bar frame. They are only applicable if you also define a menu for the left or right frames. When the user clicks on the button representing this menu item in the	None

	top toolbar Aware IM will slide-in the menu defined for the left or right frame. This method can be used for defining slide-in menus for mobile phones.	
Slide In Control Panel	This menu item can be very useful for implementing responsive applications. When the user clicks on the button representing this command Aware IM will slide-in the specified content panel from your visual perspective. This content panel can be displayed on big screens, but automatically hidden on smaller screens. Clicking the button on such smaller screens will slide-in the panel back into view.	You need to specify the panel that will slide in as well as the screen width. If the screen size is less than the specified width the panel will be hidden and the menu button will be automatically displayed. On bigger screens the panel will be visible and the menu button hidden.
Start Process	Runs the specified process. If more than one process is specified for this item Aware IM displays a choice of these processes when the user selects the menu item.	Select the process(es) to be used by the action by selecting them from the list of all processes available in the business space version.
System Settings	Creates a single instance of the SystemSettings object if it has not been created yet, or edits the existing instance.	None
Text	Allows adding arbitrary HTML to the toolbar menu.	Specify HTML to be displayed in the menu.
URL	Displays a page at the specified URL.	Specify the URL to go to as well as where to display the page.

Output

Specify where the results of the menu command will be displayed. The following options are available:

Default

The output will be displayed in the current tab.

New Tab

The output will be shown in a new tab (this requires that the “Always show tab” checkbox is ticked). **Aware IM** will create the tab automatically and the user will be able to close the tab whenever she wants.

Popup window

The output will be shown in a popup window. The user won’t be able to access elements of the screen outside the window until she closes the window.

Modeless window

The output will be shown in a modeless window. The user will be able to access all other parts of the system outside the window. The window can be resized, repositioned or closed at any time. The user can open as many modeless windows as she likes

Show Text

The text of the menu item is its name. You can turn its display on or off.

Show Icon

Specify the icon that will be displayed for the menu item (if any).

Condition when invisible

Specify a condition when the menu item is invisible. If you leave the condition blank, the menu item will always be visible. The condition must operate with the attributes of the currently logged in user, for example:

```
LoggedInUser.Role='Auditor'
```

This menu item will be visible for all users except those whose role has been assigned to “Auditor”.

Add separator after

Only for toolbars. If this option is selected the separator symbol will be displayed after this menu item.

Start right alignment

Only for toolbars. If this option is selected all subsequent menu items will be right-aligned

Expanded

For trees and folder items only. If this option is selected the folder item will be automatically expanded.

Put in overflow menu

Only for toolbars. If items of the toolbar do not fit on the available screen **Aware IM** will automatically display an “overflow” button and all items that do not fit on the screen will be accessible through this button. Using this option you can prevent certain menu items to be placed on the overflow button (in this case they will always be displayed irrespective of the screen size)

CSS class

You can customise the appearance of the menu item by assigning a CSS class to it. See the “How to use CSS” section in the How To Guide for more details.

Badge

Select this option to display a “badge” for the menu item (available for all types of menus except trees). A badge is a little icon on top of the menu button usually showing a number (for example, a number of unread messages for the current user). This number is constantly refreshed – it can be changed by the rules and the number will then be displayed. When specifying badge properties you have to define an expression for the number (or text) displayed on the badge (usually the value of the attribute that stores this number). You can then specify the background color of the badge as well as the refresh rate and tooltip.

Form and Grid Styles

When the Configurator creates a new query or a business object form, **Aware IM** automatically applies some default settings to the query or form – for example, it adds some default panel operations, a default panel header, turns on filters for the displayed attributes, displays a paging bar and so on. If the Configurator is not happy with some default settings he can manually change them.

However, if he wants most or all of his forms and queries not to have a header, for example, then he would need to do it every single time – for every new query or form. This can become quite tedious. This is where styles can help. Styles allow the Configurator to specify all the default settings for a query or form and then use them for

new queries or forms instead of the default factory settings. He can also assign a name to the style and then use a particular style when creating a form or a query. This is very similar to the concept of styles in MS Word, for example.

Styles can be defined by invoking the “Manage Styles” command from the Edit menu. There the user can define styles for queries represented by the standard form or for business object forms. The styles will appear in the editing toolbar of the system and the current style will be used when a new query or form is created. It is also possible to apply a style to an existing query or form by selecting the “Apply Style” command from the burger menu of the corresponding query or form.

For more details about form and grid styles watch the [video tutorial](#).

Creating Applications in Different Languages

Aware IM supports applications in different languages – you can configure your application to be in any language you like. Not only that, but you can also change the language dynamically or choose different languages for different users. By default **Aware IM** uses English. To define a different language you need to configure a *locale*.

This is how **Aware IM** works with different locales:

1. If you do not define your own locale an implicit “system” locale will be used. This locale will use strings defined in your configuration (attribute labels, description etc) as is. You can define your configuration strings in any language as long as your keyboard allows you to type them in. However, there are also “system” strings – the strings that are used in the application but not defined in the configuration (standard error messages, standard prompts etc). These strings will be in English.
2. When you define your own locale you can provide translation to *all* strings in the application – both system strings and configuration strings. **Aware IM** will automatically collect all strings used in the configuration and add predefined system strings, so that you can translate them all.
3. You can configure multiple locales – one for each language. You can also designate that a particular locale should be used “by default” – that is, the application will always start in this locale and all users will be assigned this locale by default. If you just need to run the application in one non-English language, this is all you need to do – define a non-English locale (or maybe a variation of the English locale) and mark it as the default locale.
4. If you configure multiple locales the user will be able to switch between locales at run-time if you include the [“Locale Selection” menu command](#) in your menu. You will also be able to assign different locales to different users by rules. Any member of the `SystemUser` business object group includes the `Locale` attribute that you can use in rules, for example:

```
IF RegularUser.Country = 'Germany' Then  
    RegularUser.Locale = 'German'
```

Aware IM will automatically use the locale with the name “German” when a user from Germany logs into the system.

See also:

[Adding/Editing Locales](#)

Adding/Editing Locales

The following section describes how to work with the editor of locales when adding a new locale or editing the existing one. Locales are described in the [Creating Applications in Different Languages](#) section.

The editor of locales can be started as described in the [Working with Configuration Elements](#) section. The working area of the locale editor contains a table of strings used in the application. When a locale is created for the first time **Aware IM** automatically extracts all strings used in the configuration and adds to them the system strings. You can provide translation to both configuration and system strings by clicking on the “Translation” column in the table. Initially the translation is set to “use the original string”, which means that if you do not provide a translation the original string will be used. Strings that have not been translated are displayed in pink. Translated system strings are displayed in green and translated configuration strings are displayed in white.

You can also click on the following buttons:

Import

This allows you to import system strings from a file. System strings for some locales are already provided. You can use those as an example for creating your own files for other locales.

Export

This allows you to export locale strings into a file

Refresh

If the configuration has been changed since you defined the locale you can refresh the strings – **Aware IM** will re-extract all configuration strings defined in the application and add the new ones to the table, so that you can provide translation to the newly added strings or delete those that are no longer used.

Delete

This allows you to delete strings that are no longer used in the application

The following properties of the locale be specified in the Element Properties window:

Name

Specify the name of the locale uniquely identifying it within the business space version.

Default

Tick this box if you want the locale to be used in the application by default – the application will start in this locale and all users will be assigned this locale unless changed by rules (see the [Creating Applications in Different Languages](#) section).

Date format

Select the date format of the locale. This format will be used for those attributes of the “Date” type that have “Take from locale” value set as their format (see [Adding/Editing Date Attributes](#))

Timestamp format

Select the timestamp format of the locale. This format will be used for those attributes of the “Timestamp” type that have “Take from locale” value set as their format (see [Adding/Editing Date Attributes](#))

Language of system messages

Some system messages (such as month names used in the calendar control, for example) have already been translated. You don’t need to provide translation for these messages, just select the language from the list of languages

Culture

Culture defines default formatting of numbers and dates. For example, in some cultures decimal point is represented by a dot, whereas in other cultures it is represented by a comma.

Right-to-left Support

Aware IM supports right-to-left orientation of the screen (RTL) for certain categories of users that require this. When a user with RTL support enabled logs in Aware IM automatically shows the screen in right-to-left orientation. All forms that the user sees will also support right-to-left input.

To enable RTL-support for a user make sure that the value of the RTL attribute in the user is set to Yes. The `RTL` attribute is a predefined attribute that is added by Aware IM automatically to all members of the `SystemUser` group. You can set the value of the `RTL` attribute by rules or explicitly from the user interface when the user record is created.

Adding/Editing Services

The following section describes how to work with the editor of services when adding a new service or editing the existing one. Services are described in the [Communication with Other Systems](#) section.

The editor of services can be started as described in the [Working with Configuration Elements](#) section.

You can define the following settings of the service in the working area of the editor:

Process

Select a process that will implement the service from a list of all processes defined in the business space version. When the service is requested the specified process will be executed. If the specified process requires input, this input must be provided by a service requestor.

SOAP/Web Services support

Choose this option if you want Aware IM to expose the service as “web service” implementing the SOAP protocol. When the business space containing such service is published Aware IM will automatically create a WSDL file for the service.

 **IMPORTANT:** After a business space version has been published the system administrator has to login into the Operation Mode to cause the deployment of a new or changed service and the creation of the WSDL file.

REST support

Tick this checkbox if the service is to be exposed as REST-ful service (REST-ful service does not need any special deployment and should be available as soon as the business space is published). If you tick this checkbox you will also need to provide REST settings (see below)

Service Reply

Service reply defines a business object or an array of business objects sent by a service provider as a reply to the service request. If you select the “Service will return object” radio button you will need to select the object that will be returned from the list of all objects. Your implementing process must populate the context with the instance(s) of the business object being returned. Tick the “Return multiple instances” checkbox to return an array of instances. Again your implementing process must populate the context with instances of the object to be returned.

The following properties can be specified in the Element Properties window:

Name

Specify the name of the service uniquely identifying it within the business space version. The following restrictions apply:

- The name of the service must be unique among the names of other services defined in the business space version.
- The name must start with a character or underscore symbol; all other symbols must be characters (including underscore symbol) or digits. Space symbols are not allowed.

Description

Specify any text that describes what the service does etc. Providing a description is not mandatory but is highly recommended. Any description if defined is included into the generated documentation for the business space version – see [Generating Documentation](#).

REST settings

If you ticked “Rest support” checkbox in the editor you will need to provide the following details:

Default URL mapping

Services exposed as REST will be called by other parties using a particular URL. If you choose the default option the default URL the other parties will have to use the default URL. It has the following format:

<http://ServerName:port/AwareIM/REST/BusinessSpace/ServiceName?parameters>

for example:

<http://myserver.com:8080/AwareIM/REST/CRM/Service1?param1=value1¶m2=value2>

URL must contain string

If default URL cannot be used you can construct your own URL by choosing this option and providing your own custom string. For example, if you provide the following string: someName1/someName2

the following URL can be used:

<http://ServerName:port/AwareIM/someName1/someName2?parameters>

 **NOTE:** If you choose this option you must also provide a file called rest.props and put it in the BIN directory of your Aware IM installation. The file must have a string that specifies the name of the business space containing REST-ful services, for example DOMAIN=CRM

Name mapping

If your REST-ful service is implemented by a process that takes some object as input (should only be one object) then values of attributes of this object have to be provided as parameters in the URL (see example above). The name of the parameters must match

the names of the attributes of the object. If this, however, is impossible for whatever reason, then you need to provide a mapping between the names of the parameters (“External Name”) and the name of the corresponding attribute. You should only do it for those parameters that have different names to the names of the attributes.

Reply Format

If a service returns a reply it can be either in the XML format (also Default) or in JSON format. The format can also vary depending on the URL used – the extension of the expected format can be specified in the URL itself. Choose the appropriate option here.

REST Handing of Undefined Values

This only applies to services exposed as REST-ful services. If values of the attributes of the returned object are undefined, you can choose how **Aware IM** will encode such values. By default **Aware IM** will skip undefined values (“Do not encode” option), but you can also encode an empty value or a particular string. You can also specify different encoding options depending on the name of the attribute.

Scheduling

Scheduling is configuration of special rules that execute processes or request services at a particular time interval. Each rule that executes such a process or service is called a *scheduling item*.

Scheduling items are added or edited by the editor of scheduling items, which is started as described in [Working with Configuration Elements](#). The editor of scheduling items is essentially the editor of a special rule collection. Working with it is very similar to working with the editor of standard rule collections as described in [Adding/Editing Rules](#) section. The only difference is in adding/editing of a single rule (which represents a scheduling item). The difference is that along with the Standard View tab (see [Adding/Editing Individual Rule](#)) of the editor looks different for the scheduling rules.

The following information can be specified on the Standard View tab of the scheduling rules editor:

Recurrence Pattern

Controls in this group box allow you to specify how often a process or service being scheduled is going to be executed:

Once

Select this radio button if a process or service is to be executed only once (you will also need to provide the date and time of this event (see Recurrence Range and Start Time below)).

Daily

Select this radio button if a process or service is to be executed every day starting and finishing on the dates specified in the Recurrence Range group box and at the time specified in the Start Time group box (see below).

Weekly

Select this radio button if a process or service is to be executed every week starting and finishing on the dates specified in the Recurrence Range group box and at the time specified in the Start Time group box (see below). You will also need to provide the day(s) of the week when the process or service is going to be executed by ticking the appropriate checkboxes.

Monthly

Select this radio button if a process or service is to be executed on the specified day of every month starting and finishing on the dates specified in the Recurrence Range group box and at the time specified in the Start Time group box (see below). You will also need to provide the day of the month when the process or service is going to be executed.

Yearly

Select this radio button if a process or service is to be executed on the specified day of the specified month of every year starting and finishing on the dates specified in the Recurrence Range group box and at the time specified in the Start Time group box (see below). You will also need to provide the month and the day when the process or service is going to be executed.

Recurrence Range

Controls in this group allow you to specify the starting and ending dates of the time period when the process or service being scheduled is going to be executed:

- *Start date* – you must provide the starting date of the recurrent pattern in the dd./MM/yyyy format (see Recurrence Pattern).
- *No end date* – select this radio button if a process or service is to be executed indefinitely according to its recurrence pattern.
- *End by* – select this option if you want to specify the end date when the process or service execution will end.

Start Time

You must specify the time of the day when the process or service is going to be started.

Actions

The options in this group box allow you to specify which process or service is going to be executed:

- *Start process* – select this option if you want to start the specified process. You will also need to select the process from the list of all processes defined in the business space version.

- *Call service* – select this option if you want to request the specified service of the specified service provider. You will also need to select the name of an intelligent business object providing the service and select the service to be requested.

Adding/Editing Business Spaces

Business space is explained in the [Business Space](#) section.

When **Aware IM** is installed one business space is created by default. The name of this business space is specified during installation. The elements that you define when configuring the application usually belong to this default business space. Sometimes, however, it may be necessary to define other business spaces – for example, if you are configuring several separate applications or if there are entities within the business that function more or less as independent units. In these cases you may need to create new business spaces and/or delete the existing ones. The following section describes how to do it.

To create a business space, follow the steps below:

1. Click on any existing business space in the Elements Tree.
2. Select File/New in the menu or right click and select “New” from the popup menu. The Business Space Dialog will be displayed.
3. Specify the following properties of a new business space in the Business Space Dialog:
 - a. *Name* – the name of the new business space. The name must be unique among the names of other business spaces. It must start with a character or underscore symbol; all other symbols must be characters or digits; space symbols are not allowed.
 - b. *Description* – a description of the new business space. Providing a description is highly recommended.
 - c. *Create options* – if you choose the “Create from sample application” radio button Aware IM will automatically import the file with the selected sample application into the business space version created with the business space.
 - d. *Database allocation options* – usually **Aware IM** database tables for business spaces are stored in the same database named BASDB (or BASDBTEST in the testing mode). Selecting the “Allocate separate database” radio button will force **Aware IM** to allocate a separate database for the business space. This can be useful if you host an application for several clients and you want data of your clients to be stored in separate databases.

- e. *Access to the new business space* – if you select the “Business space will be accessing to the current developer only” radio button, the new business space will be visible only to configurators who log into the currently active business space.
4. Press OK on the Business Space Dialog – the new business space will be displayed in the Elements Tree.

To edit the existing business space:

1. Double click on the node representing the business space in the Elements Tree or select the business space entry and choose “File/Open” from the menu.
2. Change the description and/or visibility options of the business space in the Element Properties window. Note that you cannot change the name of the existing business space.

To delete the existing business space:

1. Right click on the node representing the business space in the Elements Tree to bring up the pop-up menu.
2. Select “Delete” from the pop-up menu.

 **CAUTION:** Deleting a business space will delete all business space versions defined in the business space and all the operational data created by the users!

Setting Options for Incoming E-mail Handling

Quite often an application needs to process e-mails arriving to the business's e-mail address and perform certain functions automatically based on the e-mail contents. For example, a customer relationship management system might register all e-mails from customers in its database, assign a unique ID to the e-mails and automatically reply to customers with the details about their request.

In **Aware IM** it is possible to configure an application to process incoming e-mails and perform the necessary actions. As mentioned before all communication with the external parties in **Aware IM** is performed either via notifications or service requests (see also [Defining Intelligent Business Objects](#)). Incoming e-mails are no exception – **Aware IM** treats them as notifications sent to the **Aware IM** application via a special channel. Once incoming e-mails have been delivered to **Aware IM** as notifications **Aware IM** evaluates any rules attached to the notification as usual. It is up to the configurator to define the appropriate rules.

All that the configurator has to do to make sure that the application handles incoming e-mails is turn on the e-mail handling capability for the business space version, set the properties of the incoming e-mail channel and define the rules that deal with the incoming e-mail notification. This is explained in more detail below:

 NOTE: Starting from version 5.7 it is now possible to handle incoming e-mails dynamically from a process. To do this select the business space version in the Configuration Tree and select the “Add Incoming Email Account” object from the Edit menu. This will create a special object that stores values of the incoming email account. You can use instances of this object in the CONNECT FROM EMAIL action in a process. For more details see the CONNECT TO EMAIL and DISCONNECT FROM EMAIL actions in the Rule Language Guide.

To turn on incoming e-mail handling capability for a business space version follow the steps below:

1. Double click on the node representing the business space version to start editing it (or select File/Open from the menu).
2. Click on the “Incoming emails” property displayed in the Elements Properties window
The “Incoming E-mails” dialog will be displayed.
3. Specify the following properties in the “Incoming E-mails” Dialog:
 - a. Select the “The system will handle incoming e-mails” radio button to turn on the e-mail handling capability.
 - b. Select the “Use values below” radio button and provide the following values:
 - i. Specify the DNS name of the mail server that will receive e-mails in the Mail Host text box.
 - ii. Specify the credentials (the user name and password) of your account on the mail server.
 - iii. Specify the e-mail protocol supported by your mail server and the port number (check with your e-mail provider if not sure).
 - c. Alternatively you can select the “Use values from SystemSettings object” radio button. In this case the system administrator will have to provide the values for the DNS name, e-mail protocol and user credentials when the application is initialized – see [Setting Initial Values of the System](#).
4. Press OK on the “Incoming E-mails” Dialog.

The Configuration Tool will automatically add the following business objects and notification into the business space version:

IncomingEmail notification

This is the notification that represents an incoming e-mail. This notification has a special structure that you cannot change (you can define other attributes but you cannot change the existing ones). The attributes of the notification contain the properties of the received e-mail, such as who it is from, when it was received etc. Any rules that you want to

specify to handle incoming e-mails must be attached to the events of this notification – see [Adding/Editing Rules](#). You can check values of the pre-defined attributes of the notification in your rules and perform the appropriate actions.

To turn off the incoming e-mail handling capability for the business space version select the “Incoming emails” property of the business space version to bring up the “Incoming Emails” dialog and select “The system will not handle incoming emails” radio button.

Handling Login Events

It may be necessary for your application to execute certain rules when a new user logs in. For example, your application may collect the statistics of how many users are online or how many users have been using the application.

If you want to handle the login events in your application you need to define a special *login notification* and attach rules to this notification – see [Adding/Editing Rules](#).

To add the login notification to the business space version:

1. Right click on the “Notifications” node of the business space version in the Elements Tree to bring up the pop-up menu.
2. Select the “Add Login Notification” or “Add Login Notification Attempt” command from the pop-up menu (it will be greyed out if the login notification has already been added). A new notification with the pre-defined name `LoginNotification` or `LoginNotificationAttempt` will appear in the Elements Tree. The difference between the `LoginNotification` and `LoginNotificationAttempt` is that the first is sent when a user successfully logs into the system and the second one – when the user’s attempt to login fails.

The login notification has a special structure that you cannot change (you can define other attributes but you cannot change the existing ones). This structure includes the `LoginName` attribute. The value of this attribute contains the name of the current user. There is also the `RemoteAddress` attribute which contains the IP address of the user who tries to login. You can check the value of these attributes in the rules attached to this notification and perform appropriate actions if required.

To turn off handling of the login events in the business space version delete the `LoginNotification` from the Elements Tree – see [Adding/Editing Configuration Elements](#).

See also [Handling Logout Events](#).

Handling Logout Events

It may be necessary for your application to execute certain rules when a user logs out. For example, your application may collect the statistics of how many users are online or how many users have been using the system.

If you want to handle the logout events in your application you need to define a special *logout notification* and attach rules to this notification – see [Adding/Editing Rules](#).

To add the logout notification to the business space version:

1. Right click on the “Notifications” node of the business space version in the Elements Tree to bring up the pop-up menu.
2. Select the “Add Logout Notification” command from the pop-up menu (it will be greyed out if the logout notification has already been added). A new notification with the predefined name `LogoutNotification` will appear in the Elements Tree.

The logout notification has a special structure that you cannot change (you can define other attributes but you cannot change the existing ones). This structure includes the `LoginName` attribute. The value of this attribute contains the name of the user logging out. You can check the value of this attribute in the rules attached to this notification and perform the appropriate actions if required.

To turn off handling of the logout events in the business space version delete the `LogoutNotification` from the Elements Tree – see [Adding/Editing Configuration Elements](#).

See also [Handling Login Events](#).

Sending Outgoing E-mail

Many applications need to send e-mails – to their customers, internal staff etc. As described in the [Defining Intelligent Business Objects](#) section to send e-mails you need to define the party you are sending e-mails to as an intelligent business object and define the e-mail communication channel for this object – see [Setting Properties of E-mail Channel](#).

The actual e-mail sent to the external party represented by the intelligent business object must be a notification – see [Adding/Editing Notifications](#). It is up to you how you define the attributes of this notification and the rules that will be executed when this notification is created. However, you have to make sure that you define the following attributes in the notification representing an outgoing e-mail:

1. `Subject` – this attribute must be of the Plain Text type and must contain the subject of the e-mail.

2. Message – this attribute must be of the Plain Text type and must contain the body of the e-mail.
3. HTMLMessage – this attribute must be of the Document type. If value of this attribute is defined and contains valid HTML document, the email will be sent in HTML format rather than in a standard text format.
4. CC and BCC - these attributes represent copy and blind copy lists respectively. The email addresses in the list must be separated by a semi-colon. You can initialize the list from a list of references by using the [LIST LINE function](#).

You can also optionally add the EHeaders attribute to this notification if you want to add special headers to your email. The value of this attribute should be in the following format:

Header1#Header2#Header3...

where each header represents name and value in the standard header format:

Name: value

The Configuration Tool provides a convenience feature that creates the skeleton of the outgoing e-mail notification with all the required attributes automatically. You can use this feature to add the notification and then change it as you wish. To create the outgoing e-mail notification:

1. Right click on the “Notifications” node of the business space version in the Elements Tree to bring up the pop-up menu.
2. Select the “Add Outgoing E-mail Notification” command from the pop-up menu. The new notification with the name OutgoingEmail will appear in the Elements Tree.

Using the steps described above you can add as many outgoing e-mail notifications as you like. You can then change their names, add other attributes and/or attach creation rules – see [Adding/Editing Rules](#).

An email account that will be used when sending a notification is determined either from the SEND action itself or from the properties of the Email channel defined for the intelligent object if the account is not specified in the SEND action. An email account contains properties such as email server, port and authentication details.

If you want to use an email account directly in the SEND action you need to do the following:

1. Create the definition of the email account object in the Configuration Tool by selecting the Business Objects node in the tree and then choosing “Add Outgoing Email Account” menu command. This command will create the object with the required predefined attributes
2. Define the SEND action with the [USING syntax](#). The instance of the EmailAccount object is taken from the Context of the rule – exactly one instance of this object must be present in the Context

3. At runtime the user needs to populate the values of the EmailAccount object before invoking a process that uses the account in the SEND action.

Adding Appointment Objects

Some applications need to deal with issues that require a calendar – create appointments, register activities, arrange meetings etc. In **Aware IM** a business object encapsulating the concept of an activity that lasts a certain time is called “Appointment”. In order for **Aware IM** to be able to show such objects using a calendar the object needs to have certain attributes defined.

You can create a template of an Appointment object by selecting “Business Objects” node in the Elements Tree, bringing up the pop-up menu and selecting “Add Appointment Object” (you can also do it from the main menu). Once you do this **Aware IM** will automatically create a new definition of an Appointment-type object with the predefined attributes. You can re-name the object and add other attributes to this object, but you cannot change the predefined attributes. **Aware IM** will also create the Appointments business object group. All Appointment objects will be added to this group. Once an Appointment object has been created you can query on this object and display results using a calendar.

Working with Data Stored in Existing Database Tables or LDAP

As explained in section [Data Storage](#) **Aware IM** automatically creates, alters and deletes database tables. This is great when you want to create new applications, but what if you need to use existing data stored in database tables created by other software or in network servers such as LDAP? There are at least two scenarios when you might want to do this:

1. You have a legacy system that you want to completely transfer to **Aware IM**.
2. You have an existing database software system(s) (or network server) and you want to continue using this system, however, you also want to add an extension to this system to be managed by **Aware IM**.

For the first scenario the recommended approach is to configure a new application using **Aware IM** and then transfer the operational data from the legacy database into **Aware IM** using [Export/Import](#). For the second scenario you can get **Aware IM** to use the data stored in the existing database tables or network server by configuring business objects with persistence option “Database: existing external” or “LDAP” (see [Specifying General Properties](#)). With this approach you can configure new business objects managed automatically by **Aware IM** but also have business objects that will be shared between **Aware IM** and other software systems or network servers that already use the data. You

can get **Aware IM** to write to the existing database tables or network servers or you can only perform queries on such objects.

When you define a business object with the “Database: existing external” or “LDAP” persistence options **Aware IM** will automatically import columns of the required database tables or data definitions of the network server and convert them into business object attributes. You will not be able, however, to add your own attributes to such objects(except shortcuts to reference attributes).

For existing databases you will also need to designate one or more columns in the existing database tables as primary keys for the table that uniquely identify a record in the table (for example, a unique id of a customer or a combination of his first and last name etc). If you do not define a primary key for a table **Aware IM** will be able to perform queries on such tables but it will not be able to display details of particular records, insert new records or delete the existing ones. For a LDAP server you will need to specify a distinguished name of a sample record in the LDAP server for **Aware IM** to be able to read the data definition of the record.

As you can see this approach has certain limitations (they are summarized below) and is, therefore, only recommended when all other approaches are not practical. These limitations are the reason we recommend using export/import for the first scenario when you want to transfer a legacy system to **Aware IM**.

Limitations of using data stored in existing database tables or LDAP:

1. You can only use attributes automatically created by **Aware IM** from the database tables or network server. You cannot define your own attributes (except shortcuts).
2. Some types of database columns cannot be imported into **Aware IM**. **Aware IM** will ignore such columns.
3. If you do not define a primary key for imported columns **Aware IM** will not be able to display details of individual records, create new records or delete the existing ones.
4. You cannot mix objects with different persistence types in one query. For example, the query

```
FIND Order WHERE Order.Customer.Name = 'John'
```

will not work if `Customer` object is stored in the existing database.

5. The use of external tables and network servers can make the design of your application less portable as it will depend on specific connections to existing databases and network servers.

The rest of this section describes how to configure business objects that use existing database tables or LDAP server.

Defining Business Objects that Use Existing Database Tables

To get business objects to use existing database tables or views you need to select the “Database: existing external” option in the “Persistence” drop-down on the business object property editor (see [Specifying General Properties](#)). Then you need to provide the following details.

First you need to select the “database environment” that describes how to connect to the existing database. If there are no database environments yet you need to create one by clicking on the Add button next to the “Database” drop down. The details of this process are described later in this section.

After you select the database environment you need to specify the name of the table or view in the existing database that you want to use. Enter the name of the table or view into the “Table or view” text box. Then click on the “Discover Attributes” button. At this point **Aware IM** will automatically discover all database columns that the specified table or view has and convert them into the corresponding attributes. The results will be displayed in the “Attributes” table. If there are any database columns that could not be converted into attributes **Aware IM** will display the list of these columns.

If there are any “foreign key constraints” defined for the database table **Aware IM** will automatically recognize the constraints and create reference attributes corresponding to these constraints. If there are no foreign key constraints defined for the database table but you still want to treat one or more existing columns as foreign keys you can select the corresponding attributes and click on the “Foreign Keys” button. **Aware IM** will then create a reference attribute to replace the selected attributes.

You should then define a primary key for the table if **Aware IM** hasn’t recognized one automatically – check the attribute(s) that uniquely identify the record in the database table, for example, a unique id, unique surname, e-mail address etc. If you do not define a primary key **Aware IM** will be able to perform queries on the business object but will not be able to display individual instances, create new instances or delete the existing ones.

Once the primary key has been defined (automatically or manually) click OK and the discovered attributes will appear in the list of business object attributes. You can now use the business object in the usual way – define queries on the object, business rules, processes etc.

Defining Database Environment

To define a new “database environment” click on the Add button next to the “Database” drop down. This will bring up the “Database environment” dialog. First you need to specify the unique name of your database environment.

Then you need to select the database engine. **Aware IM** offers several pre-defined database engines to help you specify connection parameters. If your database engine is not among the pre-defined engines you need to select “Custom”.

When you select a particular database engine (a pre-defined one or custom) **Aware IM** displays connection parameters specific to this database engine. For example, for MySQL database you need to specify MySQL account credentials, machine name where MySQL server is running (if not local machine) and port where MySQL is listening for requests (if not the default one). If you need to specify connection parameters that are not included into this interface you need to select the “Custom” database engine and specify these parameters as part of connection URL string.

When you select the Custom database engine you need to make sure that you have the JDBC driver that allows connections to your database from Java. JDBC drivers exist virtually for all known databases. Many database vendors include JDBC drivers as part of their database offerings. If they don't you can almost always find a third party JDBC driver. JDBC driver is usually distributed as a file with a .jar extension. You need to put the jar file with the driver into the AwareIM/CustomJars directory (create the directory if needed) and restart Aware IM.

When specifying properties of the Custom connection you need to specify:

- Fully qualified name of the driver class (check documentation of your JDBC driver)
- Connection URL string (check documentation of your JDBC driver)

Defining Business Objects that Use Data from LDAP Server /Active Directory

To get business objects to use data stored in a LDAP server (or LDAP-compliant Windows Active Directory) you need to select the “LDAP” option in the “Persistence” drop-down on the business object property editor (see [Specifying General Properties](#)). Then you need to provide the following details.

First of all you need to select a particular LDAP server that you want to connect to. If there are no LDAP servers yet you need to create one by clicking on the Add button next to the “LDAP Server” drop down. The details of this process are described later in this section.

After you select the LDAP server you need to specify the LDAP distinguished name of a sample record in the LDAP server. The record must represent the data type that you want to create a business object for. For example, if you want to use data for users stored in your LDAP server you need to specify a distinguished name of any user stored in the LDAP server (such as uid=kurt,ou=People,dc=openldap,dc=org). Enter the distinguished name and click on the “Discover Attributes” button. At this point **Aware IM** will automatically discover data definitions stored in LDAP and convert them into the corresponding attributes. The results will be displayed in the “Attributes” table.

To speed up searches for the object you can also specify the distinguished name of the node under which all the data for the object resides in an LDAP server (if such a node exists). If you do not specify anything the entire LDAP tree will be searched.

Once you click OK the discovered attributes will appear in the list of business object attributes. You can now use the business object in the usual way – define queries on the object, business rules, processes etc.

Defining LDAP Server

To define a new “LDAP server” click on the Add button on the “LDAP Settings” dialog. This will bring up the “LDAP Server” dialog. First you need to specify the unique name of your LDAP server. Then you need to specify the credentials of your LDAP account (if you leave the values blank, an anonymous account will be used, provided that your LDAP server allows that). Then you need to specify the network name of your LDAP server and the port where it is listening to the requests.

Using LDAP/Active Directory for Login

 **NOTE:** This feature is only available for products that include the LDAP option.

Sometimes it is necessary to get Aware IM-based applications to use credentials of existing users in other systems for login rather than get **Aware IM** to store credentials in its own database. For example, if you already have an LDAP server or an Active Directory that stores corporate users you may want to get **Aware IM** to use the credentials of the existing users for logging into **Aware IM**, or even bypass **Aware IM** login altogether if a user is already logged in the other system.

To achieve this, the configurator has to perform the following steps:

1. Define an object that represents an LDAP user (see [Defining Business Objects that use the LDAP Server](#)) – the object must point to the user object in the LDAP Server/Active Directory
2. Create a regular **Aware IM** object that represents the logged in user. This object must be a member of the SystemUser group (see the [Access Level](#) section).
3. Create a reference to the LDAP object created at step 1 in the **Aware IM** object created at step 2
4. Create business rules that will determine the access level of the **Aware IM** object based on the data stored in the referenced LDAP object.
5. Start editing a business space version in the Elements Tree and then click on the “Login options” property in the Element Properties window to bring up the “Login Options” dialog. Then select the “Login will be managed by Active Directory/LDAP” radio button on the dialog and then indicate the names of the objects created at step 1 and 2 and the reference attribute created at step 3.

When a user logs in Aware IM-based system **Aware IM** will use the LDAP/Active Directory login rather than try to find the user in its own database. If LDAP/Active

Directory authenticates the user **Aware IM** will try to find the instance of the **Aware IM** object that corresponds to the user with the specified login name. **Aware IM** will automatically create such an instance if it does not exist yet and if such option has been set up in the LDAP Options dialog. This instance will then be used throughout **Aware IM** as a “logged in user”. The access level of such user will be determined by business rules created at step 4 above.

 **NOTE:** If LDAP users reside in different branches of Active Directory/LDAP server, you should create multiple LDAP objects – one per branch. You should list all these objects in the Login Options dialog. For each of the objects you need to provide the corresponding **Aware IM** object and the reference attribute in the **Aware IM** object to the LDAP object. You can also create a special group and add all these objects to this group and then specify the name of the group in the Login Options dialog, rather than specify each object individually. The group may only contain objects persisted in LDAP – it should not include objects with other types of persistence.

Bypassing Aware IM Login for Active Directory/LDAP Users

Aware IM login can be bypassed altogether by those Active Directory/LDAP users that are already logged in through LDAP/Active Directory. The configurators have to tick the “Allow Windows users to enter without logging in” checkbox on the “Login Options” dialog to allow this. **Aware IM** will automatically use the user that corresponds to the currently logged in user in the Active Directory/LDAP.

The users have to use the following URL to enter Aware IM-based system without logging in:

<http://localhost:8080/AwareIM/logonDirect.aw>

The above URL will use the default business space. It is also possible to indicate the name of the business space and testing mode flag using the following parameters: “domain”, “testingMode”, for example:

<http://localhost:8080/AwareIM/logonDirect.aw?domain=CRM&testingMode=true>

 **NOTE:** Only users accessing the system via corporate LAN can bypass the Aware IM login. Such users have to use the Internet Explorer browser and they should also enable initialising and scripting Active X controls not marked as safe for scripting in the security options of the Internet Explorer.

Login via social media sites and other applications

If users are already logged in some popular social media sites like Facebook or Twitter or other applications like Google they can log into their **Aware IM**-based applications

using the accounts of these applications. In order for them to be able to do this the configurator has to enable this functionality in the application.

To do this the configurator needs to select the business space version for editing and then click on the “Login Options” property to bring up the “Login Options” dialog as explained in the previous section. The configurator then needs to tick the appropriate checkbox, for example “Allow login via Facebook” and then click the Settings button to enter the appropriate parameters. For details how to do this please see the How To Guide.

Implementing Single Sign-on using SAML protocol

Aware IM supports single sign-on using the industry standard SAML protocol. Implementing this feature requires special setup (not included in the product by default), so if you want to implement this feature for your application please contact Awaresoft (support@awareim.com), which will send you required files with instructions how to install them. The Support Team will also explain how to integrate this feature with your application.

Generating Documentation

Once you have finished configuring your application you can get the Configuration Tool to automatically generate the documentation for it. The generated documentation is represented by a number of HTML pages, which include an overview page from which you can navigate to all other pages of the documentation. In addition you can generate a document in the Microsoft Word format (.doc).

Pages of the generated documentation contain descriptions of all business objects, processes, business rules and other configuration elements defined in the business space version. The description of any element contains all the information configured for the element – for example, the description of a business object contains the description of its attributes, services etc.

To generate documentation for a particular business space version:

1. Click on the node representing the business space version in the Elements Tree to select it and then select “Version/Generate Documentation” from the menu.
Alternatively right click on the node representing the business space version in the Elements Tree and select “Generate Documentation” from the pop-up menu.
2. In the Direction Selection Dialog that appears specify the directory where all the documentation files will be written.
3. After the Configuration Tool finishes generating the HTML documentation it will ask whether you want to generate the documentation in the Microsoft Word format.

4. To view the HTML documentation open the `configuration.html` file in the specified directory.

Show System Objects

Internally Aware IM uses certain business objects to implement some of its features, such as user-defined queries, processes and others. The configurator may need to add his own rules to these objects in order to fine-tune the behaviour of these features. In order to do this he has to select the business space version and then select the `Show System Objects` command from the Version menu. This is an option for advanced users only who fully understand how system objects work. The following table explains which system objects are used in **Aware IM**:

Object Name	Comments
BAS_UDCE	Configuration record for user defined processes
BAS_UDET	Email template for user defined processes
BAS_UDIE	Event record for import/export templates
BAS_UDIT	Import/export template
BAS_UDP	User defined process
BAS_UDPE	Execution event record for a user defined process
BAS_UserDefinedChoices	User defined attribute choices
BAS_UserDefinedDocument	User defined document
BAS_UserDefinedQuery	User defined query
BAS_User_Prefs	Saved user settings, such as grid columns, height, width etc

Searching Rules

The application that you configure may contain large number of rules so it is often necessary to find a particular rule. The Configuration Tool provides the feature that finds rules matching the specified criteria. You can search for rules implementing processes separately from rules attached to business objects.

To search for rules defined in a business space version:

1. Right click on the node representing the business space version in the Elements Tree (or the Rules node or the Processes node) to bring up the pop-up menu.
2. Select “Search Rules” in the pop-up menu. The Search Rules Dialog will be displayed.

3. Specify the following options in the Search Rules Dialog:

- a. Tick the “Process rules” checkbox if you want to include rules implementing processes in the search.
 - b. Tick the “Object rules” checkbox if you want to include rules attached to business objects in the search.
 - c. Tick the “By rule name” checkbox if you want to search for rules that have the specified text in their names. You must also provide the text to filter by, whether you want the search for the names to be case sensitive and whether you want to match the rules with the names exactly equal to the specified text or containing the specified text anywhere inside.
 - d. Tick the “By rule expression” checkbox if you want to search for rules that have the specified text anywhere in their textual expression. You must also provide the text to filter by, whether you want the search for this text to be case sensitive and whether you want to match rules with textual expressions exactly equal to the specified text or containing it anywhere inside.
4. Press the OK button on the Search Rules dialog. The Configuration Tool will display the results of the search in the Search window. You can go directly to the rule editor by double clicking on the rule in the window.

Searching Scripts and HTML

Advanced properties of many configuration elements may include Javascript. Some elements, such as forms or visual perspectives allow configurators to specify HTML. You may need to search for a particular string used inside these scripts or HTML. To do this:

1. Right click on the node representing the business space version in the Elements Tree to bring up the pop-up menu.
2. Select “Search Scripts/HTML” in the pop-up menu. The Search Dialog will be displayed.
3. Specify the string to search for and press OK. The Configuration Tool will display the results in the Search window. You can go directly to the element where the string is used by double clicking on the entry in the window.

Backing up and Restoring Operational Data

The operational data stored by a system is its most valuable asset. All precautions must be taken to preserve its integrity. It is highly recommended to perform regular database backups and certainly it is a very good idea to perform a backup before [publishing](#) a new business space version.

As backup and restore processes are quite sensitive it is also recommended to perform them when no one is using the system in the Operation Mode.

Aware IM uses two databases with the default names BASDB and BASDBTEST. These two databases need to be backed up on a regular basis. Generally it is recommended that the database backup be performed using the tools provided by the specific database used with **Aware IM**. In certain cases it is possible to perform a simple directory backup. For example, if the default Derby/Cloudscape database is used it is possible to backup the DATA directory located underneath the root directory of the **Aware IM** installation. To restore the data after the backup all you need to do is overwrite the DATA directory with the files from the backup.

 **NOTE:** If you are just doing development and do not care about current data, then all you need is a BSV, so make sure you always have the current BSV file whenever you do something make sure that you save your work. If something goes wrong during publishing the version the easiest solution is recreate a business space and re-import the BSV. This should always work fine as the BSV includes everything.

If you do have production data already that you care about then any publishing of a new BSV that involves changes to the database structure (business objects and attributes) should be considered a MAJOR EVENT. If anything goes wrong during the publishing operation you may lose your data. This is especially the case when you rename your objects/attributes and/or change the types of existing attributes.

So you need to prepare properly for this. Before you publish you need to export the current BSV (and the new one) and perform a FULL BACKUP of the current database.

IF ANYTHING GOES WRONG during publishing the first thing you need to do is RESTORE THE DATABASE FROM THE FULL BACKUP. NEVER DO ANY FURTHER WORK ON THE DATABASE THAT YOU ENDED UP WITH AFTER PUBLISHING ERROR.

The full restore should restore everything properly - there should be no report or any other errors. This is because the full snapshot of the database should include EVERYTHING THAT THE SYSTEM NEEDS to work properly.

Managing Configuration Users

When you install Aware IM for the first time the default administrator user of the Configuration Tool is created. The login name of this user is "admin" and the password is "password". Additional users of the Configuration Tool can be created using the "Manage Configuration Users" command under the Edit menu. When this command is selected the "Manage Configuration Users" dialog is displayed. In this dialog you can

add, delete and modify configuration users. When adding a configuration user the following properties can be specified:

- Login name
- Password
- Role (Administrator or Developer). The difference between administrators and developers is that developers cannot manage configuration users. Developers cannot put a business space version “in development” to start multi-developer mode and they cannot put version “in development” under test or publish it. For more details about the multi-developer mode watch the [Multi-Developer Mode video tutorial](#)
- Access to business spaces – an administrator can limit access to certain business spaces for different developers. If a developer has been disallowed access to a particular business space, this business space will not be visible to this developer in the Configuration Tool

Any user of the Configuration Tool can change his/her password by selecting the “Change Configurator Password” command under the Edit menu.

Working on the Same Business Space Version Concurrently (Multi-Developer Mode)

Several developers can work on the same business space version concurrently (this is called a “multi-developer mode”). In this mode developers lock (check-out) those elements of the version that they are working on (business objects, queries, processes etc). To make changes to the version they have to check-in their changes. To start the multi-developer mode a system administrator has to “put a business space version in development”. To do this:

3. Click on the business space version you want to put in development in the Elements Tree to select it
4. Select the “Version/Put In Development” command from the menu or right click to bring up the pop-up menu and select “Put In Development”.

For more details about the multi-developer mode please watch the [Multi-Developer Mode video tutorial](#).

Protecting Business Space Version

You can protect a business space version by password. When the business space version is protected, **Aware IM** will ask the configurator to provide the password before loading, importing or opening the business space version.

To protect the business space version:

1. Open the business space version you want to protect for editing by double clicking on it in the Elements Tree.
2. Click on the “Password protection” property in the Element Properties window to bring up the context menu and select “Protect”. The business space version protection dialog will be displayed.
3. Type in the protection password, re-type it to confirm and press OK.

To remove password protection of the business space version click on the “X” button on the “Password protection” property.

Comparing Business Space Versions

You can compare two business space versions and see a list of differences between the versions. To compare two business space versions:

1. “Load” both versions that you want to compare if they are not loaded already
2. Select the first business version in the Elements Tree.
3. Select “Compare...” under the “Version” menu item in the system menu or right click and select “Compare...” from the popup menu
4. Select the version that you want to compare with in the “Compare Versions” dialog
5. **Aware IM** will display a list of differences between the versions. If an existing element (business object, process, query etc) has been modified in one of the versions the entry for this change in the list of changes will have “View Differences...” link displayed next to the entry. When you click on this link **Aware IM** will show what has been changed for this element. The changes are displayed in an XML format.

Logging into the Operation Mode

You can log into the Operation Mode directly from the Configuration Tool – **Aware IM** will automatically launch the default Internet browser and show the login form for system administrators described in the [Full User Login, Interactive](#) section.

To login into the Operation Mode:

1. Select the Operation Mode Login command from the Tools menu.
2. **Aware IM** will launch the default browser and show the form to login as system administrator.

 **NOTE:** By default **Aware IM** will use the following URL to connect to the Operation Mode:

<http://localhost:8080/AwareIM/logon.jsp>

If your system uses a different URL (for example, if the Configuration Tool is running on a separate machine from the Aware IM Server) you can specify this URL in the Configuration Tool property file – see [Appendix A](#).

Re-connecting to the Aware IM Server

If the Aware IM Server went down for whatever reason during the configuration session it is possible to re-establish the connection once the server has been re-started. To do this:

1. Select the Reconnect command from the Tools menu.
2. Enter the credentials for logging into the Configuration Tool. Once the connection to the Aware IM server has been re-established the corresponding message will be displayed.

Undoing and Redoing Changes

You can undo and redo most changes to the business space versions that you perform while working with the Configuration Tool.

To undo the last change select Undo from the Edit menu or click on the  icon in the toolbar. To undo the change before last select Undo again and so on.

To redo the last change select Redo from the Edit menu or click on the  icon in the toolbar. To redo the change before last select Redo again and so on.

 **NOTE:** The following operations are not undoable:

[Updating Business Space Version](#)

[Testing Business Space Version](#)

[Publishing Business Space Version](#)

[Deleting Business Space Version](#)

[Creating new Minor or Major Version](#)

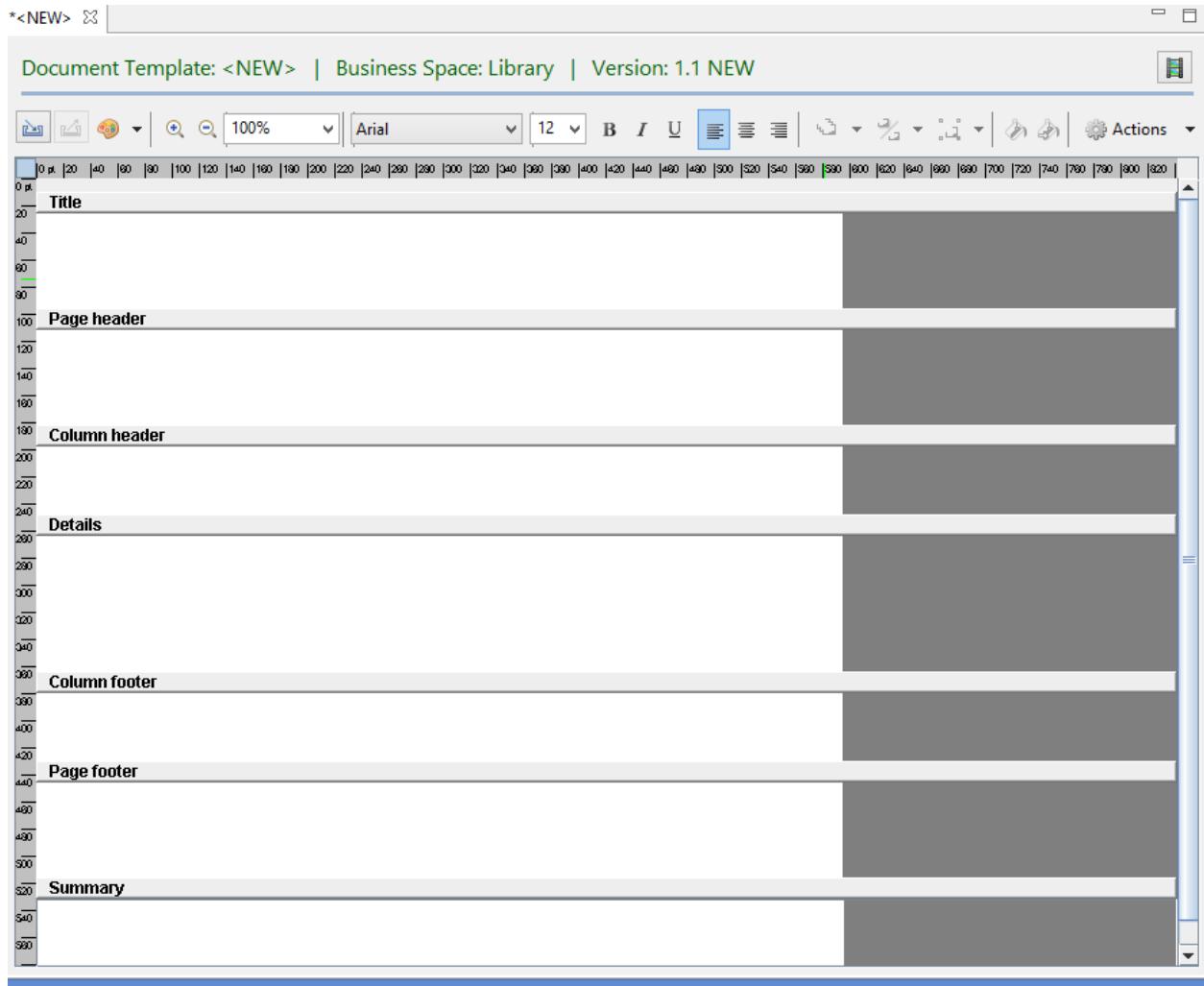
[Importing Business Space Version](#)

[Changing Description of Business Space Version](#)

[Creating, updating and deleting Business Space](#)

Working with Report/Presentation Designer

The Report/Presentation Designer is used to create a layout of document templates of the Report type (or simply reports – see [Adding/Editing Document Templates](#)) and presentations of business objects and business object groups (see [Defining Presentations](#)). When the Report/Presentation designer is started for a new report or presentation the screen looks like this:



The working area consists of the Design Area (shown as the white rectangle) and the Report Designer toolbar. There are also optional horizontal and vertical rulers. **Aware IM** also displays a special window (not shown on the picture above) that represents the “Outline view” of the report design, i.e. all elements that the report contains are listed in this window as textual entries.

The Design Area is broken into several sections or *bands* (they are shown as grey titled bars running across the Design Area). Each band has a special meaning and is processed in its own manner when the report or presentation is filled out with data at run time. Bands are explained in more detail in [Report/Presentation Bands](#). The report or

presentation is created by adding report/presentation elements to the appropriate bands in the Design Area – see [Adding Report/Presentation Elements](#).

Reports or presentations are filled out with data at run time when the documents are generated from document templates (see [Document Generation](#)). For reports the source of data is determined when a report is configured and for presentations the source of data is the instance(s) of the business object that owns the presentation. The resulting documents are in the Adobe PDF format for reports and in the HTML format for presentations. Because of the differences between the PDF and HTML formats handling of reports and presentations is slightly different. The differences are summarized below:

1. While it is entirely possible and sometimes desirable to overlap different elements in reports, it is not recommended to overlap elements in presentations – if you do only one of the overlapping elements will be shown.
2. The PDF format only uses a handful of default fonts – if you want to use a different font it has to be imported as a custom font (see [Adding Custom Font](#)). Presentations on the other hand being HTML pages will ultimately refer to the font available on the end user's machine; therefore you have to make sure that the end user's machine has the font that you use in a presentation.
3. The Baseline vertical alignment is available for text, tag and image elements in presentations but not in reports. This alignment corresponds to the baseline alignment in HTML. In order to use the baseline alignment effectively in presentations the sizes of rectangles of the elements to be aligned must be identical.

It is worth repeating the first difference as a caution because it may severely impact how a presentation design is created:

 **CAUTION:** When designing presentations make sure that presentation elements do not overlap (this applies even to lines – make sure that they do not intersect or start/end at the same point). If they do, only one of the overlapping elements will be shown.

See also:

[Report/Presentation Bands](#)
[Adding Report/Presentation Elements](#)
[Editing Report/Presentation Elements](#)
[Using Toolbar to Change Report/Presentation Elements](#)
[Setting Report/Presentation Properties](#)
[Setting Band Properties](#)
[Viewing Bands](#)
[Adding Custom Font](#)
[Finding Design Element](#)
[Aligning Elements](#)
[Positioning Elements in Band](#)
[Changing Size of Elements](#)
[Miscellaneous Commands](#)

Report/Presentation Bands

The following bands are defined in the Report/Presentation Designer:

Title

This band usually shows the title of a report or presentation. It is only processed once at the start of the report when the report or presentation is filled out with data at run time.

Page header and Page footer

A report or presentation may contain several pages (the size of a page is determined in the Report Presentation properties – see [Setting Report/Presentation Properties](#)). Elements of these bands are shown in the header and footer of each report/presentation page respectively.

Column header and Column Footer

The data shown in a report or presentation may be displayed as several vertical columns (the size and number of columns are determined in the Report Presentation properties – see [Setting Report/Presentation Properties](#)). Elements of these bands are shown in the header and footer of each column respectively.

Details

This is probably the main section of a report or presentation. Elements in the details band are repeated over and over again for different sets of data available in the data source at run time (see [Reports](#)). For example, if the details band contains elements that display values of the two attributes of a business object and at run time there are 5 instances of the business object (found by a query, for example) the elements in the details band will be repeated 5 times. Each time the band will be filled with attribute values of the corresponding instance. See also the picture in the [Defining Presentation](#) section for an example of a presentation design and the resulting document in the Operation Mode.

Group bands

The data of a report or presentation may be divided into groups. For example, each group may only show the data starting with a particular letter of the alphabet. The Group bands are explained in greater detail in the [Reports](#) section. See also the picture in the [Defining Presentation](#) section for the example of a presentation design that has one group defined (Product Category) and the resulting document in the Operation Mode.

Summary

This band usually shows the report or presentation summary. It is only processed once at the end of the report.

You can change properties of the bands or specify which ones are visible – see [Setting Band Properties](#) and [Viewing Bands](#).

Adding Report/Presentation Elements

Report or presentation may have the following elements:

Text

This element represents static text or a mixture of static text and tags (see [Reports](#)). To add a text element:

1. Click on the  icon in the toolbar and select “Text”.
2. Draw a rectangle in the appropriate band in the Design Area that will define the area occupied by the text or click anywhere in the Design Area to get the rectangle of the default size.
3. The text dialog will be displayed. Enter the text into the dialog. To include a tag expression, enter tag symbols explicitly. For example: Name is:
`<<Account.Name>>`

Tag

Tags are explained in the [Document Generation](#) section. To add a tag element:

1. Click on the  icon in the toolbar and select “Tag Expression”.
2. Draw a rectangle in the appropriate band in the Design Area that will define the area occupied by the tag element or click anywhere in the Design Area to get the rectangle of the default size.
3. The text dialog will be displayed. Enter the text of the tag expression into the dialog (do not include tag symbols). You can press F3 or F4 at any time to bring up the [Context Assistant](#).
4. Click OK on the dialog to complete the tag element. Note that the contents of the tag element will be validated at this point and if there is a problem an error message will be shown.

 **NOTE:** Aggregate operations, such as SUM, MAX, MIN etc when used inside tags in a report are calculated depending on whether they use conditions or not. Aggregate operations that do not use conditions operate only on objects iterated over in the report, whereas aggregate operations using conditions operate on all objects in the system. For example, if a report prints out all accounts with balance greater than 1000, the expression `<<SUM Account.Balance>>` will calculate the total balance of these accounts, whereas the expression `<<SUM Account.Balance WHERE Account.Balance > 500>>` will calculate the total balance of the accounts that are greater than 500 (even though the report only works with the accounts greater than 1000).

Rectangle

An element represents a rectangle. To add a rectangle element:

1. Click on the  icon in the toolbar and select “Rectangle”.
2. Draw a rectangle in the appropriate band in the Design Area.

Line

An element represents a straight line. To add a line element:

1. Click on the  icon in the toolbar and select “Line”.
2. Draw a line in the appropriate band in the Design Area.

Image

An element represents an image. To add an image element:

1. Click on the  icon in the toolbar and select “Image”.
2. Click on the spot in the appropriate band in the Design Area where the top left corner of the new image will be. The Report Designer will display the File Selection Dialog.
3. Select the file representing an image (must be a .gif or .jpeg format) and press OK. The new image element will be displayed in the Design Area.

Sub-report or Sub-presentation

This element represents a report or presentation that is embedded into the current report or presentation. To add a sub-report or sub-presentation:

1. Click on the  icon in the toolbar and select “Subreport” (the icon will be greyed out if there are no reports or presentations other than the current one in the business space version).
2. Draw a rectangle in the appropriate band in the Design Area that will define the area occupied by the sub-presentation or sub-report. The Report Designer will display the Sub-report/Sub-presentation dialog.
3. Specify the properties of the sub-report or sub-presentation as described in [Editing Sub-report/sub-presentation Element](#) and click OK. The new sub-report/sub-presentation element will be displayed in the Design Area.

Table

This element represents a table. Quite often tables can be used instead of sub-reports to show related records (such as line items of an order, for example) in a tabular fashion.

To add a table:

1. Click on the  icon in the toolbar and select “Table”.
2. Draw a rectangle in the appropriate band in the Design Area that will define the area occupied by the table. The Report Designer will display the Table dialog.
3. Specify the properties of the sub-report or sub-presentation as described in [Editing Table](#) section and click OK. The new table element will be displayed in the Design Area.

Barcode

This element represents a barcode. To add a barcode:

1. Click on the  icon in the toolbar and select “Barcode”.

2. Draw a rectangle in the appropriate band in the Design Area that will define the area occupied by the barcode. The Report Designer will display the Barcode dialog.
3. Select the type of the barcode and specify an expression that contains the code (a textual string) of the barcode, for example: <<Package.Code>>

QRCode

This element represents a QRCode element. To add a QRCode:

1. Click on the  icon in the toolbar and select “QRCode”.
2. Draw a rectangle in the appropriate band in the Design Area that will define the area occupied by the QRCode. The Report Designer will display the Barcode dialog.
3. Specify an expression that contains the code (a textual string) of the QRCode, for example: <<Package.Code>>

Conditional Element

A conditional element may be represented by any number of previously mentioned elements. A conditional element includes rules that define under which circumstances a particular sub-element will be included into the resulting document (see [Reports](#)). To add a new conditional element:

1. Click on the  icon in the toolbar and select “Conditional Element”
2. Draw a rectangle in the appropriate band in the Design Area that will define the area occupied by the conditional element. The Report Designer will display the Conditional Element dialog.
3. Specify the properties of the conditional element as described in the [Editing Conditional Element](#) section and click OK. The new conditional element will be displayed in the Design Area.

Chart Element

To add a chart element, do the following:

1. Click on the  icon in the toolbar and select “Chart”.
2. Draw a rectangle in the appropriate band in the Design Area that will define the area occupied by the chart element. The Report Designer will start the Chart Wizard that will help you design a chart. See the [Working with Charts](#) section for more details.

Page Break Element

When you insert a Page Break element Aware IM will start a new page at the spot where the break is inserted. To insert a Page Break element:

1. Click on the  icon in the toolbar and select “Page Break”.
2. Click on the spot in the Design Area where you want the new page to start.

Google Map

This element represents a Google Map that can show one or more addresses. Note that this element is only available for object presentations. An object or group that owns the presentation must have an attribute that stores the complete address or a reference to the special `MGeoLocation` object containing latitude and longitude of the location. To add a Google Map to your presentation:

1. Click on the  icon in the toolbar and select “Google Map”.
2. Draw a rectangle in the appropriate band in the Design Area that will define the area occupied by the Google Map. The Report Designer will display the Google Map dialog.
3. Specify the properties of Google Map and click OK. The new element will be displayed in the Design Area.

 **NOTE:** For details how to use the “Polygons” feature of the Google Map please refer to the How To Guide.

 **NOTE:** Some usages of Google Maps require you to create an account and specify a special key. If you need to provide a key for your Google Maps account you can do this in the predefined `GoogleMapsKey` attribute of the `SystemSettings` object.

Editing Report/Presentation Elements

To edit report or presentation elements:

1. Select one or more elements – see [Selecting Elements](#).
2. Move or scale the elements graphically see [Scaling and Moving Elements](#)
3. Click on the buttons of the toolbar to change certain properties of the elements, such as the background color, font settings (for text and tags) etc – see [Using Toolbar to Change Report Presentation Elements](#).
4. Alternatively change properties of the element(s) in the Selection Properties window – see [Changing Element Properties](#).

See also:

[Deleting Elements](#)

[Copying and Pasting Elements](#)

[Changing Element Properties](#)

Selecting Elements

To select a report/presentation element, click anywhere in the area occupied by the element or draw a rectangle around the element(s). When an element is selected the little black markers are displayed around the element. Alternatively find an element in

the Outline View window and click on its textual entry in this window. This will automatically select the element in the Design Area as well

 **NOTE:** If several elements are overlapping and you click on the overlapping area an element that was created last is selected. If you want to select a different element use “Bring To Front” and “Send to Back” commands – see [Miscellaneous Commands](#).

To select multiple elements within the same band:

1. Select one element using the technique described above.
2. Press down SHIFT or CTRL key to select other elements.
3. Alternatively press the mouse button on some point not occupied by any element and hold down the mouse button to drag a box around the elements you want to select. When you release the mouse button all elements enclosed by the box will be selected.

You can also move the selection between the elements of the current band.

1. To move the selection to the next element in the band (after the currently selected element), press the N key on the keyboard. If no element is selected the first element in the band will be selected.
2. To move the selection to the previous element in the band (before the currently selected element), press the P key on the keyboard. If no element is selected the last element in the band will be selected.

Once an element is selected you can scale or move it graphically (see [Scaling and Moving Elements](#)) or edit its properties using the Properties Selection window (see [Changing Element Properties](#)).

Scaling and Moving Elements

To scale a report or presentation element graphically:

1. Make sure that the element is selected – see [Selecting Elements](#).
2. Press the mouse button on one of the markers around the element and drag the marker to scale the selected element up or down. When you release the mouse button the element will be scaled. You can also hold down SHIFT key while dragging to make sure that scaling is proportional in both directions.

To move report or presentation elements:

1. Make sure that the elements are selected – see [Selecting Elements](#).
2. Press the mouse button anywhere inside the area occupied by any of the selected elements and drag the elements to a new position. When you release the mouse

button the elements will be moved. You can also hold down SHIFT key while dragging to constraint the movement in a horizontal or vertical direction.

 **NOTE:** You can also press the arrow keys on the keyboard to nudge the selected elements left, right, up or down.

See also: [Aligning Elements](#), [Positioning Elements In Band](#), [Changing Size of Elements](#).

Deleting Elements

To delete report or presentation elements:

1. Make sure that the elements are selected – see [Selecting Elements](#).
2. Press the Del key on the keyboard. Alternatively click on the  icon in the toolbar or select Delete from the Edit menu.

Copying and Pasting Elements

To copy report or presentation elements to the clipboard:

1. Make sure that the elements are selected – see [Selecting Elements](#).
2. Press Ctrl-C key on the keyboard. Alternatively click on the  icon in the toolbar or select Copy from the Edit menu.

To paste the elements from the clipboard:

1. Press Ctrl-V key on the keyboard. Alternatively click on the  icon in the toolbar or select Paste from the Edit menu.

Changing Element Properties

Once an element or elements are selected (see [Selecting Elements](#)) it is possible to edit them in the Selection Properties window.

Most properties are specific to the type of element being edited, however, some general properties are common for any element.

See also:

[Editing General Properties](#)
[Editing Text Element](#)
[Editing Tag Element](#)
[Editing Rectangle Element](#)
[Editing Line Element](#)
[Editing Image Element](#)
[Editing Conditional Element](#)

[Editing Sub-report/Sub-presentation Element](#)[Editing Table Element](#)[Working with Charts](#)**Editing General Properties**

The following properties are common to all elements being edited:

Size and Position

These properties include X and Y coordinates of the top left corner of the element's bounding rectangle (in points) and the width and height of the element's bounding rectangle (in points). Note that each point is 1/72 of an inch. You can use the rulers and grid to help you understand where the left top corner of the element's bounding rectangle is.

Colors and Style

These properties determine fill and outline properties of the element. Note that for some elements the fill properties are not applicable (for example, for lines) whereas for others – the outline properties are not applicable (for example, for sub-reports). The following options may be specified:

Fill color

Tick this box if you want the element to be filled with a particular color (if applicable). You must also select the color by pressing the Edit button and choosing the color in the Color Dialog. Note also that for text and tag elements this color is the background color of the text

Line color

Tick this box to specify the line color of an element (for rectangles an outline will be drawn around the rectangle; for text and tag elements this is the foreground color of the text). You must also select the color by pressing the Edit button and choosing the color in the Color Dialog. Note also that for text and tag elements this color is the foreground color of the text.

Line style

Select whether the line is solid or dotted (if applicable).

Line width

Select the width of the line in points (if applicable).

Position Type

There are three possible values for this property:

- **Float.** When this value is selected the element floats in its parent section if it is pushed downward by other elements found above it. It tries to conserve the distance between it and the neighboring elements placed immediately above it.
- **Fixed relative to top.** When this value is selected the report element simply ignores what happens to the other section elements and tries to conserve the y offset measured from the top of its parent report band.
- **Fixed relative to bottom.** If the height of the parent report band is affected by elements that stretch, the current element tries to conserve the original distance between its bottom margin and the bottom of the band.

Name

You can optionally specify the name of the element. The name can be used to find an element in the design – see [Finding Design Element](#). It can also be used by the report scriptlets (see [Setting System Calculation Properties](#)).

Stretchable

This property is only available for tag, line and rectangle elements. Tick this box if you want the element to automatically stretch downwards to make sure that all its contents are visible at run time. For example, you could define a tag element that refers to an attribute of a business object. At run time when the tag contents are replaced with the attribute value it is possible that the value occupies more space than the height of the tag element (for example, if the value represents a multi-line text). Ticking this box will make sure that the value is always visible no matter how high it is; otherwise only part of the text that fits into the original bounding rectangle of the element will be shown in the resulting document.

Editing Text Element

The following section explains how to set text specific properties.

Text

Specify the text of the element. Note that if the text element is specified as “calculated by the system” (see below) you cannot enter the text and the text control is disabled.

Font

Choose the font of the text from the combo box containing available fonts. Note that for reports the combo box contains the default fonts supported by the PDF format and any custom fonts added explicitly (see [Adding Custom Fonts](#)). For presentations the combo box contains all fonts installed on your system.

Font style

Select Regular, Bold or Italic font style.

Font size

Select the size of the font in points.

Underline

Tick this box if the text is to be underlined

Strikethrough

Tick this box if the text is to be strikethrough.

Transparent

Tick this box if the text background should be transparent.

Horizontal alignment

Select how the text should be aligned in the horizontal direction within its bounding rectangle. Choose between the Left, Right, Center and Justified alignments.

Vertical alignment

Select how the text should be aligned in the vertical direction within its bounding rectangle. Choose between the Top, Bottom and Middle alignments. Baseline alignment is also available for presentations (this alignment corresponds to the baseline alignment in HTML).

Line spacing

If the text consists of multiple lines select the Line Spacing property and specify line spacing of the text and its indentation.

Borders

If you want borders around the text click on the Borders property of the element and select the “Display Borders” radio button on the dialog. Then specify the following properties:

Border Type

Select Left, Right, Top or Bottom border to specify the properties of this border type. If this border type is not to be displayed tick the “Do not display this border type” checkbox. You can also click on the “Copy to All” button to copy the settings of this border type to all other border types.

Padding

Select the distance in pixels between the element and the border.

Border width, border color, border style

Select the width of the border in pixels, the color of the border and the style.

Rotation

You can specify rotation of the text as 90 degrees (Left), -90 degrees (Right) or 180 degrees (or Upside Down);

Hyperlink

This property is only available for presentations. Tick the box if you want the text element to represent a hyperlink. Clicking on the hyperlink in the resulting document in the Operation Mode will invoke an action as specified in the properties of the hyperlink. To set the properties of the hyperlink press the Details button next to the “Hyperlink” checkbox and set the properties in the Hyperlink dialog – see [Setting Hyperlink Properties](#).

Auto-calculated

Define this property if the text element is calculated by a scriptlet plug-in (see “Aware IM Programmer’s Reference”). In this case you may not specify the text of the element explicitly. You must also specify the scriptlet’s settings – see [Setting System Calculation Properties](#).

 **NOTE:** The text of the element may contain a mixture of static text and tag expressions, for example “Account balance is <>Account.Balance<>”. Alternatively such text may be split into the text element (“Account balance is”) and the tag element (“Account.Balance”). It is more tedious to split the text into text and tag elements, however it may be necessary if, for example, the tag element represents a separate hyperlink.

Editing Tag Element

Setting properties of a tag element is very similar to setting properties of a text element – see [Editing Text Element](#). The differences are summarized below:

1. You can press F3 and F4 at any time when specifying text of the element (tag contents) to bring up the [Context Assistant](#).
2. It is not necessary to include the tag symbols (“<<” and “>>”) in the text of the element.
3. The text of the element is validated for syntax errors when you press OK on the dialog.
4. The “Auto-calculated” property is not applicable for tag elements.
5. You can set the **Evaluation Details** property of the tag element. This property is only applicable when the contents of the tag represent a report specific expression (such as ELEMENT_COUNT function or an aggregate expression without a condition - see [Reports](#)). The property determines when the expression inside the tag is going to be calculated at run time. The following options are available:

At the end of the report

Select this option if you want the calculation to be performed only once at the end of the report or presentation. If, for example, the ELEMENT_COUNT function is used in the tag expression, the result of the calculation will be the total number of elements in the report.

At the end of each page

Select this option if you want the calculation to be performed at the end of each page of the report or presentation. If, for example, the ELEMENT_COUNT function is used in the tag expression, the result of the calculation will be the number of elements on each page in the report.

At the end of each column

Select this option if you want the calculation to be performed at the end of each column of the report or presentation. If, for example, the ELEMENT_COUNT expression is used in the tag expression, the result of the calculation will be the number of elements in the report column.

At the end of the group

Select this option if you want the calculation to be performed at the end of the specified group. If, for example, the ELEMENT_COUNT function is used in the tag expression, the result of the calculation will be the number of elements in the group. You must also select the name of the group.

Setting Hyperlink Properties

Text, tag or image elements used in presentations can represent a hyperlink. When the user clicks on this hyperlink in the Operation Mode the action specified in the hyperlink properties will be performed. The following section explains which properties can be specified in the Hyperlink dialog.

To specify the properties of the hyperlink you need to select the type of the operation (action) and specify parameters specific to each operation type. The following operation types are supported:

Start Process

This operation type starts a process selected from the list of processes defined in the business space version. If the process has [input](#) then you may need to provide the value for this input. Two scenarios are possible:

- If the object defined as the process input is the same as the owner of the presentation, you don't have to do anything, as the system will automatically provide the input when the process starts.
- If the object defined as the process input is different from the owner of the presentation, then you must specify the input in the "Value" column of the "Process Input Table". Click on the appropriate cell in the "Value" column and enter the process input as the reference attribute of the presentation owner. For example, let us assume that we are creating a forum management system where we have the

Topic and a Forum objects defined. The Topic object has a single reference attribute named Forum that refers to the Forum where the Topic belongs. Let us assume also that we are editing the presentation of the Topic object and we want to define a hyperlink that starts the PostNewTopic process, which allows posting a new topic from the presentation of the existing one. Let us assume that the PostNewTopic process requires Forum object as its input. When defining the hyperlink we would define an operation that starts the PostNewTopic process and we would specify Topic.Forum in the “Value” column of the Process Input Table as process input (note that Topic is the owner of the presentation we are editing).

Edit Business Object

An operation of this type brings up a form to edit the specified instance of the business object. You need to select the instance of the business object to be edited from the following options:

- *Owner of the presentation being edited* – this is the current instance of the business object displayed by the presentation.
- *Determined by contents of the tag* – specify the expression identifying the instance of the business object. This is useful when you want to edit instances of the business objects referred to by the current instance, for example, Transaction.Account.
- *Determined by contents of the current tag* – this option is available for tag elements only. It indicates that the instance of the business object is determined by the contents of the tag element.

Run Query

An operation of this type runs the specified query. You will need to select the query to run from the list of queries defined in the business space version. Note that the instance of the presentation owner may be referred to dynamically by the query (see [Configuring Queries](#)).

View Presentation

An operation of this type shows the specified presentation of the specified instance of the business object. You will need to define the business object that owns the presentation to be viewed (see the Edit Business Object operation for the explanation how to do it) and then select the presentation to view.

Delete Business Object

An operation of this type deletes the specified instance of the business object. You will need to define the business object to delete (see the Edit Business Object operation for the explanation how to do it).

Link to URL

An operation of this type navigates to the specified URL. You will need to select the instance of the business object to be edited from the following options:

- *Specify* – specify the URL to navigate to

- *Determined by contents of the tag* – specify the expression identifying the URL. This is useful when you want to navigate to the URL which is determined from the value of the Plain Text attribute of some business object, for example, Person.HomePage
- *Determined by contents of the current tag* – this option is available for tag elements only. It indicates that the URL is determined by the contents of the tag element.

 **NOTE:** if a tag element in a presentation refers to an attribute of the Document type the hyperlink for this tag is automatically generated in the Operation Mode even if the tag element does not define it. When a user clicks on this hyperlink the document stored in this attribute is shown in a separate browser.

Setting System Calculation Properties

Text elements and images can be specified as “auto-calculated”. This means that there is a report/presentation scriptlet plug-in that is executed at run time to calculate the contents of the text or image element (see “Aware IM Programmer’s Reference”). When you specify that a tag or image element is calculated by such a scriptlet you also need to specify the calculation module of the scriptlet. The calculation module is the fully qualified name of the scriptlet component (that must be written in the Java Programming Language) - for example, “com.mysystem.myscriptlets.Scriptlet1”.

Editing Rectangle Element

The Element Properties dialog for a rectangle element only contains general properties – see [Editing General Properties](#).

Editing Line Element

The Element Properties dialog for a line element only contains general properties – see [Editing General Properties](#).

There is one difference – the “Size and Position” group box for a line element contains the coordinates of the starting and ending points of the line, instead of the coordinates of the top left corner of the bounding rectangle and width/height as for other elements.

Editing Image Element

Loaded from file

Select this option if the image is loaded from a file rather than calculated by the system (see below). Press the Browse button to specify the image file (must be gif or jpeg format).

Borders

If you want borders around the image click on the Borders property of the element and select “Display borders” radio button. The values you need to specify are the same as for the borders of the text element.

Auto-calculated

Select this option if the image element is calculated by a scriptlet plug-in. You must also specify the scriptlet's module – see [Setting System Calculation Properties](#).

Horizontal alignment

Select how the image should be aligned in the horizontal direction within its bounding rectangle. Choose between the Left, Right and Center alignments.

Vertical alignment

Select how the image should be aligned in the vertical direction within its bounding rectangle. Choose between the Top, Bottom and Middle alignments. The Baseline alignment is also available for presentations (this alignment corresponds to the baseline alignment in HTML).

Hyperlink

This property is only available for presentations. Define this property if you want the image element to represent a hyperlink. Clicking on the hyperlink in the Operation Mode will invoke an action as specified in the properties of the hyperlink. To set the properties of the hyperlink press the Details button next to the Hyperlink checkbox and set the properties on the Hyperlink dialog – see [Setting Hyperlink Properties](#).

Editing Conditional Element

Conditions

The conditions of the elements are specified using the Conditions table which has two columns – “Condition” and “Element”. To set the conditions identifying when the element is going to be printed specify the condition directly into the “Condition” column. To set the properties of the element that will be printed when the condition holds click on the “Set Report Element” button to bring up the “Report Element” dialog. In this dialog select the type of the element to be printed and then specify its properties.

As an example let us assume that we are designing a presentation of an Account business object and we want to show the account balance in green if it is greater than 100 and in red if it is less than 100. To do this we need to define a conditional element. The condition table of this element will define two elements – both elements will be tag elements containing the `Account.Balance` expression. We will set the foreground color of the first tag element to be green and the second one – to be red. In the condition cell of the first element we will specify the following expression: `Account.Balance >= 100` and in the condition cell of the second element we will specify `Account.Balance < 100`.

Collapse height

Tick this box if you want to collapse the element if nothing is printed. It is possible that after evaluating conditions of a conditional element at run time no element is printed into the document at all. In this case the area occupied by the conditional element can be left

blank (if the checkbox is not ticked) or it can collapse and leave the space for other elements.

See also the Attach Conditions command in the [Miscellaneous Commands](#) section.

Editing Sub-report/Sub-presentation Element

Subreport (sub-presentation) Settings

Click on this property to bring up the “Subreport Settings” dialog. Define the following settings on this dialog:

Query

You must specify the query that will be used as a data source for the sub-report or sub-presentation. Note that this query may use the current instance of the business object being processed in the main report as a dynamic value (see [Configuring Queries](#)). For example, if the main report shows instances of the `Account` object and the sub-report shows instances of the `Transaction` object that belong to the account the query might look something like this:

```
FIND Transaction WHERE Transaction IN Account.Transactions
```

To specify a query press the Query button on the dialog and enter the properties of the query as described in [Adding/Editing Queries](#).

Subreport(sub-presentation)

Select the name of the sub-report or sub-presentation from the list of other reports available in the business space version or the list of other presentations of the business object.

Report (presentation) parameters

If the report or presentation requires any parameters the names of these parameters will be displayed in the Parameters table (see also [Reports](#)). You must provide the values of these parameters by clicking on the Parameter expression cell in the table and typing in the values directly into the cell.

Query

You must specify the query that will be used as a data source for the sub-report or sub-presentation. Note that this query may use the current instance of the business object being processed in the main report as a dynamic value (see [Configuring Queries](#)). For example, if the main report shows instances of the `Account` object and the sub-report shows instances of the `Transaction` object that belong to the account the query might look something like this:

```
FIND Transaction WHERE Transaction IN Account.Transactions
```

To specify a query press the Query button on the dialog and enter the properties of the query as described in [Adding/Editing Queries](#).

“When there is no data” options

These options refer to a situation when the sub-report or sub-presentation has no data to show (for example, the Account object has no transactions yet). You can select the following options:

- *Print nothing* – select this radio button if you do not want to print anything.
- *Print all except detail section* – select this option if you would still like to print the title and/or summary of the sub-report or sub-presentation (the Detail band will not be printed at all as there is no data).

Editing Table Element

Properties of this element are specified on the Table Element dialog.

Data Source

You can select either “Use data of the report/presentation” or “Run sub-query” radio buttons. Usually you will select the “Run sub-query” option to specify the query extracting related records. For example, to embed a table of line items into a report/presentation of an order you would define a query that looks something like this:

```
FIND LineItem WHERE LineItem IN PurchaseOrder.Items
```

The text of the query should be specified in the textbox next to the radio-button.

Table Columns

Here you define the columns of the table.

Tag Expression

Specify which attribute the column will show as a tag expression. If you defined a sub-query as data source the expression should start with the name of the object retrieved by the sub-query, for example, <<LineItem.Price>>

Column Name

Name of the column that will be shown in the table

Width

Width of the column in pixels

Alignment

Alignment of the column header and data in the column

Apearance

In this section you should specify how the table will look like.

Background Color

Specify background color of the cells in either the header of the table or the data section of the table.

Height

Specify height in pixels of either the header of the table or the data section of the table.

Font

Specify font of the cells in either the header of the table or the data section of the table.

Border Color

Specify color of the table's border

Border Style

Specify the style of the border by clicking the appropriate button.

Using Toolbar to change Report/Presentation Elements

You can use the report/presentation toolbar to change certain properties of the selected elements.

Make sure you select the elements that you want to change the properties of – see [Selecting Elements](#).

Font

To change the font of the selected elements select the required font in the font combo box in the toolbar. This applies only to text elements, tag elements and conditional elements that define text elements in their conditions. If no elements are selected pressing this button will set the font to be used for new text and tag elements.

Font Size

To change the font size of the selected elements select the required size from the font size combo box in the toolbar. You can also type the size directly into the size text box and press Enter. This feature applies only to text elements, tag elements and conditional elements that define text elements in their conditions. If no elements are selected pressing this button will set the font size to be used for new text and tag elements.

Bold

To change the boldness of the font of the selected elements click on the **B** icon in the toolbar. This applies only to text elements, tag elements and conditional elements that define text elements in their conditions. If no elements are selected pressing this button will set the bold property to be used for new text and tag elements.

Italics

To change the italics property of the font of the selected elements click on the **I** icon in the toolbar. This applies only to text elements, tag elements and conditional elements that define text elements in their conditions. If no elements are selected pressing this button will set the italics property to be used for new text and tag elements.

Underline

To change the underline property of the font of the selected elements click on the **U** icon in the toolbar. This applies only to text elements, tag elements and conditional elements that define text elements in their conditions. If no elements are selected pressing this button will set the underline property to be used for new text and tag elements.

Left alignment

To make the selected elements left aligned click on the **≡** icon in the toolbar. This applies only to text elements, tag elements, images and conditional elements that define

text elements or images in their conditions. If no elements are selected pressing this button will make sure that any new text or tag element will be left aligned.

Center alignment

To make the selected elements center aligned click on the  icon in the toolbar. This applies only to text elements, tag elements, images and conditional elements that define text elements or images in their conditions. If no elements are selected pressing this button will make sure that any new text or tag element will be center aligned.

Right alignment

To make the selected elements right aligned click on the  icon in the toolbar. This applies only to text elements, tag elements, images and conditional elements that define text elements or images in their conditions. If no elements are selected pressing this button will make sure that any new text or tag element will be right aligned.

Setting Report/Presentation Properties

The properties of the report or presentation can be specified in the Element Properties window. The following properties can be specified:

Report size

You can select the size of the page from a list of pre-defined sizes in the “Sizes” combo box. When you select the pre-defined size its width and height will be displayed in the “Width” and “Height” properties (you cannot edit width and height of the pre-defined size). You can also select the “Custom” size in which case you will be able to specify the width and height of the page in points

Report orientation

Choose either portrait or landscape orientation.

Margins

Specify margins between the edges of the page and the design from the top, bottom, left and right in points. You will not see the margins in the Design Area but you will see them in the resulting document.

Columns

Specify the number of vertical columns in the report or presentation as well as the width of each column and spacing between columns in points.

Report layout

Specify whether the report or presentation layout will be vertical or horizontal. In the vertical layout data elements iterated in the iterative bands (all bands except Summary and Title) are laid out vertically – each next item is placed below the previous one (see the [Defining Presentation](#) section for an example of such a layout). In the horizontal

layout elements in the iterative bands are laid out horizontally – each next item is placed next to the previous one unless there is no more horizontal space on the page.

Setting Band Properties

To set the properties of a report/presentation band (see [Report/Presentation Bands](#)), click on the band's bar in the Design Area. The properties of the selected band will be displayed in the Selection Properties window. The following properties of the band can be specified:

Name

Specify the name of the band. This name is shown in the band's bar in the Design Area. You can only define the names of the group bands that you add to the design yourself (see [Viewing Bands](#)). You can't change the names of the pre-defined bands.

Height

Specify the height of the band in points. Note that you can also drag the band's bar in the design area to change the height of the bands on both sides of the bar being dragged.

Start new page

This option is only applicable to the Title, Summary and group bands. If this box is checked the elements of the band will be printed on a new page in the resulting document.

Visible

Selecting this option will toggle visibility of the band in the Design Area (see [Viewing Bands](#)). It does not affect the presence of the band in the resulting document.

Start new column

This option is only applicable to group bands. If checked indicates that when a new group is started a new column should be started as well.

Reprint header on each page

This option is only applicable to group bands. If checked indicates that the group header should be printed not only at the start of the group but also on each new page.

Reset page number

This option is only applicable to group bands. If checked indicates that page number should be reset when a new group is started.

Minimum height to start new page

This option is only applicable to group bands. It indicates minimum amount of vertical space needed at the bottom of the column in order to place the group header on the current column.

Header height

Specify the height of the group header in points (only applicable to group bands).

Footer height

Specify the height of the group footer in points (only applicable to group bands).

Condition of group printing

This option is only applicable to group bands. It indicates the expression that will be calculated by the report engine to check whether a new group should be started. The new group will be started if the value of the expression changes. For example, if the group condition is specified as `Product.Category` the new group will be started whenever the category of the product changes (this works especially well if products are sorted by category). Specify any valid report expression as group condition – see also [Reports](#)). You can press F3 at any time while typing the expression to bring up the [Context Assistant](#).

Add/Delete Group Bands

You can add group bands to a report or presentation by selecting the “Create Group...” command in the Actions menu of the Report Designer toolbar. Alternatively, you can right click on the name of the report in the Outline window and select “Create Group...”. In the dialog that appears you can specify the name of the new group and the bands representing the group (Group Header and Group Footer) will be added to the Design Area of the report. You can click on any of these bands and set properties of the group band in the Selection Properties window.

To delete a group select either the Group Header or Group Footer bands in the Outline window, right click and select “Delete” from the popup menu.

Adding/Deleting Custom Font

Adding a custom font to a design is only relevant to reports. As explained in the [Working with Report/Presentation Designer](#) section the PDF format that is used to produce the report documents uses only a fixed number of default fonts. If you want to use a different font you have to add it to your design as a custom font (this font will be embedded in the PDF file).

To add a custom font, select the “Add Font” command from the Actions menu in the Report Designer toolbar. The True type font selection dialog will be displayed. Select the font you want and press the Open button. The selected font will appear in the list of fonts in the toolbar and will be available when creating new text and tag elements.

To delete a custom font select the “Delete Font” command from the Actions menu in the Report Designer toolbar.

Finding Design Element

If your report or presentation design contains many elements it may be necessary to find a particular element in the design. To find an element in the design select the Find Design Element command in the Actions menu of the Report Designer toolbar. The Find Element dialog will be displayed. Specify the following options on the dialog:

Criteria of search

By element name

Elements will be matched against their “name” property.

By element content

This option is applicable only to text and tag elements. Elements will be matched against their text content.

By attributes used in the element

Elements will be matched against the names of business objects and attributes used in the elements. Note that an element may refer to an attribute not only if it is a tag element, but also if it represents a hyperlink (hyperlink properties may contain expressions referring to attributes of business objects –see Setting [Hyperlink Properties](#)). This option may be especially useful if the business space version has an integrity problem in one of the elements of a report or presentation – see [Checking Integrity of Business Space Version](#). The integrity checker will display which report or presentation has the problem and also the attribute that it could not resolve, but it will not bring you straight to the problem. You can open the report or presentation with the problem and look for the offending element using this option.

By name of the process used in the element

This option is analogous to the previous option.

By name of the query used in the element

This option is analogous to the “By attributes used in the element” option.

By name of the document/presentation used in the element

This option is analogous to the “By attributes used in the element” option.

Text to use

Specify a text to be used in the search. You can also specify whether the search is case sensitive and whether the search should match the text exactly as specified or find elements that contain the specified text.

The elements found by the command will be selected.

Aligning Elements

To align several elements in the same band select the element you want to align against first and then select all other elements holding down SHIFT or CTRL keys – see [Selecting Elements](#). Then click on the  icon in the Report Designer toolbar to bring up a popup menu.

- To *align the selected elements with the left edge* of the first element in the selection choose the Left command in the popup menu.
- To *align the selected elements with the right edge* of the first element in the selection choose the Right command in the popup menu.
- To *align the selected elements with the top edge* of the first element in the selection choose the Top command in the popup menu.
- To *align the horizontal axis of the selected elements* with the horizontal axis of the first element in the selection choose the Horizontal Axis command in the popup menu.
- To *align the vertical axis of the selected elements* with the vertical axis of the first element in the selection choose the Vertical Axis command in the popup menu.

Positioning Elements in Band

To move one or more elements in the same band to the left edge of the band select the elements you want to move (see [Selecting Elements](#)) and choose the  icon in the Report Designer toolbar to bring up a popup menu and then select the edge you want position against from the popup menu.

Changing Size of Elements

To change size of several elements in the same band select the element you want to use as the prototype first and then select all other elements holding down SHIFT or CTRL keys – see [Selecting Elements](#). Then click on the  icon in the Report Designer toolbar to bring up the popup menu.

- To *make the selected elements the same size* as the first element in the selection, choose the “Same Size” command in the popup menu.
- To *make the selected elements the same width* as the first element in the selection, choose the “Same Width” command in the popup menu.
- To *make the selected elements the same height* as the first element in the selection, choose the “Same Height” command in the popup menu.
- To space elements vertically select the “Space Vertically” command
- To space elements horizontally select the “Space Horizontally” command

Working with Charts

To add a new chart to a report click on the  icon in the Report Designer toolbar and select “Chart”. Then drag a box around the area in one of report bands where the chart will be located. The Report Designer will then start the Chart Wizard that will help you define the properties of the new chart.

 **NOTE:** a chart can only be added to the Title, Summary or one of Group Header or Footer bands. You cannot add a chart to the Details, Column Header, Column Footer, Page Header or Page Footer bands.

Defining a new chart consists of the following steps:

1. Define general properties of the chart, such as chart type and orientation.
2. Define data for the chart
3. Define other chart properties, such as chart title, axes labels, whether or not to include a legend etc.

Defining general properties of the chart

First of all you need to define the type of chart. Some of the other properties of the chart will depend on the type of the chart chosen. Four types of charts are currently available:

- Bar chart
- Line chart
- Area chart
- Pie chart

You also need to specify the background color of the chart and plot and chart orientation. The preview window will show you the result of your selection and will make it easier to understand what each of the properties mean.

Defining data for the chart

The second step is to define the data that the chart will display. The data is usually the subset or all data that the report works with. For example, a report may show the details of a company’s departments – staff members, sales, expenditure etc and a particular chart may show a graph of expenditure per department.

You usually define the data for a chart by specifying expressions for X and Y axes of the chart similar to the ones you define for a tag element. For example, if a report lists staff members of a company represented by a business object `StaffMember` and you want a chart that displays ages of staff members you can define data expressions like this:

For X axis:

`StaffMember.Name`

For Y axis:

AGE (StaffMember.DateOfBirth)

You can also specify specific values for both X and Y axes.

A chart can display one graph or a series of graphs. Let's look at some examples (the configuration for these examples can be found in the `SAMPLES` directory of your Aware IM installation – the file `SampleCharts.bsv`).

Example1. In this example a report will be showing expense records for some company. Every expense record (`ExpenseRecord` object) will store a date of the expense, the expense amount and the name of the department. The report will show expense records for each department. The report will show separate charts of expense records for every department. At the end of the report there will be a chart showing total expenses for each department. This is how we can define a report for this example:

The report will have a group band with the following group condition :

`ExpenseRecord.DepartmentName`. Every time the value of the `DepartmentName` attribute changes the new group will be started. We will include a chart into the Group Footer section of the department group. This chart will show expense records for this particular group. We will define the following expressions for the data of this chart:

For X axis:

`ExpenseRecord.Date`

For Y axis:

`ExpenseRecord.Amount`

We will also include another chart in the Summary band of the report. This report will show total expenses for each group. We will define the data for this group like so:

For X axis:

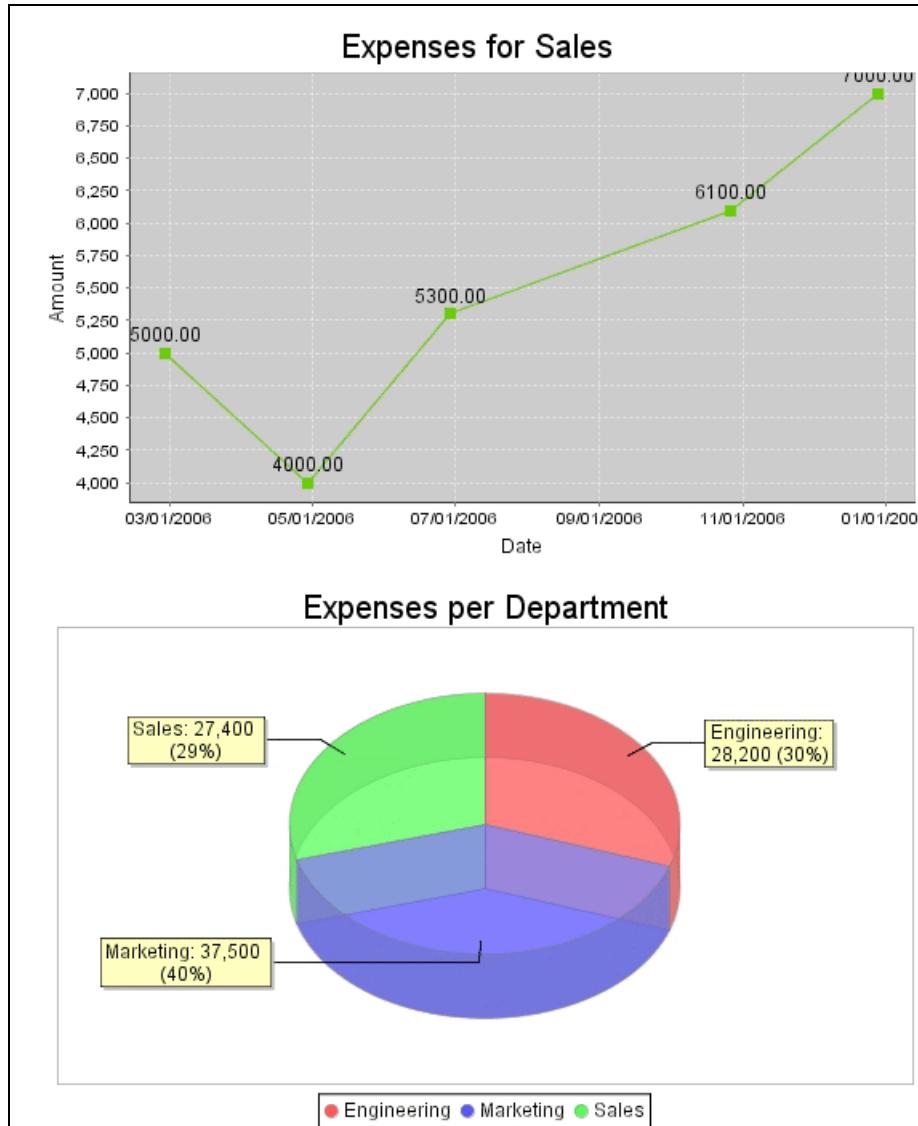
`ExpenseRecord.DepartmentName`

For Y axis:

`SUM ExpenseRecord.Amount`

Note that we will set evaluation time for the `SUM` expression to be at the end of the Department group.

The picture below shows the resulting charts for the Sales department and for all departments:



Example2. This example will also show expenses for a company's departments as in example 1, but instead of showing separate charts for each department we will be showing expenses for each department as separate graphs on the same chart.

In this case we will also define the Department group as in the example 1 with the same group condition. We will define a chart in the Summary band of the report. This chart will show expenses of all departments. This is how we will define the data for this report:

For X axis:

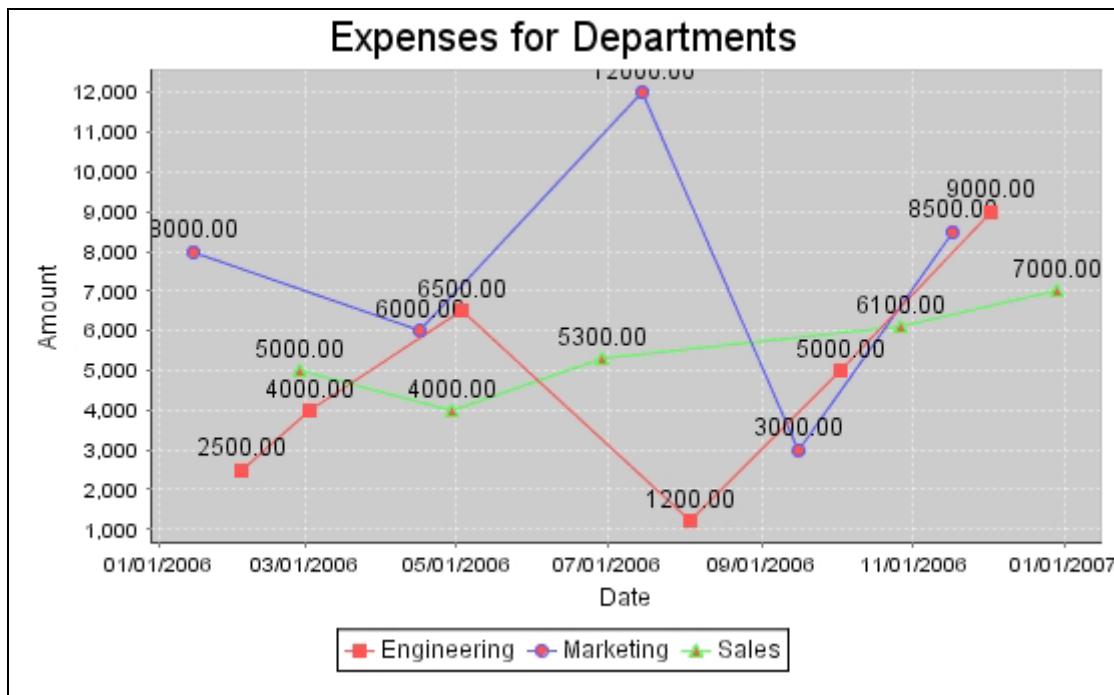
ExpenseRecord.Date

For Y axis:

ExpenseRecord.Amount

We will also tick the “Support series” checkbox, click on the “Details” button, select the “Series of data determined by group” radio button and select the `Department` group. Then we will specify the following expression that will determine the name of each series `ExpenseRecord.DepartmentName`. This is the crucial step – it will tell the Report Designer that it should combine data for every group on the same chart.

The resulting chart is shown on the picture below:



Example 3. In this example we will be designing a chart that will be showing patient's records for a particular day in a hospital – heart rate and blood pressure measurements taken at different times during the day.

We assume that the `PatientRecord` business object has been defined with the following attributes:

- `PatientName`
- `TimeTaken`
- `HeartRate`
- `BloodPressureLow`
- `BloodPressureHigh`

We want to define a chart that will show all these measurements at once. We want to have one X-axis showing time of the day and we want to have separate Y-axis for heart rate, low blood pressure and high blood pressure values. This is how we can define the data for this chart:

For X axis:

PatientRecord.TimeTaken

For Y axis:

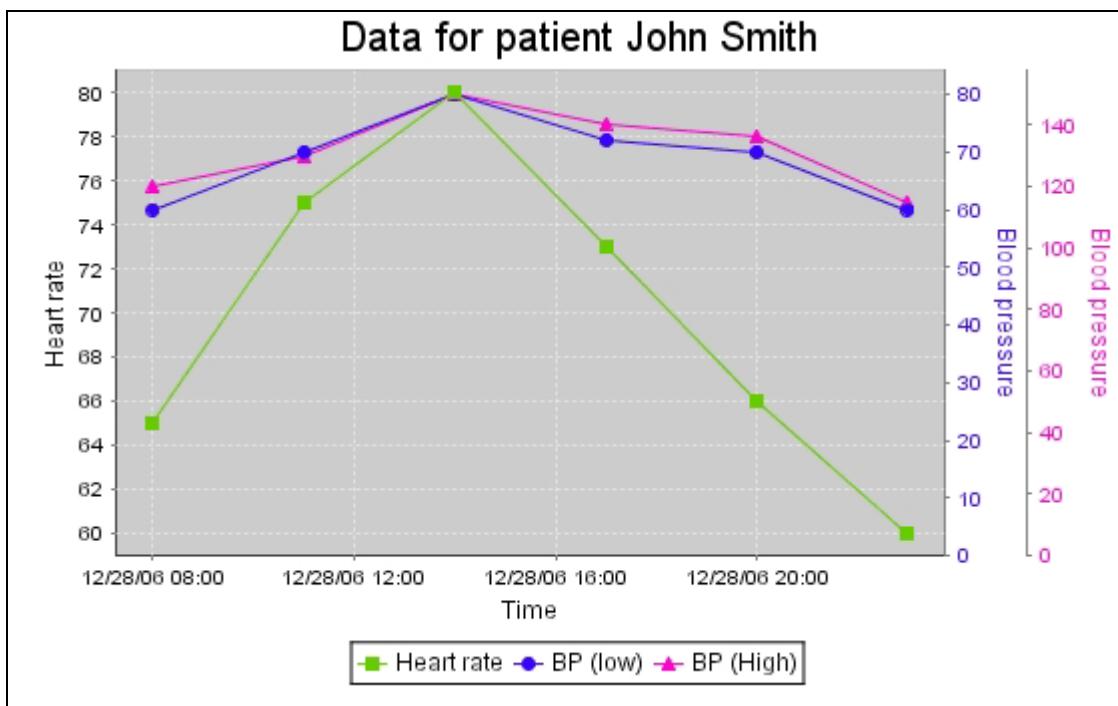
PatientRecord.HeartRate

Note that for Y-axis we can pick any of the attributes that we want to show – HeartRate, BloodPressureLow or BloodPressureHigh. We will also tick the “Support series” checkbox, click on the “Details” button, select the “Series of data determined by expressions” radio button and define the following additional data expression for Y-axis:

PatientRecord.BloodPressureLow

PatientRecord.BloodPressureHigh

We will also choose the name and color for each series. The resulting chart is shown on the picture below:



Defining other properties of the chart

The final step is to define other properties of the chart. These include the following:

- The title of the chart. You can define a static title, for example “Company Expenses” or you can define an expression similar to those you define in tag elements, for example “<<’Expenses for department ’ + Company.DepartmentName>>. Expressions should be enclosed in tag symbols “<<” and “>>”

- Up to two subtitles of the chart. You can define a static text for a subtitle or an expression. If you do not want to define a subtitle leave it blank.
- Whether or not to include a legend for the chart
- Labels of the axes, font and colors of label marks
- Whether or not to include labels for values on the chart
- Whether or not to include gridlines
- Whether or not to include effects, such as 3D effect, gradient effects and others
- Other chart type specific properties

All different properties are grouped in tabs and you can switch between tabs to navigate to a different group of properties. The preview window will show you the result of your selection and will make it easier to understand what each of the properties mean.

Previewing the Report

To see how the report will look like to the user select the “Preview Report” item from the Actions menu displayed on the Report Designer toolbar. A dialog will be displayed where you can specify how many records Aware IM will generate for the preview dataset. This will be the number of test records displayed in the Details Band of the displayed report.

Miscellaneous Commands

The following section has the description of some miscellaneous commands of the Report/Presentation Designer.

Bring To Front and Send To Back

You can change the relative order of elements in the design by using the Bring to Front or Send to Back commands. This may be useful when selecting one out of several overlapping elements. Bring To Front command makes the selected element last in the band so it will have preference over other overlapping elements. Send to Back command makes the selected element first in the band. To invoke these commands select them from the Actions menu of the Report Designer toolbar.

Attach Conditions

This command makes a conditional element out of the existing non-conditional element. The command creates a conditional element with the original element being the sub-element of the conditional element (initially without the conditions but you can add them later) - see [Editing Conditional Element](#). The command may be useful if you want to attach conditions to the existing element, but you do not want to re-create the element as part of a conditional element. To invoke the command right click on the element you want to attach the conditions to and select the Attach Conditions from the pop-up menu.

Show rulers

Rulers may be helpful when determining coordinates and dimensions of elements in the design. It is possible to change measurements units of the rulers from points (each point is equal to 1/72 of an inch) to centimetres by clicking on the corner point where vertical and horizontal rulers meet. You can also turn visibility of the rulers on or off by selecting the Rulers command in the Actions menu in the Report Designer toolbar.

Zoom

Zooming in and out may be very useful when working with the design. The following options are available:

Zooming using toolbar

Specify the zoom scale in the toolbar or select from a number of the pre-defined scales (scale of 100% corresponds to the actual size of the design).

Zooming in

Click on the  icon in the Report Designer toolbar. The current zoom scale will be increased by a factor of two.

Zooming out

Click on the  icon in the Report Designer toolbar. The current zoom scale will be reduced by a factor of two.

Fit to page

Select "Fit to page" in the zoom box of the toolbar to fit the entire design into the screen.

Show grid

When the grid is displayed new elements created in the design will be snapped to the grid. All movements of the elements will be snapped to the grid as well. To turn grid on or off select the Show Grid command from the Actions menu of the Report Designer toolbar.

Grid settings

To specify grid settings select the Grid Settings command from the Actions menu of the Report Designer toolbar – the Grid Settings dialog will be displayed, where you will be able to specify the resolution of the grid and its color.

Copy Style/Apply Style

You can quickly apply the entire presentation style of the one element to some other element. To do this select the element the style of which you want to use and click on the  icon in the Report Designer toolbar to "copy" the style. Then select the element you want to apply the style to and click on the  icon in the toolbar to "paste" the style.

Building Runtime Executable

 **NOTE:** This feature is only available in the Aware IM Developer Edition.

If you want to sell applications configured with **Aware IM** you can use the “Build Executable” feature to prepare the system for your end users with your own product name and copyright.

To do this select the business space version containing the final configuration of your application and select the “Build Executable” menu item from the “Version” menu.

Aware IM will display the “Build Executable” dialog. Enter the following information in the dialog:

Name of the application

Specify the name of your application to be displayed by the Installation program and the “About” menu item. This value is mandatory.

Version number

Specify the version number of your application to be displayed by the Installation program and the “About” menu item. This value is mandatory.

Company name/Copyright

Specify your company name and copyright to be displayed by the “About” menu item. This value is optional.

Target platform

Specify the target operating system platform where your application will be used. If your application is to be used for multiple platforms, run “Build Executable” feature for each target platform independently. This value is mandatory.

Target database

Specify the database that your application will use. This value is mandatory.

Do not allow end users to change business space version configuration

Tick this box if you do not want users to change the configuration of your application using the Configuration Tool. In this case also specify the protection password to make sure that only you can access the configuration.

Output directory

Specify the directory where the executable will be built. This value is mandatory.

License file location

Specify the location of your license file. This must be an ASCII text file. This value is mandatory.

Readme file location

Specify the location of the “README” file of your application. This must be an ASCII text file. This value is mandatory.

Documents directory

If you include electronic documentation with your application specify the directory where your documentation files are stored. This value is optional.

Web resources

If your application requires any resources (such as images and styles), which are used in the custom HTML pages of your application, move these resources into a separate directory and specify the name of this directory. Make sure that your HTML pages refer to these resources using this directory as the parent directory. This value is optional.

Other resources

If your application requires any other resources (such as images used in the [IMPORT DOCUMENT](#) action), move these resources into a separate directory and specify the name of this directory. Make sure that these resources are referred to using '.../OtherResources', for example

```
IMPORT DOCUMENT Statement.StatementDocument FROM  
'.../OtherResources/myfile.doc'
```

This value is optional.

Custom JAR's location

If your application requires any custom JAR files (for example if you write your own Java extensions – see [Extending Aware IM](#) and Aware IM Programmer’s Reference), move these JAR files into a separate directory and specify the name of this directory. This value is optional.

JDK location

If you are building an application for the Linux platform and your current operating system is not Linux, you need to download the Linux JDK1.4 or later¹² and specify the directory where it is stored.

Once you provide the required values and press OK **Aware IM** will build the executable (for Windows platform) or zip file (for Linux and Mac OS X platforms) in the output directory that you specified. You can distribute this executable or zip file to your end users

.

¹² The license of Sun Microsystems does not allow distributing the complete JDK. However, **Aware IM** only requires Java Runtime environment (JRE) and the file tools.jar (you can take it from the JDK and put into the lib directory of the JRE – this file can be freely distributed together with the JRE).

 **NOTE:** When you install the runtime application you will not be able to run the Configuration Tool. If you want users to be able to run the Configuration Tool install the standalone Configuration Tool on the runtime machine or copy the AwareIM/ConfigTool directory from your development machine to the runtime machine.

 **NOTE:** If you are distributing an application for Mac OS X platform you can take the resulting zip file to the Mac platform, unpack it and create an application bundle and/or distributable package out of it (see Mac OS X manuals for details). You can then distribute the application bundle or package to your customers. If you decide to distribute the application as an original zip file, you will need to provide startup instructions in a readme file. Customers will need to unpack the zip file, start the Mac OS X Terminal application, change to the BIN directory and run the startAwareIM.sh script.

Configuring Applications for Mobile Devices

This is described in detail in the Aware IM For Mobile Devices document.

Creating Native Mobile Applications

This is described in detail in the Aware IM For Mobile Devices document.

Determining Current Location of the User

This is described in detail in the Aware IM For Mobile Devices document. Note, however, that this functionality is available for all devices that support location detection – all mobile devices do, but many desktop devices and laptops support this as well.

Rule Language Reference

This section provides the description of the Aware IM Rule Language. The rule language is used to specify rules, queries, tags and other configuration elements. The rule language is simple and intuitive and, unlike traditional programming languages does not require special software development skills.

The description of the Rule Language provided in this section is intended to give readers an informal and simple-to-understand introduction to the capabilities of the Rule Language. For a more formal and comprehensive description please refer to a separate document called the “Aware IM Rule Language Reference”.

See:

[Rule](#)
[Rule Condition](#)
[Calculations](#)
[Actions](#)
[Functions](#)

Rule

The most basic construct in the Rule Language is the *rule*. The rule consists of a condition followed by one or more actions. The condition part starts with the “IF” keyword and the action part – with the “THEN” keyword. Therefore most rules look like this:

If Condition Then Action

For example,

```
IF Policy.Driver.Age > 70 THEN Policy.Premium = 300
```

```
IF Account.State='CLOSED' AND Account.Balance<>0 Then  
REPORT ERROR 'Account with non-zero balance cannot be closed'
```

As seen from the examples above both the condition and action parts of a rule may refer to a [business object](#) (or [business object group](#) or [notification](#)) and its attributes. Business objects are referred to by name, for example `Account`. Attributes of a business object are referred to by the attribute name where the name of the attribute is separated from the name of the business object by a dot symbol, for example `Account.State`.

 **NOTE:** The condition part of a rule may be omitted. A rule without a condition is called an *unconditional rule* – it consists of one or more actions only, for example:

```
CreditAccount.AvailableFunds=CreditAccount.CreditLimit +  
CreditAccount.Balance - CreditAccount.NonClearedFunds
```

 **NOTE:** A rule may also include the “ELSE” part which specifies what should happen if a condition does not hold, for example:

```
IF Policy.Driver.Age > 70 THEN Policy.Premium = 300
ELSE Policy.Premium = 250
```

or

```
IF Policy.Driver.Age > 70 THEN Policy.Premium = 300
ELSE If Policy.Driver.Age > 80 Then Policy.Premium = 350
ELSE Policy.Premium = 250
```

Rule Condition

The following section describes the expressions that can be used in the conditional part of a rule (see [Rule](#)). The conditional part of a rule consists of one or more expressions, which are connected with the “AND” or “OR” keywords. For example,

1. IF Policy.Driver.Age > 70 THEN Policy.Premium = 300

The conditional part of this rule has one expression: `Policy.Driver.Age > 70`

2. If Account.State='CLOSED' AND Account.Balance<>0 Then
REPORT ERROR 'Account with non-zero balance cannot be closed'

The conditional part of this rule has two expressions:

- `Account.State='CLOSED'`
- `Account.Balance<>0`

3. If Policy.Driver.Age < 70 AND (Policy.Driver.PostCode BETWEEN 2010 AND 2040 OR Policy.Driver.PostCode BETWEEN 2060 AND 2070)
Then Policy.Premium = 250

The conditional part of this rule has three expressions:

- `Policy.Driver.Age < 70`
- `Policy.Driver.PostCode BETWEEN 2010 AND 2040`
- `Policy.Driver.PostCode BETWEEN 2060 AND 2070`

The rest of this section describes various types of expressions that can be used in the conditional part of the rule. See:

[Comparison](#)

[String Expression](#)

[EXISTS Expression](#)

[IN Expression](#)[Range Expression](#)[WAS Changed Expression](#)[IS UNDEFINED Expression](#)[IS NEW Expression](#)[Negation](#)

Comparison

Comparison is used in the conditional part of a rule (see [Rule Condition](#)) to compare values of two attributes using the following operators:

1. “=”
2. “<”,
3. “>”
4. “<=”
5. “>=”
6. “<>” (not equal)

For example:

- Account.State = 'CLOSED'
- Account.Balance < Account.Type.MinBalance

 **NOTE:** All attribute types can be compared for equality or non-equality (even attributes of the reference type – see [Reference Attributes](#)). If the types of the attributes on both sides of the comparison are different, **Aware IM** automatically converts the attribute types if it can. For example, if attributes of the Plain Text type are compared with the attributes of the Number type, numbers are converted to strings as in the example below:

```
Account.Name = 1000
```

this comparison will only be true if the value of Account.Name is '1000'

 **NOTE:** Only attributes of the Number, Date, Timestamp and Duration may be compared using other operators (“<”, “>”, “<=”, “>=”)

 **NOTE:** If a value of an attribute is undefined (blank) it is considered to be 0 for comparison purposes.

String Expression

The String Expression is used in the conditional part of a rule (see [Rule Condition](#)) to check whether an attribute starts with (or ends with or contains) the specified text, for example:

- Account.Name STARTSWITH 'John'
- Account.Name ENDSWITH 'Smith'
- Account.Name CONTAINS 'it'

 **NOTE:** Typically the String Expression checks attributes of the Plain Text type. However, it can also be used to check attributes of other types, for example:

```
Account.Balance STARTSWITH '10'
```

EXISTS Expression

The EXISTS Expression is used in the conditional part of a rule (see [Rule Condition](#)) to check whether there are any instances of the specified [business object](#) (or [business object group](#)) in the system, for example,

```
If EXISTS Account Then ...
```

The expression may also check if only instances that match a particular condition exist in the system. The condition may be indicated using the WHERE keyword and must be enclosed in brackets, for example:

```
EXISTS Account WHERE (Account.State = 'OPEN')
```

The above expression checks whether there are open accounts in the system. The condition that follows the WHERE keyword may have one or more expressions connected with AND or OR keywords – just like the conditional part of a rule ((see [Rule Condition](#)), for example:

```
EXISTS Account WHERE (Account.State = 'OPEN' AND Account.Balance > 100)
```

 **NOTE:** The expression checks all instances of the specified business object that exist in the system's database, not in the current Context – see [Aggregate Operations](#).

IN Expression

The IN Expression is used in the conditional part of a rule (see [Rule Condition](#)) to check whether the value of a particular attribute of a [business object](#), [business object group](#) or [notification](#) is equal to one of the specified values in the provided list. For example,

- Account.State IN 'Open', 'Closed'
- Account.Balance IN 1000, 2000, 3000

As seen from the examples above, values in the list must be separated by a comma symbol. There is no limit on a number of entries in the list.

The IN Expression may also check whether an instance of a business object is in the list of references of another object. This form of the IN expression is typically used inside the condition that follows the “WHERE” keyword (see [EXISTS Expression](#)). For example,

```
EXISTS Account WHERE (Transaction IN Account.Transactions AND  
Account.State = 'Open')
```

The above expression checks whether there is an open account in the system that contains a particular transaction (the instance of a Transaction must be in the [Context](#)).

 **NOTE:** It is possible to use a special expression LOGGED_IN_USERS instead of the list of references. This will check if the specified user is logged in, for example:

```
FIND SystemUser WHERE SystemUser.LoginName='john'  
IF SystemUser IN LOGGED_IN_USERS Then  
    DISPLAY MESSAGE 'John is logged in'
```

Range Expression

The Range Expression is used in the conditional part of a rule (see [Rule Condition](#)) to check whether the value of a particular attribute of a [business object](#), [business object group](#) or [notification](#) is within the specified range. For example,

- Account.Balance BETWEEN 10000 AND 20000
- Transaction.Amount BETWEEN Account.Balance AND 5000

 **NOTE:** A comma can be used instead of AND. For example,

```
Account.Balance BETWEEN 10000,20000
```

 **NOTE:** Both lower and upper limits are included in the range.

WAS CHANGED Expression

The WAS CHANGED Expression is used in the conditional part of a rule (see [Rule Condition](#)) to check whether the value of a particular attribute of a [business object](#) or [business object group](#) has been changed compared to the value stored in the system. For example,

```
If Account.State WAS CHANGED Then ...
```

The WAS CHANGED Expression can also be used to check if any attribute of the object has changed, for example:

```
If Account WAS CHANGED
```

The WAS CHANGED Expression can also check whether an attribute has been changed to a particular value, for example:

```
If Account.State WAS CHANGED TO 'Open' Then ...
```

 **NOTE:** When comparing new and old values of the attribute, the WAS CHANGED expression only checks whether the value has been changed compared to the value of the attribute in the *last stable version* of the business object – see the [Evaluation of Rules Containing WAS CHANGED Expressions](#) section).

Expressions that track changes in a list

The WAS CHANGED expression can be used for reference lists as well as for ordinary attributes. The WAS CHANGED expression for lists indicates whether there were any references changed or removed from the list. For example,

```
If Account.Transactions WAS CHANGED Then...
```

It is possible to identify more precisely how a reference list has been changed and perform actions based on the attribute values of objects that have been added or removed from the list. The WAS ADDED TO expression can be used to check whether any objects have been added to the list and the WAS REMOVED FROM expression can be used to check whether objects have been removed from the list. To refer to the objects that have been added or removed, the Added and Removed instance prefixes can be used respectively (see [Instance Prefixes](#)). For example,

```
If Transaction WAS ADDED TO Account.Transactions Then INCREASE  
Account.Balance BY AddedTransaction.Amount
```

```
If Transaction WAS REMOVED FROM Account.Transactions Then REDUCE  
Account.Balance BY RemovedTransaction.Amount
```

If the list itself hasn't been changed, but an element belonging to a list has been, then this situation can be checked using the combination of "FROM" and "WAS CHANGED" keywords, for example:

```
If Transaction FROM Account.Transactions WAS CHANGED Then ...
```

IS UNDEFINED Expression

The IS UNDEFINED Expression is used in the conditional part of a rule (see [Rule Condition](#)) to check whether the value of a particular attribute of a [business object](#), [business object group](#) or [notification](#) is defined. Typically a value is undefined if it is "blank" – for example, a user didn't fill in the value in a form of the business object. For attributes of the Reference Type (see [Reference Attributes](#)) "undefined" means that the reference list is empty. For example,

- Account.State IS UNDEFINED
- Account.Transactions IS UNDEFINED

The variation of the IS UNDEFINED expression checks whether the value is defined, for example:

```
Account.State IS DEFINED
```

IS NEW Expression

The IS NEW Expression is used in the conditional part of a rule (see [Rule Condition](#)) to check whether a particular [business object](#) specified in the expression is being created (does not exist in the system yet), for example

```
If NOT (Message IS NEW) Then PROTECT Message.Subject
```

In this example the Subject attribute of the Message object is protected if the object already exists in the system.

Negation

All the expressions used in the conditional part of a rule (see [Rule Condition](#)) can be negated by adding the NOT keyword in front of the expression (in this case the expression must be enclosed in brackets), for example:

- NOT (EXISTS Account WHERE (Account.State = 'OPEN'))
- NOT (Account.Balance BETWEEN 100 AND 200)

- NOT (Account.State IN 'OPEN', 'CLOSED' AND Account.Balance > 100)

Calculations

Expressions that can be used in the conditional part of a rule (see [Rule Condition](#)) may work not only with attributes of [business objects](#), [business object groups](#) or [notifications](#) but also with calculations performed with these attributes. For example,

- If Account.ClosingDate < Account.OpeningDate + 5 Then ...
- If Account.Balance < SUM Transaction.Amount WHERE (Transaction IN Account.Transactions) Then ...

Calculations can include the following constructs:

[Constants](#)

[Arithmetic operations](#)

[Functions](#)

[Aggregate calculations](#)

Constants

The following types of constants can be used in [calculations](#):

1. Number (integer or floating point), for example, 3 or 5.6.
2. String (must be enclosed in apostrophe), for example 'CLOSED' or 'Balance must be positive'.
3. Date (in dd/mm/yy format), for example 05/12/98.
4. Date/Time (in dd/mm/yy HH:mm format), for example 05/12/98 17:05.
5. Duration (in #w#dHH:mm, where # stands for any digit, HH – for hours and mm – for minutes), for example, 2w3d10:45.
6. UNDEFINED, for example Loan.Item = UNDEFINED

Arithmetic Operations

Basic arithmetic operations such as addition, subtraction, multiplication and division can be used in [calculations](#), for example:

- Account.Balance/2
- Account.InterestRate * Account.Balance - Account.Fee

Functions

A function performs some calculation and returns a result. The result of a function is a [constant](#). There are a number of built-in functions that **Aware IM** supports. New functions can be plugged in as well (see “Aware IM Programmer’s Reference”). A function may or may not have parameters. Parameters of a function must be either attributes or [calculations](#) with attributes. If a function does not have parameters then it can be referred to by name only. If a function has parameters, they are listed after the function name and enclosed in brackets. Parameters are separated by the comma symbol. For example:

- CURRENT_DATE - function with no parameters.
- LENGTH (Customer.Name) – function with one parameter.
- MONTH_DIFFERENCE (Account.OpeningDate, Account.ClosingDate) – function with two parameters.

The complete list of built-in functions supported by **Aware IM** is provided in the [Functions](#) section.

Aggregate Calculation

The Aggregate Calculation performs calculations on a number of [business objects](#) or [business object groups](#) and/or their attributes, for example, calculates the sum total of an attribute:

```
SUM Account.Balance
```

The calculation above calculates the total balance of all available accounts.

The calculation may be applied not only to all available business objects of the specified type, but also to objects that meet the specified condition. The condition can be specified after the WHERE keyword and must be enclosed in brackets, for example:

```
SUM Account.Balance WHERE (Account.State='OPEN')
```

The calculation above calculates the total balance of all open accounts. The condition that follows the WHERE keyword can have one or more expressions connected with the AND or OR keywords – just like a conditional part of a rule ((see [Rule Condition](#))).

The following types of the Aggregate Calculation are supported:

1. SUM – calculate sum total of an attribute.
2. COUNT – calculate the number of available objects.
3. MIN – calculate minimum value of an attribute.
4. MAX – calculate maximum value of an attribute.

5. AVG – calculate average value of an attribute.

 **NOTE:** SUM, MIN, MAX, AVG calculations must not use attributes of the Reference type, for example the following expression is not valid:

```
SUM Account.Transactions.Amount
```

If aggregate of the referred object is required as in the example above, the following expression must be used:

```
SUM Transaction.Amount WHERE (Transaction IN Loan.Transactions)
```

 **NOTE:** The COUNT calculation must only use the names of business objects or business object groups – it is not allowed to use attributes, for example,

```
COUNT Account or COUNT Account WHERE (Account.State='Open').
```

Using references is also not allowed in the COUNT calculation, for example the following expression is invalid:

```
COUNT Account.Transactions.
```

The valid expression that achieves the desired result is:

```
COUNT Transaction WHERE (Transaction IN Account.Transactions)
```

 **NOTE:** The Aggregate Calculation uses instances of business objects that exist in the system's database, not in the current Context – see [Aggregate Operations](#).

Actions

The action part of a rule consists of actions that are executed when the rule condition holds true (see [Rule](#)). The following section describes different actions of the Rule Language. See:

[Modify Attribute Action](#)

[INCREASE BY and REDUCE BY Actions](#)

[INSERT and REMOVE Actions](#)

[REPLACE Action](#)

[CREATE Action](#)

[DELETE Action](#)

[SEND Action](#)

[REQUEST SERVICE Action](#)

[REPORT ERROR Action](#)

[PROTECT Action](#)
[FIND Action](#)
[ENTER NEW Action](#)
[EDIT Action](#)
[VIEW Action](#)
[DISPLAY PERSPECTIVE Action](#)
[DISPLAY DOCUMENT Action](#)
[PRINT DOCUMENT Action](#)
[EXPORT DOCUMENT Action](#)
[IMPORT DOCUMENT Action](#)
[EXPORT Action](#)
[IMPORT Action](#)
[SET Action](#)
[UPDATE Action](#)
[IMPORT RELATIONSHIPS Action](#)
[DISPLAY MESSAGE Action](#)
[DISPLAY QUESTION Action](#)
[PICK FROM Action](#)
[DISPLAY Action](#)
[Process Call Action](#)

Modify Attribute Action

The Modify Attribute action modifies the value of a particular attribute of a [business object](#), [business object group](#) or [notification](#). The action assigns a new value to the attribute. For example:

- Account.State = 'Open'
- Account.Balance = 1000 + Transaction.Amount

It is possible to assign values to attributes of the Reference type (see [Reference Attributes](#)), for example:

Loan.Item = Item

It is also possible to clear the single references or references lists by assigning an UNDEFINED constant as the value (see [Constants](#)), for example:

Member.Loans = UNDEFINED

INCREASE BY and REDUCE BY Actions

These actions increment or decrement the value of an attribute of a [business object](#), [business object group](#) or [notification](#). For example:

- INCREASE Account.Balance BY 1000
- REDUCE Account.Balance BY Transaction.Amount

The actions also allow specifying the amount to increase or reduce by in percents, for example:

- INCREASE Account.Balance BY 10%
- REDUCE Account.Balance BY 5%

INSERT and REMOVE Actions

These actions insert or remove an instance of a [business object](#) or [business object group](#) into a reference list of another object. For example,

- INSERT Transaction IN Account.Transactions
- REMOVE Transaction FROM Account.Transactions

REPLACE Action

The REPLACE Action replaces an instance of a [business object](#) or [business object group](#) from a reference list of another object with some other instances. This action can be especially useful when combined with the This and That prefixes (see [Instance Prefixes](#)). For example,

```
REPLACE ThisTransaction IN Account.Transactions WITH  
ThatTransaction
```

CREATE Action

The CREATE Action creates an instance of the specified [business object](#). For example,

```
CREATE Account
```

CREATE action can optionally initialize one or more attributes of the business object that it creates, for example:

```
CREATE Account WITH Account.State='Open', Account.Balance=0
```

The attributes to be initialized must follow the WITH keyword and must be separated by the comma. An initialization expression may contain any constant or other [calculation](#).

Sometimes it may be necessary to create several instances of a business object with a single CREATE action. For example,

1. CREATE Transaction FOR EACH Account
2. CREATE Transaction FOR EACH DAY/WEEK/MONTH/QUARTER/YEAR/WEEK_DAY/WEEKEND_DAY BETWEEN Account.OpeningDate AND Account.ClosingDate
3. CREATE Transaction FOR EACH NUMBER BETWEEN 1 AND 3
4. CREATE Attachment FOR EACH FILE IN 'c:/mydirectory'

The action in the first example will create as many instances of the Transaction object as there are instances of the Account object in the [Context](#).

The action in the second example will create as many instances of the Transaction object as there are days in the specified date interval. The date interval includes both starting and ending dates.

The action in the third example will create 3 instances of the Transaction. The interval includes both starting and ending numbers.

The action in the fourth example will create as many instances of the Attachment object as there are files in the specified directory.

 **NOTE:** You can use LOOP_ITERATION expression to get values of the current file name, current date or current iteration number, for example:

```
CREATE TRANSACTION FOR EACH FILE IN 'c:/mydirectory' WITH  
Transaction.FileName=LOOP_ITERATION
```

See also the “Aware IM Rule Language Reference” for more details.

DUPLICATE Action

The DUPLICATE Action duplicates an instance of the specified [business object](#). For example,

```
DUPLICATE Account
```

The action will create a copy of the instance of the object with attribute values equal to those of the original object. The action will not copy multiple references, document or picture attributes. You have to copy them separately.

It is possible to exclude some attributes from the copied attributes, for example:

```
DUPLICATE Account EXCEPT Attribute1,Attribute2
```

The above action will copy all attributes except Attribute1 and Attribute2.

Multiple references can be duplicated using the following syntax:

```
DUPLICATE ThisPerson.Accounts TO ThatPerson.Accounts
```

The above action will duplicate each instance of the Account object stored in the ThisPerson.Accounts attribute and insert the duplicated instances into ThatPerson.Accounts.

DELETE Action

The DELETE action deletes all instances of the specified [business object](#) or [business object group](#), which exist in the [Context](#). For example,

```
DELETE Account  
DELETE Account.Owner
```

CLEAN Action

The CLEAN action is similar to the DELETE action in that it deletes instances of the specified [business object](#). Unlike the DELETE action the CLEAN action does not invoke execution of rules – records are deleted in the database directly. CLEAN action is much more efficient than the DELETE action, however, you should use this action with care because it does not check the integrity of the data – if there are instances of the business objects left that refer to the deleted instances the data will be inconsistent. It is your responsibility to make sure that the data remains consistent after deletion.

The syntax of the CLEAN action is similar to that of the FIND action. Examples:

```
CLEAN ALL Account
```

The above action deletes all records of the Account object in the database.

```
CLEAN Account WHERE Account.Name='Smith'
```

The above action deletes all accounts with the name “Smith”

 **NOTE:** The CLEAN action is not supported for business object groups. You cannot use references in the condition of this action either.

DELETE FILE Action

The DELETE FILE action deletes the specified file or directory (with all files in the directory). For example,

```
DELETE FILE 'c:/temp/myfile.txt'  
DELETE FILE Account.FileName
```

COPY FILE Action

The COPY FILE action copies the specified file to the specified location. For example,

```
COPY FILE 'c:/temp/myfile.txt' TO 'c:/temp2/mynewfile.txt'
```

MAKE DIRECTORY Action

The MAKE DIRECTORY action creates the specified directory. For example,

```
MAKE DIRECTORY 'c:/temp/mydirectory'  
MAKE DIRECTORY Account.DirectoryName
```

SEND Action

The SEND action allows sending a notification to a particular notification receiver. For example,

```
SEND ReservationOfferEmail TO Reservation.Member
```

The receiver of the notification must be an intelligent business object with active communication channels (see [Intelligent Business Objects](#)).

The VIA keyword can be used to indicate the specific channel through which a notification will be sent, for example

```
SEND ReservationOfferNotification TO Reservation.Member VIA Email
```

If the VIA keyword is not specified, the default channel of the business object is used.

The USING keyword can be used to send emails using a particular email account, for example:

```
SEND ReservationOfferNotification TO Reservation.Member USING  
EmailAccount
```

Here the instance of the EmailAccount object is taken from the Context and it should contain email account values to use when sending an email (host server, port, authentication details etc). Therefore, the object representing an account must have certain attributes defined. The definition of such an object can be created in the Configuration Tool using the “Add Outgoing Email Account” command.

REQUEST SERVICE Action

The REQUEST SERVICE action makes it possible to use a service of an intelligent business object (see [Communication Between Systems](#)). For example,

```
REQUEST SERVICE RegisterProduct OF Awaresoft
```

The VIA keyword can be used to indicate specific channel through which the service is requested, for example

```
REQUEST SERVICE RegisterProduct OF Awaresoft VIA Sockets
```

If the VIA keyword is not specified, the default channel of the service provider is used.

REPORT ERROR Action

The REPORT ERROR Action causes **Aware IM** to stop executing rules and issue the specified error message to the original requestor (typically the error message is displayed on the user's screen). For example,

```
REPORT ERROR 'Value of the attribute is not defined'
```

This action is typically used to validate attribute values, for example:

```
If Account.Balance < 0 Then REPORT ERROR 'Account balance cannot be negative'
```

 **NOTE:** the action stops execution of any rules triggered by the initial request to the system (unless there are process failure rules defined – see other notes). If the request was issued by the user the specified error message is displayed on the user's screen. If the request did not originate from the user interface (for example, the request originated from a scheduled process) the error message is written into the log and the current process is terminated.

NOTE: The request that eventually caused the REPORT ERROR action could have changed a number of objects and attributes prior to the execution of the REPORT ERROR action. All changes to the business objects and their attributes prior to the REPORT ERROR action within the context of the request are discarded when the REPORT ERROR action is triggered (unless there are process failure rules defined – see the next note). See the [Rules and Transactions](#) section for more details.

NOTE: If evaluation of rules that caused execution of REPORT ERROR action was initially triggered by a process and this process had failure rules attached to it, the changes to the business objects and their attribute prior to the REPORT ERROR action are not discarded. Instead process failure rules are evaluated and the execution of the process continues – see Process Failure Rules.

PROTECT Action

The PROTECT action protects a [business object](#) or [business object group](#) or their attributes from access by all or specified users. When a business object or its attribute is protected it is not possible for the user to modify the object or attribute in any way - if an attribute of a business object is protected it is read-only on the form of this business object. If the entire object is protected all its attributes are read-only on the form (see [Conditional Access](#)). The examples of the PROTECT action are shown below:

1. If Transaction.State='APPLIED' Then PROTECT Transaction FROM ALL
2. If Transaction.State='APPLIED' Then PROTECT Transaction FROM ALL EXCEPT Administrator
3. If Account.State='CLOSED' Then PROTECT Account.Name FROM User AND Operator

The action in the first example protects the Transaction object from access by all users.

The action in the second example protects the Transaction object from access by all users except those operating at the “Administrator” [access level](#).

The action in the third example protects the Name attribute of the Account object from users operating at the “User” and “Operator” access levels.

 **NOTE:** By default protection applies not only to changes done via the user interface, but also to changes done by a [process](#). It is possible to distinguish between these two situations by specifying `System` as the access level, for example:

```
If Account.STATE <> 'NEW' THEN PROTECT Account.Balance FROM ALL  
EXCEPT System
```

In this case users will not be able to change the account balance when the state of the account is not new, however, it is possible to configure the process rules that change the account balance.

 **NOTE:** Protecting attributes of referred objects is not allowed, for example the action `PROTECT Transaction.Account.State FROM ALL` is invalid.

 **NOTE:** The `PROTECT` action can only be used in rules attached to a business object to be protected. The action may not be used in processes.

 **NOTE:** The action specified in the format described above protects against changes to a business object or its attribute ("write protection"). If "read protection" is required, `READ` prefix should be added in front of the action. When a business object is "read protected" instances that match the protection condition will not be read from the system. For example,

```
If Transaction.State='APPLIED' Then READ PROTECT Transaction FROM  
ALL
```

If an attribute is "read protected" it is not visible on any form of the business object and its value cannot be changed.

FIND Action

The FIND action finds particular instances of a [business object](#) or [business object group](#) in the system. There are several variations of the action:

1. Find all instances of the specified business object or group. For example,

```
FIND ALL Account
```

2. Run the specified [query](#) that finds particular instances of the business object or group. For example,

```
FIND 'Open accounts'
```

The action above will run the query named ‘Open accounts’. Note that the apostrophe must only be used if the query name contains space symbols otherwise the identifier of the query name can be used without the apostrophe.

3. Find all instances of the business object or group that match the specified condition.
For example,

```
FIND Account WHERE Account.State = 'Open'
```

The condition must be specified after the “WHERE” keyword. The format of the condition is exactly the same as the one used in the [Rule Condition](#).

The following keywords can be optionally used after the FIND action (written in any of the above formats):

1. ORDER BY

If this keyword is used after the FIND action, the instances found by the action will be sorted by the specified attribute in the specified order. For example,

```
FIND ALL Account ORDER BY Account.Balance DESC
```

The above action finds all accounts sorted by their balances in the descending order. The ASC keyword indicates the *ascending order* and the DESC keyword indicates the *descending order*. If ASC and DESC keywords are omitted the ASC keyword is implied.

2. TAKE BEST

If this keyword is used after the FIND action, only the specified number of business object instances which match the specified criteria, will be found by the action. Typically this keyword is used together with the ORDER BY keyword. For example,

```
FIND ALL Account ORDER BY Account.Balance DESC TAKE BEST 5
```

The above action will find 5 accounts with the highest balance.

3. IN BATCHES OF

If the action is likely to find many instances of the business object (hundreds or even thousands) their processing may take a while. In this case it is better to perform the processing of instances in smaller chunks (batches). After processing of each batch is finished the results will be immediately committed to the system and stored in the database. If the batch size is not specified the system will only commit the results once all the instances have been processed (see [Batch Operations](#)). For example:

```
FIND Account WHERE Account.State = 'OPEN' AND Account.Balance > 1000 ORDER BY Account.Balance IN BATCHES OF 5  
Perform some actions with found objects  
(The actions will be performed in batches of 5 objects)
```

If IN BATCHES OF keyword is omitted the default batch size of 1000 is used.

ENTER NEW Action

The ENTER NEW action is similar to the [CREATE](#) action in that it creates a new instance of a [business object](#). Unlike the CREATE action it lets the user fill in the initial values of the business object. The action displays a form of the specified business object and waits for the user to provide the initial values of the attributes and submit them to the system. For example,

```
ENTER NEW Account
```

 **NOTE:** if the name of a business object group is specified in the action, **Aware IM** will first display a list of all members of the group and when the user selects the name of the required business object, **Aware IM** will display a form of this object.

 **NOTE:** It is possible to indicate the initial values of the attributes using the WITH keyword. The syntax is the same as for the CREATE action. The form will be pre-populated with the supplied values (this initialization though is not available for groups – see previous note). For example:

```
ENTER NEW Account WITH Account.Name='John Smith'
```

 **NOTE:** It is possible to indicate the name of the specific form of the business object that will be used when entering the object, for example:

```
ENTER NEW Account USING 'Form for administrators'
```

In this action 'Form for administrators' is the name of the form that must be configured with the Account object (see [Business Object Forms](#)).

 **NOTE:** By default the form of the object will be displayed in a pop-up window. If the process finishes immediately after the user enters form values, you can designate the form to be displayed in the current window or in a new tab. For example:

```
ENTER NEW Account AND VIEW  
ENTER NEW Account AND VIEW IN TAB
```

EDIT Action

The EDIT action displays a form of the existing instance of a business object to the user and waits for the user to provide the new values of the attributes. For example,

- EDIT Account
- EDIT Account.Type

 **NOTE:** It is possible to indicate the name of the specific form of the business object that will be used when editing the object, for example:

```
EDIT Account USING 'Form for administrators'
```

In this action 'Form for administrators' is the name of the form that must be configured with the Account object (see [Business Object Forms](#)).

VIEW Action

The VIEW action is very similar to the [EDIT](#) action. The difference is that the [process](#) in which the action has been called does not wait for the user to change the values of the object and continues execution immediately after displaying the form. Also the VIEW action allows viewing the specific presentation ([see Business Object Presentation](#)) or form of the business object. For example,

- VIEW Account
- VIEW Account.Type
- VIEW Account USING 'Some fancy presentation'.

In the last example 'Some fancy presentation' is the name of the presentation that must be configured with the Account object.

 **NOTE:** If NOEDIT keyword is specified at the end of the action the form viewed by the action will have all its input controls disabled so that a user won't be able to change any attribute values. NOEDIT keyword is not applicable if a presentation is being viewed. For example:

```
VIEW Account NOEDIT
```

DISPLAY PERSPECTIVE Action

The DISPLAY PERSPECTIVE action shows the specified visual perspective on the screen, for example:

DISPLAY PERSPECTIVE Orders

DISPLAY LAYOUT Action

The DISPLAY LAYOUT action shows the layout of the specified tab of the main frame of the specified visual perspective on the screen, for example:

```
DISPLAY Layout Main FROM_VP Orders
```

The above action shows the content panels of the tab `Main` of the visual perspective `Orders`. The benefit of this action is that it allows using layouts of content panels defined in a visual perspective without using other elements of the perspective (menu, tabs etc). Moreover, the action makes the context of the current process available to commands invoked by the layout (such as processes, queries etc).

DISPLAY DOCUMENT Action

The DISPLAY DOCUMENT action displays the specified document on the screen. The action has two variations:

1. Display the document contained in an attribute of the Document Type. Whatever document is stored in the attribute will be displayed – no document processing is performed (see [Document Management](#)). For example,

```
DISPLAY DOCUMENT Statement.StatementDocument
```

2. Generate the document from a document template and display the result on the screen (see [Document Generation](#)). Consider the following rules as an example:

```
FIND Person WHERE Person.Name='John Smith'  
DISPLAY DOCUMENT AccountOpeningLetter
```

In this example `AccountOpeningLetter` is the name of the document template. If this template has the following line :

Dear <>Person.Name<>,

it will be replaced with the line

Dear John Smith

when the document is generated and displayed.

Text and HTML documents can also be displayed inside a pop-up window if you use the AS MESSAGE clause at the end of the action, for example:

```
DISPLAY DOCUMENT SplashScreen AS MESSAGE
```

Report documents can be displayed in the XLS format rather than the default PDF format:

```
DISPLAY DOCUMENT AccountOpeningLetter AS XLS
```

You can also specify a query in this action to be used as the data source for the document. **Aware IM** will produce as many documents as there are instances returned by the query. If MERGE INTO ONE option is not used **Aware IM** will display all instances on screen (the user will have to click on an icon next to each entry to see the document). If MERGE INTO ONE clause is specified **Aware IM** will automatically merge all documents into one document and show it to the user immediately. For example,

```
DISPLAY DOCUMENT AccountOpeningLetter USING 'All accounts' MERGE  
INTO ONE
```

You can also merge the display document with any other document stored in some attribute of the Document type (not necessarily used by a query). This is only supported for PDF documents at the moment. For example:

```
DISPLAY DOCUMENT AccountOpeningLetter MERGE WITH  
SystemSettings.TermsAndConditionsDoc
```

PRINT DOCUMENT Action

This action is very similar to the [DISPLAY DOCUMENT](#) action, but instead of displaying the document on the screen, it sends the document to the default printer. It is also possible to specify the name of the network printer to print to (if not specified the default printer will be used) and the number of copies to print (if not specified 1 copy will be printed). For example:

```
PRINT DOCUMENT StaffReport 2 COPIES  
PRINT DOCUMENT StaffReport TO `Network Printer 1` 2 COPIES
```

EXPORT DOCUMENT Action

The EXPORT DOCUMENT action exports the specified document into a file on disk. The action has two variations:

1. Export the document or picture contained in an attribute of the Document or Picture Type. Whatever document or picture is stored in the attribute will be exported – no document processing is performed (see [Document Management](#)). For example,

```
EXPORT DOCUMENT Statement.StatementDocument TO FOLDER  
'c:/mydocuments'
```

2. Generate the document from a document template and export the result (see [Document Generation](#)). Consider the following rules as an example:

```
FIND Person WHERE Person.Name='John Smith'  
EXPORT DOCUMENT AccountOpeningLetter TO FOLDER 'c:/mydocuments'
```

In this example `AccountOpeningLetter` is the name of the document template. If this template has the following line :

Dear <>Person.Name<>,

it will be replaced with the line

Dear John Smith

when the document is exported.

The `FOLDER` keyword specified after the `TO` keyword identifies the directory in the file system where the file will be written. If a directory doesn't exist it will be created. The name of the file that the document will be written to will be the name of the original file that the document was created from. Note that if the file with this name already exists in the specified folder, it will not be overwritten. Instead another file with the variation of the original name (for example, `originalName0`) will be created.

The `FILE` keyword can be specified instead of the `FOLDER` keyword. In this case the string after the `FOLDER` keyword must contain the full path of the file that the document will be exported to. If a file with the specified name already exists it will be overwritten. For example,

```
EXPORT DOCUMENT AccountOpeningLetter TO FILE  
'c:/mydocuments/myfile.doc'
```

Report documents can be exported in the XLS format rather than the default PDF format:

```
EXPORT DOCUMENT AccountOpeningLetter TO FOLDER 'c:/mydocuments'  
AS XLS
```

IMPORT DOCUMENT Action

The IMPORT DOCUMENT action imports the specified file into an attribute of the specified [business object](#) (provided that the attribute is of the Document or Picture type). For example,

```
IMPORT DOCUMENT Statement.StatementDocument FROM  
'c:/mydocuments/myfile.doc'
```

EXPORT action

The EXPORT action exports existing instances of the specified [business object](#) or results of running a query into a comma delimited text file (CSV file). For example:

```
EXPORT PersonalSavingAccount TO 'c:/mydocuments/psa.csv'  
EXPORT 'My Query' TO 'c:/mydocuments/psa.csv'
```

If the name of the business object is used, the instances available in the current context will be exported. If the name of the query is used **Aware IM** will run the query and export the results. If the query has attributes to display defined, only those attributes will be exported. Query names have to be enclosed in apostrophe.

There are several options that can be used with the action:

1. If the FOR UPDATE keyword is specified the [ID attributes](#) of the business objects will be written into the export file. If such a file is later imported into the system, the system will look for the objects with the specified ID's and modify them rather than insert the new ones. If the FOR UPDATE keyword is not specified the ID attributes of the objects will not be written into the export file and if such a file is later imported into the system, each record in the file will create the new instance of the business object. For example:

```
EXPORT PersonalSavingAccount TO 'c:/mydocuments/psa.csv' FOR  
UPDATE
```

2. If EXCLUDE RELATIONSHIPS keyword is specified any relationships that the exported object has with other objects will not be written into the output file. By default all relationships are exported. For example:

```
EXPORT PersonalSavingAccount TO 'c:/mydocuments/psa.csv' EXCLUDE  
RELATIONSHIPS
```

3. If EXCLUDE BINARY keyword is specified any binary attributes that the exported object has (such as Pictures and Documents) will not be written into the output file. By default all binary attributes are exported. For example:

```
EXPORT PersonalSavingAccount TO 'c:/mydocuments/psa.csv' EXCLUDE  
BINARY
```

4. The **USING** expression allows you to use an existing export template. For example:

```
EXPORT PersonalSavingAccount TO 'c:/mydocuments/psa.csv' USING  
'Account Template'
```

5. The **APPEND** clause allows you to append to an existing file rather than create a new one. For example:

```
EXPORT PersonalSavingAccount TO 'c:/mydocuments/psa.csv' APPEND
```

See also the [Export and Import](#) section.

IMPORT Action

The **IMPORT** action imports the contents of the comma delimited text file (CSV) or the XML file or XML string and creates or modifies instances of the specified [business object](#). For example:

```
IMPORT PersonalSavingAccount FROM 'c:/mydocuments/psa.csv'  
IMPORT PersonalSavingAccount FROM XML XmlInput.XMLString
```

In the first example the object is imported from a file, in the second – from an XML string contained in the `XMLString` attribute of the `XmlInput` object.

The format of the CSV and XML file is described in the file `ExportImport.txt` located in the `DOC` directory of your Aware IM installation.

The following options can be used with the action:

1. **IN BATCHES OF**

If the action is likely to import many instances of the business object (hundreds or even thousands) their processing may take a while. In this case it is better to import smaller chunks (batches). After import of each batch finishes the results are immediately committed to the system and stored in the database. If the batch size is not specified the system will only commit the results once all instances have been imported (see [Batch Operations](#)). For example:

```
IMPORT PersonalSavingAccount FROM 'c:/mydocuments/psa.csv' IN  
BATCHES OF 100
```

2. WITH VALIDATION

If this keyword is specified any rules associated with the business object being imported will be executed. If any rule fails for some record in the import file, this record will be ignored. If this option is omitted, the instances of the business object will be stored in the system but any rules associated with the business object will not be executed. For example:

```
IMPORT PersonalSavingAccount FROM 'c:/mydocuments/psa.csv' WITH  
VALIDATION
```

3. USING

If this keyword is specified an import is performed using one of the user-defined import templates, for example:

```
IMPORT PersonalSavingAccount FROM 'c:/mydocuments/psa.csv' USING  
'My import template'
```

 **NOTE:** this option will slow down the import process considerably and is recommended when the import files are not too large. On the other hand using this option will guarantee that only valid instances of the business object are stored in the system.

 **NOTE:** The first line of the input file must contain the description of the imported attributes. If this description contains the [ID attribute](#), the system will look for the specified instances and modify them with the supplied data, otherwise new instances will be created.

See also the [Export and Import](#) section.

After the import has been finished a special predefined object called `ImportResults` is placed into the Context. You can use this object to obtain import log and check whether any errors have been detected. This object has the following attributes – `ErrorsDetected` and `Log`.

SET Action

The SET action allows setting values of several attributes of a [business object](#) from a string. The format of the import string must be one of the following:

1. attrName1#attrValue1#attrName2#attrValue2 etc

The string represented in this format has attribute names followed by the corresponding values. The attribute names and values are separated by the “#” delimiter, for example

```
#Name#John Smith#State#NEW#Balance#100.0
```

2. attrName1 attrValue1 attrName2 attrValue2 etc

The string represented in this format also has attribute names followed by the corresponding values. The attribute names and values are separated by the space character (space character is thus not allowed inside attribute values, for example

Name John Smith State NEW Balance 100.0	- invalid
Name John State NEW Balance 100.0	- valid

3. The string has multiple lines where each line has a single attribute name and the corresponding value. The attribute name and value are separated either by the space character or “#” delimiter, for example:

```
Name John  
State NEW  
Balance 100
```

The example of the action is shown below:

```
SET Account FROM IncomingEmail.Message
```

Instead of the space and “#” symbols you can use “USING” expression to specify the delimiter explicitly, for example:

```
SET Account FROM Name: 'John' USING ':'
```

The delimiter used here is the “.” symbol.

This action can be useful in a variety of situations, for example when processing the contents of the incoming e-mails (provided that they are formatted as described above) – see [Email Handling](#).

UPDATE Action

The UPDATE action invokes evaluation of rules attached to the specified business object (provided that there are any). For example,

```
UPDATE Account
```

If there are any rules attached to the Account business object they will be evaluated. Normally there is no need to use this action, as rules will be evaluated whenever the object is modified. However, if an object contains a rule that performs scheduled

operations (for example, IF DAY_DIFFERENCE(CURRENT_DATE, Client.DateOfBirth) <= 3 Then SEND GreetingEmail TO Client), the UPDATE action may be used by a schedule process to invoke this rule (see [Scheduling](#)).

IMPORT RELATIONSHIPS Action

The IMPORT RELATIONSHIPS action imports the contents of the comma delimited text file (CSV) that contains the relationships of the specified [business object](#). For example,

```
IMPORT RELATIONSHIPS OF PersonalSavingAccount FROM  
'c:/mydocuments/psa.csv'
```

The following option can be used with this action:

IN BATCHES OF

If the action is likely to import many instances of the business object (hundreds or even thousands) their processing may take a while. In this case it is better to import smaller chunks (batches). After import of each batch finishes the results are immediately committed to the system and stored in the database. If the batch size is not specified the system will only commit the results once all the instances have been processed (see [Batch Operations](#)). For example:

```
IMPORT PersonalSavingAccount TO 'c:\mydocuments\psa.csv' IN  
BATCHES OF 100
```

If IN BATCHES OF keyword is omitted the default batch size of 1000 is used.

See also the [Export and Import Relationships](#) section.

DISPLAY MESSAGE Action

The DISPLAY MESSAGE action displays the specified information message to the user. For example,

```
DISPLAY MESSAGE 'Items have been created'  
DISPLAY MESSAGE 'Items have been created' MTITLE 'My title'
```

The message will be displayed as a pop-up dialog and the user will have to click OK to continue. The ASYNCH option can be used to display the message in different corners of the screen. The message will then automatically fade out in a few seconds and no user intervention will be required. For example:

```
DISPLAY MESSAGE ASYNCH 'Items have been created'
```

```
DISPLAY MESSAGE ASYNCH DELAY 15 'Items have been created'  
(display message for 15 seconds)
```

```
DISPLAY MESSAGE ASYNCH CLOSABLE 'Items have been created'  
(display closable window)
```

```
DISPLAY MESSAGE ASYNCH BOTTOM_LEFT 'Items have been created'  
(display window in the bottom left corner of the screen, default is bottom right. TOP,  
TOP_LEFT, TOP_RIGHT, BOTTOM, BOTTOM_LEFT and BOTTOM_RIGHT are  
available.)
```

DISPLAY QUESTION Action

The DISPLAY QUESTION action displays a question to the user and waits for the user's reply. The string specified in the action identifying a question is displayed together with the Yes, No and Cancel buttons. For example,

```
DISPLAY QUESTION 'Do you want to print out a receipt?'  
DISPLAY QUESTION 'Do you want to print out a receipt?' MTITLE  
'Question'
```

The reply of the user can be checked using the Reply attribute of the predefined object Question, for example:

```
If Question.Reply = 'Yes' Then ...
```

DISPLAY URL Action

The DISPLAY URL action goes to the specified URL. For example,

```
DISPLAY URL 'http://www.awareim.com'
```

or

```
DISPLAY URL Person.WebPage
```

By default the URL will be opened in a new window. You can also specify "IN MAIN WINDOW", "IN NEW WINDOW", "IN CURRENT TAB", "NEW TAB" or "FULL SCREEN" to display URL in the main window, in the new window, in the current tab, in the new tab or in the same window full screen respectively. For example,

```
DISPLAY URL 'http://www.awareim.com' IN MAIN WINDOW
```

When the URL is displayed in a new tab there is an option to specify the name of the tab, for example:

```
DISPLAY URL 'http://www.awareim.com' NEW TAB 'My tab'
```

PICK FROM Action

This action is similar to the [FIND](#) action in that it finds particular instances of the [business object](#), but unlike the FIND action, it displays the found instances on the screen and waits for the user to pick a particular instance. The syntax of the action is almost exactly the same as that of the FIND action except that the PICK FROM keyword is used instead of FIND. For example,

```
PICK FROM Account WHERE Account.State = 'OPEN' ORDER BY  
Account.Balance
```

 **NOTE:** IN BATCHES OF keyword that can be used in the FIND action is not applicable to the PICK FROM action.

 **NOTE:** By default the action will display a screen that allows selecting only one object. If multiple selection is required use the PICK ONE OR MORE FROM keyword instead of PICK FROM, for example

```
PICK ONE OR MORE FROM Account WHERE Account.State = 'OPEN' ORDER  
BY Account.Balance
```

 **NOTE:** By default if a query finds just one instance of an object this instance will be displayed on the screen and the user will have to select it as usual. If you do not want the action to prompt for the single found instance, but use this instance straight away add NO CONFIRMATION FOR ONE keyword at the end of the action. For example,

```
PICK FROM Account WHERE Account.State = 'OPEN' ORDER BY  
Account.Balance NO CONFIRMATION FOR ONE
```

DISPLAY Action

This action is very similar to the [PICK FROM](#) action in that it displays the instances of the business object found by the action, however it does not expect the user to pick any particular instance. The syntax of the action is exactly the same as that of the PICK FROM action except that the DISPLAY keyword is used instead of PICK FROM. For example,

```
DISPLAY Account WHERE Account.State = 'OPEN' ORDER BY  
Account.Balance
```

PRINT FORM Action

This action prints the specified form of the specified business object on the client's screen. Note that unlike the [PRINT DOCUMENT](#) action that prints the document on the server, the PRINT FORM action prints the form on the *clients*'s machine inside a browser. For example,

```
PRINT FORM Main OF Account
```

This action prints the form with the name "Main" of the Account object.

EXECUTE PROGRAM Action

This action runs an external program. For example:

```
EXECUTE PROGRAM 'c:/TEMP/SomeProgram.exe'
```

By default **Aware IM** will wait for the external program to complete. However, if "NO WAIT" clause is specified the system will not wait for the external program. For example,

```
EXECUTE PROGRAM 'c:/TEMP/SomeProgram.exe' NO WAIT
```

EXEC_SP Action

This action allows execution of a database stored procedure. You can initialize input parameters of the stored procedure with rule expressions and you can also capture the output parameters of the stored procedure in the attributes of business objects. If the stored procedure returns a "result set" (the result of the SQL SELECT statement) you can capture returned records as instances of business objects, which can then be placed in the Context or returned by a query. The stored procedure can be in the native Aware IM database or in the external database.

For detailed description of the syntax of this action refer to the Rule Language Reference Guide. Here we just provide a few examples:

```
EXEC SP 'procAlertGetAll' RETURN Alert
```

This stored procedure does not require any parameters. It "selects" all alert records in the native database, that Aware IM will automatically convert to instances of the Alert object and put in the context or make available for a query

```
EXEC SP 'procAlertGet' WITH '@alerID'=1 RETURN Alert  
This stored procedure returns alert record with id=1
```

```
EXEC SP 'procAlertGet' WITH '@alerID'=SPParam.AlertId RETURN Alert
```

This stored procedure returns alert record with id taken from the AlertId attribute of the SPParam object

```
EXEC SP 'procAlertGetOut' WITH  
'@alerID'=SPParam.AlertId,'@alertName'=SPParam.AlertName OUT  
This stored procedure returns alert record with id taken from the AlertId attribute of the SPParam object. The name of the alert is then written into the AlertName attribute.
```

```
EXEC SP 'proc1' OF SQLServer WITH '@param1'=1,'@param2'=2 RETURN SomeObject
```

This stored procedure returns the specified records from an [external database](#) identified by the name SQLServer.

CONNECT TO EMAIL and DISCONNECT FROM EMAIL Actions

These actions allow you to handle incoming e-mail dynamically from a process. For more details please see the Rule Language Guide.

SAVE SCREEN Action

This action allows you to save image of a chart displayed on the current screen or the entire displayed screen in an attribute of the Picture or Document types (in the latter case the image is saved as PDF file). The syntax is::

```
SAVE SCREEN 'my chart id' TO Object.PictureAttribute
```

The action above saves the chart identified by id 'my chart id' in the picture attribute of some object in the Context. The id of the chart can be specified when defining a chart query.

```
SAVE SCREEN TO Object.PictureAttribute
```

The action above saves the current screen in the picture attribute of some object in the Context.

```
SAVE SCREEN TO Object.DocumentAttribute AS PDF
```

The action above saves the current screen in the document attribute of some object in the Context as PDF file.

RENAME DOCUMENT Action

This action allows you to rename a document stored in an attribute of the Document type, for example :

```
RENAME DOCUMENT Object.DocAttribute TO `abc.doc`
```

CLOSE TAB Action

This action forces closes all tabs with the specified id. Id's can be assigned when defining an operation or a menu item that directs its output to a new tab (settings of the "New Tab" output).

```
CLOSE TAB 'my tab'
```

EXEC_STRING Action

This action executes the specified string as if it was an action of the Rule Language. This allows configurators to define rule actions dynamically, for example:

```
Object.Attribute = 'FIND ALL Customer'  
EXEC_STRING Object.Attribute
```

EXEC_SQL Action

This action executes the specified SQL string by invoking the database engine, for example:

```
EXEC_SQL `UPDATE CRM_Customer SET Name='John'`
```

If SQL to be executed performs a SELECT specify the object name that the SQL returns, for example:

```
EXEC_SQL `SELECT CRM_Customer WHERE FirstName='Jane'` RETURN  
Customer
```

You have to be careful when using this action as you can stuff up your database if you do something wrong. This action is only recommended for advanced users who understand how Aware IM manages the database.

LOG2 Action

This action puts the specified string into the [Execution Log](#), so that it becomes visible in the Log Viewer. For example,

```
LOG2 'This is my log string'
```

LOG2 CONTEXT Action

This action dumps the contents of the current [Context](#) into the [Execution Log](#), so that it becomes visible in the Log Viewer. For example,

```
LOG2 CONTEXT
```

COMMIT TRANSACTION Action

This action forcefully commits the current transaction. The next action in the process (if any) starts a new transaction. For example,

```
COMMIT TRANSACTION
```

MOBILE CAMERA SNAP INTO Action

This action opens a camera on a mobile device that the user logged in from, allows the user to take a photo and then writes the result into the specified Picture attribute of the specified business object. Note that this action can only be used in native mobile applications – it will not work in a browser.

For example:

```
MOBILE CAMERA SNAP INTO MyObject.MyPictureAttribute
```

You can also optionally specify different properties defining how the camera will behave. See the Rule Language Guide for more details. An example of the action using camera properties:

```
MOBILE CAMERA SNAP INTO MyObject.MyPictureAttribute WITH  
'targetWidth'='100','targetHeight'='100','cameraDirection'='1','allowEdit'='false'
```

MOBILE CAMERA GET INTO Action

This action opens a photo library on a mobile device that the user logged in from, allows the user to select a picture from the library and then writes the result into the specified Picture attribute of the specified business object. Note that this action can only be used in native mobile applications.

For example:

```
MOBILE CAMERA GET INTO MyObject.MyPictureAttribute
```

You can also optionally specify different properties defining how the camera will behave. See the Rule Language Guide for more details.

MOBILE GET LOCATION INTO Action

This action reads the current location on a mobile device, that the user logged in from, and writes the results into the attributes of the specified MGeoLocation object. For example,

```
MOBILE GET LOCATION INTO MGeoLocation
```

The results will be written into the specified instance of the MGeoLocation object (longitude, latitude, altitude etc).

MOBILE START LOCATION WATCH Action

This action starts tracking changes to the current location of the user on a mobile device that he used to log in from. The changes are written into the specified instance of the MGeoLocation object. For example:

```
MOBILE START LOCATION WATCH INTO MGeoLocation
```

MOBILE STOP LOCATION WATCH Action

This action stops tracking changes to the current location of the user on a mobile device that he used to log in from. For example:

```
MOBILE STOP LOCATION WATCH FROM MGeoLocation
```

MOBILE SUBSCRIBE Action

This action subscribes the mobile device of the user that he logged in from to receive push notifications from the system. This action only works in native mobile applications – it doesn't work in the browser. Notifications are sent by using the MOBILE PUSH command (see below). As the result of the successful subscription **Aware IM** automatically creates an instance of the `MobilePhone` object and puts it into the Context. The instance can then be used to send notifications to. For example:

```
MOBILE SUBSCRIBE  
LoggedInRegularUser.Phone = MobilePhome
```

See the How To document for more details about push notifications.

MOBILE PUSH Action

This action sends the specified push notification to the mobile phones (`MobilePhone` objects) that are currently in the Context of the process. This action only works in native mobile applications – it doesn't work in the browser. For example,

```
FIND ALL MobilePhone  
CREATE MobilePushNotification WITH  
MobilePushNotification.Title='Test',MobilePushNotification,Subjec  
t='This is my test  
notification',MobilePushNotification.Sound='default'  
MOBILE PUSH MobilePushNotification TO MobilePhone
```

See the How To document for more details about push notifications.

EXEC_SCRIPT Action

This action runs the specified Javascript inside the browser of the current user that started the process with this action. The syntax is:

For example:

```
EXEC_SCRIPT 'AwareApp.closeComponent(parser.m_widgetInfo,false,false);'
```

For more details please see the Rule Language Guide document.

Process Call Action

This action makes it possible to run a process. The syntax of the action just includes the name of the process to run. For example,

```
If Policy.State = 'Open' Then CalculatePremium
```

In this rule `CalculatePremium` is the name of the process to run (`RUN PROCESS` keyword can be optionally specified as well, for example `RUN PROCESS CalculatePremium`).

If a process requires [process input](#) then instances of the business objects representing the process input will be automatically taken from the current Context when the action is executed (see the [Context of Rule Execution](#) section). It is also possible to explicitly indicate this input, for example,

```
If Policy.State = 'Open' Then CalculatePremium USING Policy
```

The process input must be used explicitly in the action if it represents a reference attribute. For example,

```
If Customer.CurrentPolicy.State = 'Open' Then CalculatePremium  
USING Customer.CurrentPolicy
```

You can also run a process by using the `START PROCESS` action. The advantage of using this action is that you can specify the name of the process to run dynamically – for example:

```
START PROCESS SomeObject.ProcessName
```

The name of the process to run is stored in the `ProcessName` attribute of the `SomeObject` object.

Functions

The following section provides the description of all functions supported in **Aware IM** out-of-the-box. Note that new functions can be plugged in as well – see “Aware IM Programmer’s Reference”

[Date and Time Functions](#)
[Text Functions](#)
[Mathematical Functions](#)
[Financial Functions](#)
[Miscellaneous Functions](#)

Date and Time Functions

See:

[Date and Time Functions \(A – C\)](#)
[Date and Time Functions \(D – E\)](#)
[Date and Time Functions \(F – K\)](#)
[Date and Time Functions \(L – R\)](#)
[Date and Time Functions \(S – Z\)](#)

Function:	AGE
Description:	Returns the full year difference between the provided date and the current date
Parameters:	Attribute of the Date type or date constant or calculation producing date
Example:	IF Age (Account.Customer.DateOfBirth) > 70 Then ...

Function:	BUSINESS_DAY_FORWARD
Description:	Calculates the date that corresponds to the first business day after the provided date. Business days are usually those that do not include weekends and public holidays. The list of public holidays may be provided in the “PublicHolidays” property of the server property file.
Parameters:	Attribute of the Date type or date constant or calculation producing a date. The second parameter is optional – it indicates the number of days to move forward. If omitted, one day is assumed.
Example:	IF CURRENT_DATE=BUSINESS_DAY_FORWARD (Account.OpeningDate) Then ...

Function:	BUSINESS_DAY_BACK
Description:	Calculates the date that corresponds to the first business day before the provided date. Business days are usually those that do not include weekends and public holidays. The list of public holidays may be provided in the “PublicHolidays” property of the server property file.
Parameters:	Attribute of the Date type or date constant or calculation producing a date. The second parameter is optional – it indicates the number of days to move back. If omitted, one day is assumed.
Example:	IF CURRENT_DATE=BUSINESS_DAY_BACK (Account.OpeningDate) Then ...

Function:	CURRENT_DATE
Description:	Returns current date as the date constant
Parameters:	None

Example:	Account.OpeningDate = CURRENT_DATE
-----------------	------------------------------------

Function:	CURRENT_TIMESTAMP
Description:	Returns current date and time as the timestamp
Parameters:	None
Example:	Transaction.Time = CURRENT_TIMESTAMP

Function:	CURRENT_DAY_OF_YEAR
Description:	Returns current day of the year as an integer constant in the range 1-366
Parameters:	None
Example:	IF CURRENT_DAY_OF_YEAR = 8 Then ...

Function:	CURRENT_DAY_OF_MONTH
Description:	Returns current day of the month as an integer constant in the range 1-31
Parameters:	None
Example:	IF CURRENT_DAY_OF_MONTH = 8 Then ...

Function:	CURRENT_DAY_OF_WEEK
Description:	Returns current day of the week as a string constant ('Monday', 'Tuesday', etc)
Parameters:	None
Example:	IF CURRENT_DAY_OF_WEEK = 'Saturday' Then ...

Function:	CURRENT_MONTH
Description:	Returns current month as an integer constant in the range 1-12
Parameters:	None
Example:	IF CURRENT_MONTH = 1 Then ...

Function:	CURRENT_YEAR
Description:	Returns current year as an integer constant
Parameters:	None
Example:	IF CURRENT_YEAR = 2004 Then ...

Function:	CURRENT_WEEK
Description:	Returns current week as an integer constant in the range 1-52

Parameters:	None
Example:	IF CURRENT_WEEK = 1 Then SEND GreetingEmail TO Customer

Function:	CURRENT_HOUR
Description:	Returns current hour as an integer constant in the range 0-23
Parameters:	None
Example:	IF CURRENT_HOUR = 12 Then DISPLAY MESSAGE 'Midday!'

Function:	CURRENT_MINUTE
Description:	Returns current minute as an integer constant in the range 0-59
Parameters:	None
Example:	IF CURRENT_MINUTE = 45 Then ...

Function:	DATE
Description:	Returns the date constant built from the given numbers
Parameters:	An integer constant indicating day (1-31), an integer constant indicating month (1-12), an integer constant indicating year
Example:	If DATE(DAY_OF_MONTH(Account.OpeningDate), 4, 2004) = 07/04/2004 Then ...

Function:	DATE_ADD
Description:	Returns the date resulting from adding/subtracting the specified number of days to the specified date
Parameters:	An expression producing date and an expression producing a number to be added or subtracted (if the number is negative) to the date
Example:	If DATE_ADD(Account.OpeningDate), 4) = 07/04/2004 Then ...

Function:	DATE_PART
Description:	Returns the date part of the given timestamp
Parameters:	Timestamp
Example:	If DATE_PART(Account.OpeningDateTime) = 07/04/2004 Then ...

Function:	DAY_DIFFERENCE
Description:	Calculates the day difference between the two dates as an integer

	constant
Parameters:	Two attributes of the Date type or date constants or calculations producing date
Example:	If DAY_DIFFERENCE (Account.OpeningDate, Account.ClosingDate) = 3 Then ...

Function:	DAY_DIFFERENCE2
Description:	Calculates the day difference between the first date and the second date ignoring years of the dates. For example: DAY_DIFFERENCE2 (15/06/1985, 17/06/1998) = 2 (the difference between 15 of June and 17 of June is 2) DAY_DIFFERENCE2 (15/06/1985, 14/06/1973) = 364 (the difference between 15 of June and 14 of June is 364) The function can be useful, for example, when determining next anniversary of some event.
Parameters:	Two attributes of the Date type or date constants or calculations producing a date
Example:	If DAY_DIFFERENCE2 (CURRENT_DATE, Client.DateOfBirth) = 2 Then SEND GreetingEmail TO Client

Function:	DAY_OF_WEEK
Description:	Returns day of week of the provided date as a string ('Monday', 'Tuesday' etc)
Parameters:	Attribute of the Date type or date constant or calculation producing a date
Example:	IF DAY_OF_WEEK (Account.OpeningDate='Wednesday') Then ...

Function:	DAY_NUMBER_IN_WEEK
Description:	Returns day of week of the provided date (1 for Sunday, 2 for Monday etc)
Parameters:	Attribute of the Date type or date constant or calculation producing a date
Example:	IF DAY_NUMBER_IN_WEEK (Account.OpeningDate=1) Then ...

Function:	DAY_OF_MONTH
Description:	Returns day of month of the provided date as an integer constant in the range 1-31
Parameters:	Attribute of the Date type or date constant or calculation producing a date

Example:	IF DAY_OF_MONTH (Account.OpeningDate=25) Then ...
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Function:	DAY_OF_YEAR
Description:	Returns day of year of the provided date as an integer constant in the range 1-366
Parameters:	Attribute of the Date type or date constant or calculation producing a date
Example:	IF DAY_OF_YEAR (Account.OpeningDate=250) Then ...

Function:	DAYS
Description:	Returns an integer constant indicating the number of days in the provided duration
Parameters:	Attribute of the Duration type or duration constant or calculation producing duration
Example:	If DAYS (Task.Duration) = 5 Then ...

Function:	END_OF_WEEK
Description:	Returns a date being Sunday of the week that the parameter date represents
Parameters:	Attribute of the Date type or duration constant or calculation producing Date
Example:	Account.EndOfWeek = END_OF_WEEK(CURRENT_DATE)

Function:	FIRST_DAY_OF_MONTH
Description:	Calculates the date that corresponds to the first day of month of the provided date
Parameters:	Attribute of the Date type or date constant or calculation producing a date
Example:	IF FIRST_DAY_OF_MONTH (Account.OpeningDate=01/10/2004) Then ...

Function:	FIRST_DAY_OF_NEXT_MONTH
Description:	Calculates the date corresponding to the first day of the next month of the provided date
Parameters:	Attribute of the Date type or date constant or calculation producing a date
Example:	IF FIRST_DAY_OF_NEXT_MONTH (Account.OpeningDate=01/11/2004) Then ...

Function:	FIRST_DAY_OF_PREV_MONTH
Description:	Calculates the date corresponding to the first day of the previous month of the provided date
Parameters:	Attribute of the Date type or date constant or calculation producing a date
Example:	IF FIRST_DAY_OF_PREV_MONTH (Account.OpeningDate=01/09/2004) Then ...

Function:	FULL_YEARS
Description:	Calculates the number of full years between the two dates as an integer constant. Full year difference between 31/12/2004 and 01/01/2005 is 0
Parameters:	Two attributes of the Date type or date constants or calculations producing date
Example:	If FULL_YEARS (Account.OpeningDate, Account.ClosingDate) = 5 Then ...

Function:	HOUR
Description:	Returns hour of the provided date as an integer constant in the range 0-23
Parameters:	Attribute of the Date type or date constant or calculation producing date
Example:	IF HOUR (Account.OpeningDate=12) Then ...

Function:	HOURS
Description:	Returns an integer constant indicating the number of hours in the provided duration
Parameters:	Attribute of the Duration type or duration constant or calculation producing duration
Example:	If HOURS (Task.Duration) = 5 Then ...

Function:	LAST_DAY_OF_MONTH
Description:	Calculates the date that corresponds to the last day of month of the provided date
Parameters:	Attribute of the Date type or date constant or calculation producing a date

	date
Example:	IF LAST_DAY_OF_MONTH (Account.OpeningDate=31/10/2004) Then ...

Function:	LAST_DAY_OF_NEXT_MONTH
Description:	Calculates the date that corresponds to the last day of next month of the provided date
Parameters:	Attribute of the Date type or date constant or calculation producing a date
Example:	IF LAST_DAY_OF_NEXT_MONTH (Account.OpeningDate=30/11/2004) Then ...

Function:	LAST_DAY_OF_PREV_MONTH
Description:	Calculates the date that corresponds to the last day of the previous month of the provided date.
Parameters:	Attribute of the Date type or date constant or calculation producing a date
Example:	IF LAST_DAY_OF_PREV_MONTH (Account.OpeningDate=30/09/2004) Then ...

Function:	MINUTE
Description:	Returns the minute of the provided date as an integer constant in the range 0-59
Parameters:	Attribute of the Date type or date constant or calculation producing a date
Example:	IF MINUTE (Account.OpeningDate=45) Then ...

Function:	MINUTES
Description:	Returns an integer constant indicating the number of minutes in the provided duration
Parameters:	Attribute of the Duration type or duration constant or calculation producing duration
Example:	If MINUTES (Task.Duration) = 5 Then ...

Function:	MONTH
Description:	Returns the month of the provided date as an integer constant in the range 1-12
Parameters:	Attribute of the Date type or date constant or calculation producing a date

Example:	IF MONTH (Account.OpeningDate=12) Then ...
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Function:	MONTH_ADD
Description:	Returns the date resulting from adding/subtracting the specified number of months to the specified date
Parameters:	An expression producing date and an expression producing a number to be added or subtracted (if the number is negative) to the date
Example:	If MONTH_ADD (Account.OpeningDate), 4) = 07/04/2004 Then ...

Function:	MONTH_DIFFERENCE
Description:	Calculates the month difference between the two dates as an integer constant
Parameters:	Two attributes of the Date type or date constants or calculations producing a date
Example:	If MONTH_DIFFERENCE (Account.OpeningDate, Account.ClosingDate) = 5 Then ...

Function:	MONTH_DIFFERENCE2
Description:	Calculates the month difference between the first date and the second date ignoring years. For example: MONTH_DIFFERENCE2 (15/06/1985, 17/07/1998) = 1 (the difference between June and July is 1) MONTH_DIFFERENCE2 (15/06/1985, 14/05/1973) = 11 (the difference between June and May is 11) The function can be useful, for example, when determining next anniversary of some event.
Parameters:	Two attributes of the Date type or date constants or calculations producing a date
Example:	If MONTH_DIFFERENCE2 (CURRENT_DATE, Client.DateOfBirth) = 3 Then SEND ReminderEmail TO Client

Function:	NEXT_DAY_OF_WEEK
Description:	Returns the next day of the week closest to the specified date
Parameters:	An expression producing a date and a string identifying the day
Example:	Object.NextDay = NEXT_DAY_OF_WEEK (CURRENT_DATE, 'Tuesday') /* This returns next Tuesday from current date)

Function:	PREV_DAY_OF_WEEK
Description:	Returns the previous day of the week closest to the specified date
Parameters:	An expression producing a date and a string identifying the day
Example:	Object.PrevDay = PREV_DAY_OF_WEEK (CURRENT_DATE, 'Tuesday') /* This returns previous Tuesday from current date)

Function:	SECONDS
Description:	Returns an integer constant indicating the number of seconds in the provided duration
Parameters:	Attribute of the Duration type or duration constant or calculation producing duration
Example:	If SECONDS (Task.Duration) = 5 Then ...

Function:	START_OF_WEEK
Description:	Returns a date being Monday of the week that the parameter date represents
Parameters:	Attribute of the Date type or duration constant or calculation producing Date
Example:	Account.StartOfWeek = START_OF_WEEK(CURRENT_DATE)

Function:	TIME_ADD
Description:	Returns the timestamp resulting from adding/subtracting the specified number of hours to the specified timestamp
Parameters:	An expression producing timestamp and an expression producing a number to be added or subtracted (if the number is negative) to the timestamp
Example:	If TIME_ADD (Account.OpeningTime), 4) = 07/04/2004 12:00 Then ...

Function:	TIMESTAMP
Description:	Returns the timestamp constant built from the given numbers
Parameters:	An integer constant indicating day (1-31), an integer constant indicating month (1-12), an integer constant indicating year, an integer constant indicating hours (0-23), an integer constant indicating minutes (0-59)
Example:	If TIMESTAMP (DAY_OF_MONTH (Account.OpeningDate), 4, 2004, 11, 0) = 07/04/2004 11:00 Then ...

Function:	WEEK
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Description:	Returns the week of the provided date as an integer constant in the range 1-52
Parameters:	Attribute of the Date type or date constant or calculation producing a date
Example:	IF WEEK (Account.OpeningDate=50) Then ...

Function:	WEEK_DIFFERENCE
Description:	Calculates the week difference between the two dates as an integer constant
Parameters:	Two attributes of the Date type or date constants or calculations producing date
Example:	If WEEK_DIFFERENCE (Account.OpeningDate, Account.ClosingDate) = 2 Then ...

Function:	WEEKS
Description:	Returns an integer constant indicating the number of weeks in the provided duration
Parameters:	Attribute of the Duration type or duration constant or calculation producing duration
Example:	If WEEKS (Task.Duration) = 5 Then ...

Function:	YEAR
Description:	Returns the year of the provided date as an integer constant
Parameters:	Attribute of the Date type or date constant or calculation producing a date
Example:	IF YEAR (Account.OpeningDate=2004) Then ...

Function:	YEAR_DIFFERENCE
Description:	Calculates the calendar year difference between the two dates as an integer constant. Year difference between 31/12/2004 and 01/01/2005 is 1.
Parameters:	Two attributes of the Date type or date constants or calculations producing a date
Example:	If YEAR_DIFFERENCE (Account.OpeningDate, Account.ClosingDate) = 5 Then ...

Text Functions

See:

[Text Functions \(A – M\)](#)

[Text Functions \(L – Z\)](#)

Function:	AS_DATE
Description:	Converts the given string into a date according to the specified format.
Parameters:	Attribute of the Plain Text type or string constant or calculation producing text and a format string
Example:	Object.DateAttr = AS_DATE ('02-25-2007', 'MM-dd-yyyy')

Function:	AS_NUMBER
Description:	Converts the given string into a number. If a string cannot be converted the original string is returned.
Parameters:	Attribute of the Plain Text type or string constant or calculation producing text
Example:	If AS_NUMBER (Account.Text) = 5 Then ...

Function:	AS_STRING
Description:	Converts the given attribute or expression of the Number, Date, Timestamp, Yes/No or Plain Text types into a string.
Parameters:	Attribute or expression of the Number, Date, Timestamp, Yes/No or Plain Text types
Example:	If AS_STRING (Account.Number) = '5' Then ...

Function:	AS_TIMESTAMP
Description:	Converts the given string into a timestamp according to the specified format.
Parameters:	Attribute of the Plain Text type or string constant or calculation producing text and a format string
Example:	Object.TimeStampAttr = AS_TIMESTAMP ('02-25-2007 10:05', 'MM-dd-yyyy HH:mm')

Function:	CHARS_FROM_LEFT
Description:	Returns the text being the specified number of the leftmost characters in the provided text
Parameters:	Attribute of the Plain Text type or string constant or calculation

	producing text and an integer constant indicating the number of characters to retrieve
Example:	If CHARS_FROM_LEFT (Account.Name, 2) = 'Jo' Then ...

Function:	CHARS_FROM_RIGHT
Description:	Returns the text being the specified number of the rightmost characters in the provided text
Parameters:	Attribute of the Plain Text type or string constant or calculation producing text and an integer constant indicating the number of characters to retrieve
Example:	If CHARS_FROM_RIGHT (Account.Name, 3) = 'ith' Then ...

Function:	INDEX_OF
Description:	Returns an integer constant indicating the index of the first string within the second string. For example, INDEX_OF('fox', 'red fox') returns 5. If the first string is not contained within the second one 0 is returned.
Parameters:	Two attributes of the Plain Text type or two string constants or calculations producing text. A third parameter can be optionally specified – this parameter indicates occurrence number of the first string in the second string.
Example:	If INDEX_OF ('Smith', Account.Name) = 0 Then ...

Function:	LAST_INDEX_OF
Description:	Returns an integer constant indicating the last index of the first string within the second string. For example, LAST_INDEX_OF('r', 'bright red fox') returns 8. If the first string is not contained within the second one 0 is returned.
Parameters:	Two attributes of the Plain Text type or two string constants or calculations producing text
Example:	If LAST_INDEX_OF ('Smith', Account.Name) = 0 Then ...

Function:	LENGTH
Description:	Returns an integer constant indicating the number of characters in the provided text
Parameters:	Attribute of the Plain Text type or string constant or calculation producing text
Example:	If LENGTH (Account.Name) = 5 Then ...

Function:	MATCHES
Description:	Returns 'Yes' if the specified string matches the specified regular expression
Parameters:	Attribute of the Plain Text type or string constant or calculation producing text and a regular expression
Example:	If MATCHES (Customer.PhoneNo, '[0-9]') = 'No' Then ...

Function:	PAD_LEFT
Description:	Pads the given string on the left with the specified character
Parameters:	Attribute of the Plain Text type or string constant or calculation producing text identifying the string to pad; the character to pad with; the resulting length of the string
Example:	PAD_LEFT ('John', '0', 6) returns '00John'

Function:	PAD_RIGHT
Description:	Pads the given string on the right with the specified character
Parameters:	Attribute of the Plain Text type or string constant or calculation producing text identifying the string to pad; the character to pad with; the resulting length of the string
Example:	PAD_RIGHT ('John', '0', 6) returns 'John00'

Function:	REPLACE_PATTERN
Description:	Returns the text being the replacement of all occurrences of the old pattern in the provided text with the new pattern
Parameters:	Attribute of the Plain Text type or string constant or calculation producing text; the text indicating the old pattern (supports format of regular expressions) and the text indicating the new pattern
Example:	If REPLACE_PATTERN (Account.Name, 'ohn', 'ack') = 'Jack Smith' Then ...

Function:	SUBSTRING
Description:	Extracts a string between two indexes of the given string (the second index is not inclusive)
Parameters:	Attribute of the Plain Text type or string constant or calculation producing text and two indexes
Example:	If SUBSTRING (Account.Name, 0, 4) = 'John' Then

Function:	TO_LOWER_CASE
Description:	Returns the text being the lower case representation of the provided

	text
Parameters:	Attribute of the Plain Text type or string constant or calculation producing text
Example:	If TO_LOWER_CASE (Account.Name) = 'john smith' Then ...

Function:	TO_UPPER_CASE
Description:	Returns the text being the upper case representation of the provided text
Parameters:	Attribute of the Plain Text type or string constant or calculation producing text
Example:	If TO_UPPER_CASE (Account.Name) = 'JOHN SMITH' Then ...

Function:	TO_PROPER_CASE
Description:	Returns the text being the 'proper' case representation of the provided text. "biLL sMith" becomes "Bill Smith"; "o'mailey" becomes "O'Mailey"
Parameters:	Attribute of the Plain Text type or string constant or calculation producing text
Example:	If TO_PROPER_CASE (Account.Name) = 'JOHN SMITH' Then ...

Function:	URL_ENCODE, URL_DECODE
Description:	Convert the string into a representation that can be used in a URL replacing spaces and other special symbols
Parameters:	Attribute of the Plain Text type or string constant or calculation producing text
Example:	DISPLAY URL URL_ENCODE(Object.Url)

Function:	WORDS_FROM_LEFT
Description:	Returns the text being the specified number of the leftmost words in the provided text
Parameters:	Attribute of the Plain Text type or string constant or calculation producing text and an integer constant indicating the number of words to retrieve
Example:	If WORDS_FROM_LEFT (Account.Name, 1) = 'John' Then ...

Function:	WORDS_FROM_RIGHT
Description:	Returns the text being the specified number of the rightmost words in the provided text
Parameters:	Attribute of the Plain Text type or string constant or calculation

	producing text and an integer constant indicating the number of words to retrieve
Example:	If WORDS_FROM_RIGHT (Account.Name, 1) = 'Smith' Then ...

Function:	WORD_NUMBER
Description:	Returns an integer constant indicating the number of words in the provided text
Parameters:	Attribute of the Plain Text type or string constant or calculation producing text
Example:	If WORD_NUMBER (Account.Name) > 2 Then ...

Mathematical Functions

Function:	RANDOM
Description:	Calculates randomly generated number as a floating point constant in the range of 0-1
Parameters:	None
Example:	Account.Key = RANDOM

Function:	ABS
Description:	Returns the number constant being an absolute value of the provided number
Parameters:	Attribute of the Number type or number constant or calculation producing number
Example:	If ABS (Transaction.Amount) = 10 Then ...

Function:	SIGN
Description:	Returns the sign of the provided number (0, 1 or -1)
Parameters:	Attribute of the Number type or number constant or calculation producing number
Example:	If SIGN (Transaction.Amount) = -1 Then ...

Function:	FLOOR
Description:	Returns the largest integer number that is not greater than the provided number: FLOOR (5.67) = 5; FLOOR (-5.57) = -6
Parameters:	Attribute of the Number type or number constant or calculation producing number

Example:	If FLOOR (Transaction.Amount) = 10 Then ...
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Function:	CEILING
Description:	Returns the smallest integer number that is not less than the provided number: CEILING (5.67) = 6; CEILING (-5.57) = -5
Parameters:	Attribute of the Number type or number constant or calculation producing number
Example:	If CEILING (Transaction.Amount) = 10 Then ...

Function:	EXP
Description:	Returns the exponential number raised to the power of the provided number
Parameters:	Attribute of the Number type or number constant or calculation producing number
Example:	If EXP (Transaction.Amount) = 10 Then ...

Function:	NEG
Description:	Returns the provided number negated
Parameters:	Attribute of the Number type or number constant or calculation producing number
Example:	If NEG (Transaction.Amount) = -10 Then ...

Function:	SQRT
Description:	Calculates the square root of the provided number
Parameters:	Attribute of the Number type or number constant or calculation producing number
Example:	If SQRT (Transaction.Amount) = 10 Then ...

Function:	POWER
Description:	Returns the value of the first number raised to the power of the second number
Parameters:	Two attributes of the Number type or number constants or calculations producing number
Example:	If POWER (Transaction.Amount, 2) = 100 Then ...

Function:	ROUND
Description:	Returns the first number rounded to the precision of the second number. For example, ROUND (6.738, 1) = 6.7; ROUND (6.738, 2) = 6.74

Parameters:	Two attributes of the Number type or number constants or calculations producing number
Example:	If ROUND (Transaction.Amount, 1) = 10.3 Then ...

Function:	MIN2
Description:	Calculates the minimum of the two provided numbers
Parameters:	Two attributes of the Number type or number constants or calculations producing number
Example:	If MIN2 (Transaction.Amount, Account.Balance) = 100 Then ...

Function:	MAX2
Description:	Calculates the maximum of the two provided numbers
Parameters:	Two attributes of the Number type or number constants or calculations producing number
Example:	If MAX2 (Transaction.Amount, Account.Balance) = 100 Then ...

Function:	MOD
Description:	Calculates the remainder of the first number divided by the second one
Parameters:	Two attributes of the Number type or number constants or calculations producing number
Example:	If MOD (Account.Balance, Transaction.Amount) = 10 Then ...

Function:	LOG
Description:	Calculates the base 10 logarithm of the provided value
Parameters:	An attribute of the Number type or number constant or a calculation producing a number
Example:	If LOG (Transaction.Amount) = 1 Then ...

Function:	LN
Description:	Calculates the natural (base e) logarithm of the provided value
Parameters:	An attribute of the Number type or number constant or a calculation producing a number
Example:	If LN (Transaction.Amount) = 1 Then ...

Financial Functions

Function:	CURRENCY_SYMBOL
Description:	Returns the currency symbol for the given currency code
Parameters:	Currency code, for example USD
Example:	CURRENCY_SYMBOL('USD')

Function:	PV
Description:	Calculates present value of an investment. The present value is the total amount that a series of future payments is worth now
Parameters:	<ul style="list-style-type: none"> 1) Rate – interest rate per period (in percents, 50% is 0.5). 2) Nper – total number of payment periods in an annuity 3) Payment – payment made each period 4) Future value (optional) – future value or the cash balance you want to attain after the last payment is made. If omitted assumed to be 0 5) Type (optional) – indicates when payments are due. 0 or omitted – at the end of the period; 1 – at the start of the period
Example:	PV (0.08, 12 * 20, 500, 0, 0)

Function:	FV
Description:	Calculates the future value of an investment based on periodic constant payments and a constant interest rate
Parameters:	<ul style="list-style-type: none"> 1) Rate – interest rate per period (in percents, 50% is 0.5). 2) Nper – total number of payment periods in an annuity 3) Payment – payment made each period 4) Present value (optional) – present value or the lump-sum amount that a series of future payments is worth right now. If omitted assumed to be 0 5) Type (optional) – indicates when payments are due. 0 or omitted – at the end of the period; 1 – at the start of the period
Example:	FV (0.08, 12 * 20, 500, 0, 0)

Function:	NPER
Description:	Calculates total number of payment periods in an annuity
Parameters:	<ul style="list-style-type: none"> 1) Rate – interest rate per period (in percents, 50% is 0.5). 2) Payment – payment made each period 3) Future value (optional) – future value or the cash balance that is attained after the last payment is made. If omitted assumed to be 0 4) Present value (optional) – present value or the lump-sum amount that a series of future payments is worth right now. If omitted assumed to be 0

	5) Type (optional) – indicates when payments are due. 0 or omitted – at the end of the period; 1 – at the start of the period
Example:	NPER (0.08, 500, 0, 0, 0)

Function:	PMT
Description:	Calculates payment to be made each period
Parameters:	<p>1) Rate – interest rate per period (in percents, 50% is 0.5).</p> <p>2) Nper – total number of payment periods in an annuity</p> <p>3) Future value (optional) – future value or the cash balance that is attained after the last payment is made. If omitted assumed to be 0</p> <p>4) Present value (optional) – present value or the lump-sum amount that a series of future payments is worth right now. If omitted assumed to be 0</p> <p>5) Type (optional) – indicates when payments are due. 0 or omitted – at the end of the period; 1 – at the start of the period</p>
Example:	PMT (0.08, 12 * 20, 500, 0, 0)

Miscellaneous Functions

Function:	OLD_VALUE
Description:	Returns the old value of the attribute before it was changed
Parameters:	An attribute of a business object or group
Example:	If OLD_VALUE(Account.Balance) = 100 Then ...

Function:	TYPE
Description:	Returns the specific type of the member of the business object group as a string constant
Parameters:	The name of the business object group
Example:	If TYPE (Account) = 'PersonalSavingAccount' Then ... (this assumes that the Account is a business object group having PersonalSavingAccount as its member)

Function:	SEARCH_COUNT
Description:	Returns the number of object instances found by the last query
Parameters:	None
Example:	FIND ALL Account If SEARCH_COUNT = 1 Then

	DISPLAY MESSAGE ('One account was found')
--	---

Function:	FILE_EXISTS
Description:	Checks if the specified file or directory exists
Parameters:	An expression returning a string identifying a file or directory name
Example:	If FILE_EXISTS('c:/myfile.txt') = 'Yes' Then DISPLAY MESSAGE ('File exists')

Function:	FILE_NAME
Description:	Returns the name of the specified file or document without the extension
Parameters:	An expression returning a string identifying a file or directory name or an attribute of the Document type
Example:	DISPLAY MESSAGE ('File name is ' + FILE_NAME('c:/myfile.txt'))

Function:	FILE_EXTENSION
Description:	Returns the extension of the specified file or document
Parameters:	An expression returning a string identifying a file or directory name or an attribute of the Document type
Example:	DISPLAY MESSAGE ('File extension is ' + FILE_EXTENSION('c:/myfile.txt'))

Function:	FILE_SIZE
Description:	Returns the size of the specified file or document in bytes
Parameters:	An expression returning a string identifying a file or directory name or an attribute of the Document type
Example:	DISPLAY MESSAGE ('File size is ' + FILE_SIZE('c:/myfile.txt'))

Function:	FILE_LAST_MODIFIED
Description:	Returns the date when the specified file was last modified
Parameters:	An expression returning a string identifying a file or directory name
Example:	DISPLAY MESSAGE ('File modified ' + AS_STRING(FILE_LAST_MODIFIED('c:/myfile.txt')))

Function:	READ_TEXT_FILE
Description:	Returns the textual contents of the specified file
Parameters:	An expression returning a string identifying the full path of the textual file

Example:	Object.Attribute = READ_TEXT_FILE('c:/temp/myFile.txt')
-----------------	---

Function:	EXACT
Description:	By default Aware IM automatically translates explicit strings used in rules using the current locale. This function allows to bypass this mechanism and use strings as they are specified in the function
Parameters:	A string to use
Example:	IF Account.Status = EXACT('Final') Then PROTECT Account FROM ALL

Function:	GENERATE_PWD
Description:	Generates random string that can be used as string password
Parameters:	<ul style="list-style-type: none"> 1) Min. number of characters in the password 2) Max. number of characters in the password 3) Number of capital letters 4) Number of digits 5) Number of special characters
Example:	Object.Pwd = GENERATE_PWD(8,15,2,2,2)

Function:	GROUP_MEMBER
Description:	Returns true if the specified business object belongs to the specified business object group
Parameters:	<ul style="list-style-type: none"> 6) String identifying the business object 7) String identifying the business object group
Example:	IF GROUP_MEMBER('SavingAccount', 'Account') = TRUE Then ...

Function:	DISTANCE
Description:	Returns the distance between two addresses or locations in metres
Parameters:	Two addresses or locations as Plain Text and a Google Maps key as PlainText. A location can be specified as two geo coordinates separated by comma
Example:	IF DISTANCE (ThisClient.Address, ThatClient.Address, SystemSettings.GoogleMapsKey) > 1000 THEN ...

Function:	EVAL_STRING
Description:	Evaluates the specified string as if it was a condition of the Rule Language. Returns the result of evaluation, which can either be a numeric value or "Yes/No" value
Parameters:	An expression providing a string
Example:	Object.Attribute = 'Customer.Nmb'

	IF EVAL_STR (Object.Attribute) = 5 THEN ... Object.Attribute = 'Customer.Nmb>5' IF EVAL_STR(Object.Attribute) = 'Yes' THEN ...
--	---

Function:	EXEC_SPF
Description:	Executes the specified stored procedure and returns a value in the OUT parameter of the stored procedure. The stored procedure must have one and only one OUT parameter defined. All other parameters (if any) should be IN parameters.
Parameters:	The first parameter is the name of the stored procedure to execute. All other parameters (if any) are IN parameters of the stored procedure
Example:	IF EXEC_SPF ('ContactNotesCount', 'MAIN', Customer.ID) = 4 THEN...

Function:	LIST_SIZE
Description:	Returns number of elements in the list
Parameters:	A reference to the list
Example:	IF LIST_SIZE (Client.Children) > 2 THEN ...

Function:	LIST
Description:	Prints out a list of business objects as a table where each row represents a single list member. A list may be specified as an attribute or as a query string. Only specified attributes of each list member are printed out. This function is useful when it is necessary to print out a relatively small list inside a document or inside an e-mail (usually used inside a tag). Returns a table as a text string.
Parameters:	<ol style="list-style-type: none"> Identifier of the list or a string identifying the query (either Rule Language string or the name of the existing query). Delimiter to be used between attributes of a member. Attribute names to be printed out. The name of the attribute to print out may be optionally followed by the print format (the name of the attribute and the format must be separated by comma). If format is not specified the default attribute format will be used.
Example:	<<LIST(Client.Children, ' ', 'FirstName', 'LastName', 'Age,#')>> <<LIST('FIND Child WHERE Child IN Client.Children', ' ', 'FirstName', 'LastName', 'Age')>>

Function:	LIST_TABLE
Description:	Prints out a list of business objects as a table where each row

	represents a single list member. A list may be specified as an attribute or as a query string. Only specified attributes of each list member are printed out. The header of the table containing attribute names is printed automatically
Parameters:	<ol style="list-style-type: none"> Identifier of the list or a string identifying the query (either Rule Language string or the name of the existing query). If the list identifier is used the second parameter may optionally indicate ordering of the list Attribute names to be printed out. The name of the attribute to print out may be optionally followed by the print format (the name of the attribute and the format must be separated by comma). If format is not specified the default attribute format will be used.
Example:	<<LIST_TABLE(Client.Children, 'FirstName', 'LastName', 'Age,#')>>

Function:	LIST_TABLE_START, LIST_TABLE_END								
Description:	Whereas the LIST_TABLE function prints the entire table including the header, the combination of LIST_TABLE_START and LIST_TABLE_END functions allows using an existing header of the table. Just like the LIST_TABLE function it prints out members of a list of query results. However, you create the table in the document itself and only mark the start and end of the data. All tags in between the markers represent attributes to be printed (see example). Aware IM automatically inserts extra rows as required. These functions can only be used inside tags in MS Word, Excel or HTML documents!								
Parameters:	LIST_TABLE_START function takes an identifier of the list or a string identifying the query (either Rule Language string or the name of the existing query) – see LIST_TABLE function. If the list identifier is used the second parameter may optionally indicate ordering of the list. LIST_TABLE_END has no parameters.								
Example:	<table border="1"> <thead> <tr> <th>Header1</th> <th>Header 2</th> <th>Header3</th> </tr> </thead> <tbody> <tr> <td><<LIST_TABLE_START(C lient.Children)>><<Child.Fi rstName>></td> <td><<Child.LastNa me>></td> <td><<Child.Age>><<LI ST_TABLE_END()> ></td> </tr> </tbody> </table>			Header1	Header 2	Header3	<<LIST_TABLE_START(C lient.Children)>><<Child.Fi rstName>>	<<Child.LastNa me>>	<<Child.Age>><<LI ST_TABLE_END()> >
Header1	Header 2	Header3							
<<LIST_TABLE_START(C lient.Children)>><<Child.Fi rstName>>	<<Child.LastNa me>>	<<Child.Age>><<LI ST_TABLE_END()> >							

Function:	LIST_LINE		
Description:	Prints out members of a list as a single line. Only specified attributes of each list member are printed out. A list may be specified as an attribute or as a query string. This function is useful when it is necessary to print out a relatively small list inside a document or inside an e-mail (usually used inside a tag). Returns a line as a text string.		
Parameters:	1. Identifier of the list or a string identifying the query (either Rule		

	<p>Language string or the name of the existing query).</p> <ol style="list-style-type: none"> 2. If the list identifier is used the second parameter may optionally indicate ordering of the list 3. Delimiter to be used between attributes of a member. 4. Delimiter to be used between members. 5. Attribute names to be printed out. The name of the attribute to print out may be optionally followed by the print format (the name of the attribute and the format must be separated by comma). If format is not specified the default attribute format will be used.
Example:	<pre><<LIST_LINE(Client.Children,'ORDER BY Child.FirstName DESC','','','FirstName', 'LastName', 'Age,#')>> <<LIST_LINE('FIND ALL Child','','','FirstName', 'LastName', 'Age,#')>></pre>

Function:	SUB_DOCUMENT
Description:	Includes a subdocument inside a master document. The source of data for the sub-document is specified as the first parameter of the function. The sub-document will be included for each instance of the business object in the data source. This function can only be used inside tags in MS Word documents!
Parameters:	<ol style="list-style-type: none"> 1. Identifier of the list or a string identifying the query (either Rule Language string or the name of the existing query). List members of business objects found by a query serve as the data source for the sub-document 2. Name of the document template identifying the sub-document.
Example:	<<SUB_DOCUMENT(Client.Children, 'ClientList')>>

Function:	PAGE_NUMBER
Description:	Returns the current page number in a report
Parameters:	None
Example:	(to be used only inside the tags in the Report Designer)

Function:	NUMBER_OF_PAGES
Description:	Returns the number of pages in a report
Parameters:	None
Example:	(to be used only inside tags in the Report Designer)

Function:	ELEMENT_COUNT
Description:	Returns number of elements in a report, page, column or group (which is specified by pressing the Evaluation Details button in the

	Report/Presentation Designer – see Editing Tag Element)
Parameters:	None
Example:	(to be used only inside tags in the Report Designer)

Function:	ELEMENT_COUNTER
Description:	Returns the number of an element in the report, page, column or group (which is specified by pressing the Evaluation Details button in the Report/Presentation Designer – see Editing Tag Element). For example, if Details band contains 5 elements the value of the function for the first element will be 1, the second – 2 etc.
Parameters:	None
Example:	(to be used only inside tags in the Report Designer)

Function:	NESTING_LEVEL
Description:	Returns the level of nesting of the currently executing subreport. Master report has nesting level 0, the subreport of the master report has nesting level 1, the subreport of the subreport has nesting level 2 etc.
Parameters:	None
Example:	(to be used only inside tags in the Report Designer)

Function:	URL_CONTENTS
Description:	Calls the specified URL and returns its response as text.
Parameters:	1. URL to call
Example:	Object.URLContents = URL_CONTENTS('http://www.test.com')

Function:	GET_CHANGES
Description:	If an object was changed returns which attributes have been changed as well as old and new values
Parameters:	Object name that has been changed
Example:	IF MyObject WAS CHANGED THEN CREATE AuditRecord WITH AuditRecord.Description=GET_CHANGES(MyObject)

Function:	NMB_OF_SESSIONS
Description:	Returns the number of time a particular user is logged in the system, 0 is returned if the user is not logged in
Parameters:	An instance of an object that belongs to the SystemUser group

Example:	IF NMB_OF_SESSIONS(RegularUser) > 1 THEN REPORT ERROR 'User can only be logged in once'
-----------------	--

Function:	NMB_OF_USERS
Description:	Returns the number of licensed users for the current Aware IM license or -1 if evaluation version
Parameters:	None
Example:	IF Object.Count>NMB_OF_USERS() THEN REPORT ERROR 'Error'

Function:	SCALE_IMAGE
Description:	Scales the given image to the specified width and height
Parameters:	An attribute of the picture type and two numbers representing width and height respectively
Example:	Object.ScaledImage = SCALE_IMAGE(Object.OrgImage, 30, 30)

Function:	IMAGE_WIDTH, IMAGE_HEIGHT
Description:	Determines width(height) of the provided image
Parameters:	An attribute of the picture type
Example:	IF IMAGE_HEIGHT(Object.Picture) > 800 THEN ...

Function:	TESTING_MODE
Description:	Return 'Yes' if the current user is running in the testing mode
Parameters:	None
Example:	IF TESTING_MODE() = 'Yes' THEN ...

Function:	NATIVE_MOBILE_MODE
Description:	Return 'Yes' if the current user is running a native mobile application. Can only be used in applicability conditions!
Parameters:	None
Example:	NATIVE_MOBILE_MODE()='Yes'

Function:	ENCRYPT_B64, DECRYPT_B64
Description:	Provides BASE64 with XOR shift encryption(decryption_) of the specified string. Can be used to encrypt Aware IM links – see Login Parameters
Parameters:	An attribute of the Plain Text type or an expression producing a string
Example:	DISPLAY URL 'logonOp.aw?e=ENCRYPT_B64('domain=Test&userName=john&password=123')

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Access level

Access level determines what information users can see, how it is presented and what operations are available to them when they [login](#) into their [business space](#) in the [operation mode](#). Each system user has an access level. The [configurator](#) may define as many access levels as necessary to set restrictions and privileges for different categories of users. When a new user is registered the user is assigned one of the defined access levels.

Action

An action is a part of a [rule](#) that performs some operation. The [rule language](#) has a number of pre-defined actions. Actions can perform validation, assign values to [attributes](#), create, find or display [business objects](#), start [processes](#), display or print documents, [import](#) or [export](#) data, communicate with other software and perform other operations.

Aggregate operation

An aggregate operation performs arithmetic calculations on several [business objects](#) and/or their [attributes](#). An example of an aggregate operation would be counting the number of items in an order. Another example is calculating the order amount as a total of the amounts of all items in the order. There are several aggregate operations in the [rule language](#).

Attribute

An attribute is a part of a [business object](#) that holds some fact about the business object. It may be, for example, a customer name, an account balance or an order number. The kind of information held by the attribute depends on its [type](#).

[Notifications](#), like [business objects](#), also have attributes.

Attribute choice list

[Attributes](#) of [basic types](#) that hold textual, numeric, date and time data can have a list of possible values specified by a [configurator](#). When entering data in the [operation mode](#) a user can select one of these values rather than having to type it manually. This feature offers convenience and saves data entry time.

In addition, the configurator can restrict the values allowed for the attribute to one of those in the list. In this case [Aware IM](#) will validate the data against the list when the attribute is updated whether manually or by a [rule](#).

Attribute format

Attribute format determines how the attribute value will appear on the screen or in a document. It applies to [attributes](#) of [basic types](#) that hold numeric, date and time data. For example, a date may be presented in full, short or a custom-specified format.

Attribute initial value

For an [attribute](#) of a [basic type](#) a [configurator](#) may specify an initial value. This value will be assigned to the attribute when the [business object](#) (or [notification](#)) to which it belongs is created in the [operation mode](#). For example, the configurator may specify that all orders be created with the status 'New'.

Attribute length

Attribute length applies only to [textual attributes](#). It specifies the maximum number of letters allowed for the attribute value. For example, the length for a customer name may be set to 100. When specifying the length the [configurator](#) should use some sufficient but sensible number to avoid wasting space in the [data storage](#).

Attribute query

A [query](#) may be nominated for [reference attributes](#) to limit available [business objects](#) applicable to the attribute. For example, there may be a requirement that an account holder cannot be younger than 18 years old. With the attribute query only persons of 18 years old and over will appear for selection of the account holder when a new account is created.

Attribute type

An attribute type determines the nature of the information held by the [attribute](#). An attribute type can be either a [basic type](#) or a [reference type](#). There are following basic types:

- **Plain Text**, used for non-formatted textual information such as a person's name or address.
- **Number**, used for monetary, countable or other numerical data.
- **Yes/No**, used for information that can be described by one of two possible values, such as yes/no, on/off, etc.
- **Date**, used to hold dates.
- **Timestamp**, used to hold a moment in time including the date and the time parts.
- **Duration**, used to hold a time interval.
- **Picture**, used specifically for images intended to be displayed on the object form.
- **Document**, used to hold document data such as text, report, scanned picture, web page, digitised sound, etc.
- **Shortcut**, used to display data of a related business [object](#).

Attribute value range

For [numerical attributes](#) the [configurator](#) may specify an interval of acceptable values. For example, a person's age can be expected to be within a certain range, a transaction amount cannot exceed certain value, etc. When a range is specified, [Aware IM](#) will validate the data against the range when the attribute is updated whether manually or by a [rule](#).

Auto-generated form

An auto-generated form is an [object form](#) that [Aware IM](#) generates automatically in the [operation mode](#). This way the [configurator](#) does not have to do any work related to presentation of the object information in the [operation mode](#). With auto-generated forms the configurator can easily control which [attributes](#) appear on the form and in which order.

To display information in an enhanced or special fashion the configurator can supply [custom forms](#) or design [presentations](#).

Auto-generated rule

[Aware IM](#) creates auto-generated [rules](#) to handle certain instructions that the [configurator](#) may specify for an [attribute](#), such as [initial values](#), [choice lists](#), [value ranges](#), and [required values](#). Auto-generated rules are normally hidden, but can be made visible when working with rules. Auto-generated rules cannot be edited.

Aware IM

Aware IM is a configurable information management software system designed for businesses that cannot justify costs of custom-built software, or individuals with non-

standard computing requirements. **Aware IM** allows non-technical people to configure an information management system for their needs without engineering assistance. Unlike traditional software applications with **Aware IM** the users can make frequent adjustments to the system whenever their needs change.

Aware IM server

Aware IM server, or simply the server, is the central component of **Aware IM**. It manages [business space](#) data in the [operation mode](#), maintains the configuration information of business spaces and provides the [Configuration Tool](#) with it, handles communication between **Aware IM** and other software systems.

Business object

A business object, or simply an object, represents an element of the business for which some information needs to be maintained. Examples of business objects: customers, accounts, orders, payments, etc. A number of facts usually need to be registered for an object. For example, an order may have the placement date, customer, line items, shipment address, shipment date, shipment number, delivery instructions, order status, etc. Each of such facts is represented by a separate [attribute](#).

An advanced variant of a business object is called an [intelligent business object](#).

Business object group

A business object group allows for uniform handling of [business objects](#) of different [types](#). It offers the convenience of establishing links to various business objects in one place. For example, a Transaction group may be created to embrace all possible transactions that can be applied to an account, where a separate object represents each transaction type. An Account business object may have an [attribute](#) that is a [multiple reference](#) to the Transaction group. In this way transactions of different types would be registered with the account in a single list.

Business space

A business space is a container of all information and rules on processing the information that a business organization, or an individual, may need to manage.

[Aware IM](#) manages a business space according to the instructions provided by a [configurator](#) in the [configuration mode](#). Regular users [login](#) into the business space in the [operation mode](#) to work with operational information. A business space is therefore a combination of both configuration instructions and operational data.

All configuration elements, such as [business objects](#), [processes](#), [rules](#) and others, belong to a business space. They reflect the unique requirements of the organization, or

individual, and can be adjusted as often as necessary to accommodate changes in the requirements.

Business space documentation

On request of a [configurator](#) **Aware IM** will generate a complete self-containing documentation of a [business space](#). The documentation contains details of all [business objects](#), [processes](#), [rules](#) and other configuration elements specified in the business space. The generated document can be stored electronically and used by anyone without access to **Aware IM**. It can be searched for information of interest, printed out, filed away, used for audit purposes, etc.

The document is generated for a given [business space version](#). It is recommended to generate and keep documentation for each [published](#) version. This will allow keeping track of the information and rules that were in effect at a given time in the past.

Business space integrity

A [business space version](#) may become inconsistent in the course of editing of its configuration elements. To check for possible integrity problems, such as references to non-existent [business objects](#), invalid [rules](#), etc., a [configurator](#) can use a command of the [Configuration Tool](#) that verifies the integrity of the business space version. **Aware IM** always checks the integrity of the version when the version is being [published](#) or made available for [testing](#). It will not allow publishing or testing an inconsistent version.

Business space version

To help manage changes made to a [business space](#) **Aware IM** has a built-in version control mechanism. It allows making and testing changes to a business space without affecting the normal operation of the system. To make changes to a business space [the configurator](#) creates a new version of the business space and makes the changes in that version. Then the modified version can be put [under test](#) to verify that the changes work as expected. After that the new version can be [published](#), i.e. made operational. The state of a newly created version is 'New', state of a version being tested is 'Under Test', the operational version, i.e. the one used in the [operation mode](#) has state 'Current', the state of the former operational version is 'Obsolete'.

All the configuration work for a business space is done in a version of that business space. The configuration information of a business space version can be exported into or imported from a file, which makes configuration information portable between different **Aware IM** installations. In particular it allows people to prepare [configuration templates](#) for others to use.

Calculated attribute

A [configurator](#) may nominate an [attribute](#) as calculated, meaning that the attribute can be updated in the [operation mode](#) only by a [rule](#), but not by users. For more flexible access control to attributes the configurator may use [access levels](#) and the PROTECT [action](#).

Communication channel

A communication channel is a software adaptor carrying communication between [Aware IM](#) and an [intelligent object](#). [Aware IM](#) provides several channels that allow communicating with people via e-mail or software systems via a standard data exchange protocol (SOAP). Custom communication channels can be developed and plugged into [Aware IM](#) for situations where a software or device does not support the standard communication protocol.

Condition

A condition is an [expression](#) in the [rule language](#) which result is either true or false.
Examples of conditions:

```
Order.State = 'Approved'  
  
Account.Holder.Age < 18  
  
Customer.Name IS UNDEFINED  
  
LineItem WAS ADDED TO Order.Items
```

Conditions are an essential part of [rules](#), where they determine when the rule [actions](#) need to be executed, and of [queries](#) where they specify which [business objects](#) to find. Conditions are also used for [conditional elements](#) in [reports](#) and [presentations](#) to specify how a particular element should be displayed.

Conditional element

A conditional element is an element of a [report](#) or a [presentation](#) that can be displayed differently depending on [conditions](#) attached to the element. A single condition can be used to specify whether the element should be displayed. If the condition is not met the element is not displayed. In particular, this may be used in letter [templates](#) to designate conditional text.

Multiple conditions can be used to specify how the element should be displayed. For example, an amount can be shown in black if it is non-negative, in red if it is negative, or a little picture can be displayed if the value of the amount is unknown.

Configuration mode

The configuration mode allows users to specify the elements of their [business space](#), in other words to define the contents and behaviour of their application. They use [Configuration Tool](#) for this purpose. [Aware IM](#) uses the provided configuration information to manage the business space in the [operation mode](#).

Configuration template

Configuration template is a configuration of a [business space](#) prepared by a person with an intention of distributing to other people so they can use it for their own purposes. This is similar to templates of letters, forms or reports that may be found in an office environment. [Configuration Tool](#) allows exporting business space configurations to files, and importing from files, making it easy for people to share their configurations.

Configuration Tool

Configuration Tool is the editor of configuration information for a [business space](#). It is a component of [Aware IM](#) that allows a user to work with configuration of business spaces, [business space versions](#) and the elements such as [business objects](#), [processes](#), [rules](#) and others. Configuration Tool connects to [Aware IM server](#) to request the necessary configuration information and submit the modified information back to the server.

Configurator

The configurator is a person using [Configuration Tool](#) to edit configuration information of a [business space](#).

Context

The context is a working area containing relevant [business objects](#) and [notifications](#) that [Aware IM](#) maintains in the [operation mode](#) for the purpose of [rule evaluation](#) and displaying of information. The initial content of the context depends on the configuration element. For example, for [rules](#) attached to a [business object](#) the context contains a single [instance](#) of the object when the rules are evaluated. For [processes](#) the initial context is determined by the [process input](#). More objects can be added to the context following execution of [actions](#) that create new business objects or [retrieve](#) them from the [storage](#).

Note that rules do not distinguish between different [instances](#) of objects of the same [type](#). If there are multiple instances in the context the rule action will be executed on each of the instances. For example, consider the following process:

```
FIND Loan WHERE Loan.DueDate < CURRENT_DATE  
Loan.State = 'Late'
```

The first rule will find all overdue loans and place them in the context. The second rule will change the state of each loan in the context.

Context assistant

The Context Assistant is a little pop-up window in the [Configuration Tool](#) that helps the [configurator](#) enter and edit [expressions](#) of the [rule language](#). Context Assistant comes up when the configurator presses F3 while typing text of a [rule](#) or [tag](#) expression.

Control Panel

The window that starts up and shuts down the main **Aware IM** components and shows their status. **Aware IM** system is started by starting the Control Panel.

Custom form

A custom form is an [object form](#) that the [configurator](#) can design to replace an [auto-generated form](#) that [Aware IM](#) supplies by default for [business objects](#). With custom forms the configurator has the freedom of choosing the layout, background, fonts, colors and other visual elements for displaying and editing of [object attributes](#).

The configurator can also design [presentations](#) for custom display, but not editing, of object attributes.

Default business space

The default business space is a [business space](#) that [Aware IM](#) creates during the installation with the name supplied by the user. For many users the single default business space will be sufficient to manage their information. Others may create additional business spaces for testing purposes or to import, inspect and reuse [configuration templates](#). People creating configuration templates for others will probably need to maintain multiple business spaces.

Default communication channel

For [intelligent business objects](#) that have more than one [communication channel](#) the [configurator](#) may nominate one of these channels as a default channel. The default

channel is the channel that all the communication with the business object will be sent through if the channel is not explicitly specified in the rules that send a [notification](#) or request a [service](#).

Discovering services

Discovering services is a feature of [Aware IM](#) that automatically downloads into a [business space](#) the definition of [services](#) provided by an [intelligent business object](#). This works only for business objects that communicate via the SOAP [channel](#), a standard web communication protocol. Discovering services is much easier than having to enter the definitions by hand. Besides, it eliminates potential errors related to manual data entry.

This feature is particularly useful when establishing communication between two business spaces maintained by the same or different [Aware IM](#) installations. One of these business spaces will include an intelligent business object that represents the other business space and communicates via the SOAP channel. Discovering the services of the intelligent object will automatically add the definitions of the services, [service input](#) and [service replies](#) into the business space.

Document template

A document template is a fully prepared document, usually with some textual contents, that is intended to include some information taken from [business objects](#). The [configurator](#) supplies document templates when editing [a business space](#). In the operation mode [Aware IM](#) creates an actual document from a template by inserting the required information. Examples of document templates may be an account-opening letter, a purchase receipt, etc. The business object-specific information is marked in the template by special [tags](#).

[Aware IM](#) supports several document template types including plain text, MS Word, MS Excel, HTML and a special report type. The [report](#) is different from the other types in that it allows insertion of information for multiple business objects and can also be used for producing comprehensive reports. In addition the report type makes it possible to include conditional text or other conditional elements that will be printed in the actual document only when their conditions are met.

Export

Export is an [action](#) that writes values of [attributes](#) of a [business object](#) into a file in the [operation mode](#). It can be used to extract required information from the system on a one-off or [regular basis](#), for example to exchange data with software systems that do not support [direct communication](#). It is also possible to export data of multiple business objects for editing in a specialised software application and [import](#) the modified data back into [Aware IM](#).

Expression

An expression is a building block in the [rule language](#) used to construct various elements of the rule language such as [conditions](#), [actions](#), [tags](#), etc.

Form section

A form section is a separate page on the [object form](#). For most [business objects](#) the form contains a single section. However, if a business object is complex and contains many [attributes](#) it is often beneficial to split them into logical groups, each displayed on a separate form section with a specific name. A form section can be either [auto-generated](#) or [custom](#). In the [operation mode](#) users can switch between different sections according the [navigation style](#) the [configurator](#) selects for the object form.

Form section navigation style

For [object forms](#) with multiple [sections](#) the navigation style determines how users navigate between sections in the [operation mode](#). There are two navigation styles: random (direct) and wizard-like (sequential). With the random navigation style the user can switch between sections at random by clicking on the section name to go directly to the desired section. With the wizard-like navigation the order of form sections is strictly defined. The user can only navigate to the next or previous form section by clicking a corresponding button. The latter style is useful in situations where some [attributes](#) depend on other attributes. During the transition between sections **Aware IM** recalculates the value of dependent attributes as necessary.

Function

Functions can be used in [rules](#) to perform various manipulations with data. **Aware IM** includes several groups of functions to work with text, dates and time, perform mathematical calculations and others.

Aware IM also allows addition of new functions that can be developed using a programming language.

Hosting environment

Aware IM allows users to access their [business space](#) in the [operation mode](#) from any location via the Internet using a standard Web browser. This requires [Aware IM Server](#) to be installed on a computer that has a permanent connection to the Internet with sufficient speed and bandwidth. The users who do not have a suitable Internet

connection can run **Aware IM** Server on a computer managed by an Internet hosting service provider, which is called a hosting environment.

Working in [configuration mode](#) in a hosting environment is a little different. In particular, the [configurator](#) saves business space configuration into a file and then uploads it to **Aware IM** Server in the [operation mode](#) using a special command.

Users who only need to access their information system within a single location do not need a hosting environment.

Hyperlink element

A visual element in [presentations](#) can have an operation assigned to it. When the user clicks on the element in the [operation mode](#) the assigned operation is executed. The operation types include starting a [process](#), running a [query](#), viewing a presentation and others.

ID attribute

ID attributed is added automatically to a definition of any business object. When an instance of a business object gets created the ID attribute is assigned a value that uniquely identifies the instance within **Aware IM**

Import

Import is an [action](#) that reads values of [attributes](#) of a [business object](#) from a file in the [operation mode](#) and inserts its contents into a [business space](#) creating or replacing business objects as necessary. In addition to inserting separate object data it can also preserve relations between objects allowing for importing complex data. For example, it is possible to import customer details together with all his accounts and transactions on those accounts.

It can be used to acquire data on a one-off or [regular basis](#), for example to transfer data from software systems that do not support [direct communication](#). It is especially useful for the initial migration of data from older software applications into a newly created business space.

It is also possible to use the import action in combination with the [export](#) action to allow for editing of multiple object data in specialised software applications.

Indexed attribute

If a [configurator](#) marks an [attribute](#) as indexed, **Aware IM** will instruct the underlying database system to create an index for this attribute. Creating database index may

significantly speed up [queries](#) involving the attribute. This is an advanced option to be used by users familiar with the database management systems.

Initialization rule

[Aware IM](#) considers [rules](#) with a certain pattern to be initialization rules. Here is an example of an initialization rule:

```
If Order.State IS UNDEFINED Then Order.State = 'New'
```

When a new [business object](#) is created in the [operation mode](#) the initialization rules are executed before the [object form](#) is displayed. Therefore, when the user sees the form for the new object its [attributes](#) are already initialized according to the rules.

[Aware IM](#) automatically generates initialization rules to handle [initial values](#) the [configurator](#) specifies for object attributes.

Intelligent business object

In addition to a collection of attributes that [ordinary business objects](#) have, intelligent business objects are capable of processing information and communicating in a meaningful way. This includes human beings, software systems and electronic devices. For example, a customer would be an intelligent object because an organization needs to keep certain information about its customers, and may need to communicate with them. [Aware IM](#) can communicate with intelligent objects via [communication channels](#) in two ways: sending [notifications](#) or requesting [services](#).

A [business space](#) in [Aware IM](#) is an intelligent business object because it can both communicate and process information. The information is processed according to the [rules](#) defined in the business space. As far as communication is concerned, a business space can both provide [services](#) and handle incoming [notifications](#).

Login

Login is a process of a user entering a [business space](#) that takes place in both [configuration mode](#) and [operation mode](#). In the configuration mode the [configurator](#) enters a password and logs into a business space when Configuration Tool starts up. In the operation mode there are two categories of users: registered users and guests. An authorised person, usually the administrator of the system, can register users. Alternatively users can self-register if the business space allows them to. Either way, on registration all users are assigned a login name, a password and an [access level](#). To login the registered users must enter their login name and password.

The configurator may allow guest users to enter the business space without having to login. Such users are assigned with special 'Guest' access level, which is usually

configured to grant very limited access privileges. This is useful when the business space should allow visitors to access some common information, such as the home page of a web site.

Logout

Logout is a process of a user leaving a [business space](#). In the [configuration mode](#) the [configurator](#) logs out by closing [Configuration Tool](#). In the [operation mode](#) users click on the Logout link or [Aware IM](#) automatically logs them out after a certain period of inactivity.

It is strongly recommended that users logout when finishing their work with the system, especially if they use a computer that belongs to someone else. This will prevent unauthorised access to the system.

Matching attributes

Matching attributes are [reference attributes](#) of two [related business objects](#) that describe the same relation. Consider an example where Customer object has attribute Accounts that keeps track of all accounts of the customer, and Account object has attribute Holder that refers to the customer holding this account. These two attributes are declared as matching. The user creates a new account and selects a customer as its holder. When looking at the customer details the user will see the newly created account in the customer's account list.

Since objects in [Configuration Tool](#) are edited separately, the [configurator](#) needs to specifically nominate attributes of related objects as matching to establish a two-way connection. Otherwise they will be treated as two separate one-way connections between the related objects.

Notification

A notification is a way of communicating where a party can send a message to another party without having to identify itself and without expecting a reply back from the other party. It is entirely up to the other party to decide how to react upon receiving the notification. An e-mail is a good notification example.

[Aware IM](#) allows sending notifications from a [business space](#) to [intelligent business objects](#) defined in the business space, for example sending e-mails to customers. It also forwards incoming notifications into relevant business spaces, for example when an incoming e-mail arrives or a user [logs](#) into the business space in the [operation mode](#).

Notifications, like business objects, have [attributes](#) to hold communication information.

Object form

An object form is one or more pages displayed for users in the [operation mode](#) to view and edit a [business object](#). The form shows [attributes](#) of the object according to their [type](#) and the appearance settings specified by a [configurator](#). Object forms can have one or several [sections](#), each section can be either [auto-generated](#) or [custom](#). [Presentations](#) offer an alternative way of displaying, but not editing, object information.

Object operation

An object operation is an operation that applies to a particular [business object](#). For example, a transaction object may have such operations as approve transaction, reject transaction, etc. Object operations can be configured as [processes](#) taking as their [input](#) the business object of interest. Object operations appear in the caption bar of the [object form](#) making it easier for the users to start an operation while looking at the object details. Also, object operations can be configured as [hyperlink elements](#) on a [presentation](#) designed for the object, so the users can start an operation by clicking on the hyperlink.

Object relation type

There are two relation types: **peer** and **ownership**. The peer relation type should be used for objects that can exist independently of each other. For example a product can exist without being linked to a product category. If a product category is deleted, all products that were linked to the category lose the link but continue to exist on their own.

The ownership (or parent/child) relation type should be used if an object belongs to some other object and does not make sense without its owner object. For example, a line item always belongs to an order. If an order is deleted all line items of that order should be deleted as well. If a [configurator](#) marks a [reference attribute](#) of an object as owned by another object, [Aware IM](#) will automatically delete the object when its owner object is deleted, or when the link with the owner object is broken.

Object storage

Business object storage, also called persistence, determines where the [business object](#) data is kept. Usually the data is stored in a database. The [configurator](#) can nominate an object as not persisted, in which case the object is used in the [operation mode](#) temporarily and is not saved in the system.

Object type and object instance

While there is a single [business object](#) describing a business element in the [configuration mode](#), there may be many objects in the [operation mode](#) representing the

same business element. For example, a customer object may be defined in the configuration mode, and then many customer objects would be registered in the operation mode, each representing a different customer.

A formal way of making the distinction between objects in the two modes is to refer to the configuration-mode object as **object type** and to the operation-mode object as **object instance**. When it is necessary to avoid confusion between the two modes this formal notation is used. When it is clear which mode is being described, the term **object** is used.

Operation

Operation is an action that a user can perform with the instance of [a business object](#) in the [Operation Mode](#). This action may start a [process](#), run a [query](#), create a document etc. The action is usually specific to the instance of a business object for which the operation is invoked. For example, a process started by an operation may take the instance of a business object as its [input](#). Operations can be configured on business object [forms](#), on [reference attributes](#) and on query result screen.

Operation mode

In the operation mode [Aware IM](#) manages the information system according to the instructions in the [business space](#) provided by a [configurator](#) in the [configuration mode](#). Regular users [login](#) into the business space in the operation mode to use the system in the course of conducting their day-to-day business activities.

Presentation

A presentation is a way of displaying information of one or multiple [business objects](#) for users in the [operation mode](#). Unlike [object forms](#) presentations are not used to edit objects, instead they offer a variety of data presentation options for designing custom layouts, including a conditional display of information. Presentations can include [hyperlink elements](#) for performing various operations, in particular [object operations](#), with a mouse click. Presentations can also be used for displaying [query](#) results.

Presentations are designed using the same visual designer used for designing [reports](#). They share many features with reports including the ability to reuse designs.

Process

Process is a way of performing an operation in [Aware IM](#). In the [operation mode](#) a process can be started from a [rule](#), manually by a user, or when a [service](#) is requested by an external software system. Usually a [configurator](#) defines a process as a [collection of rules](#) that are executed in a [particular order](#). A process can also be configured to use

a software component developed using a traditional programming language. This option is useful when some special functionality, such as a complex mathematical algorithm, needs to be implemented, which cannot be done using the [rule language](#).

Process Failure Rules

Process failure rules may be attached to a particular [process](#). They are evaluated if this process fails as a result of execution of the REPORT ERROR action by one of its rules. Failure rules perform corrective actions. If failure rules are defined for a process the execution of the process continues after the failure.

Process input

If a [process](#) needs one or several [business objects](#) to work properly, a [configurator](#) should declare such objects as the process input. When the process is executed in the [operation mode](#) these objects will form the initial [context](#) for the process.

[Aware IM](#) uses the process input information for various purposes, for example when looking for [object operations](#) for a particular business object, or when determining [service input](#) for a service.

Publish

Publish is a command of the [Configuration Tool](#) that makes a [business space version](#) operational. The version state becomes 'Current'.

Query

A query is used in the [operation mode](#) to find [business objects](#) that meet specified [conditions](#). Query results can be displayed to the user or used for processing by [rules](#), for example within a [process](#). Queries can also find objects that belong to a [business object group](#).

If query results are intended to be displayed to users, the [configurator](#) can select which [attributes](#) of the found business objects should appear on a standard result page. Alternatively a [presentation](#) can be designed for the query for customized display of the results.

The configurator can specify queries in [simple form](#), [rule form](#) or [SQL form](#).

Query rule form

The rule form is a section of the query editor in the [Configuration Tool](#) where a [configurator](#) can specify a [query](#) using the [rule language](#). It can be used for queries that are too complex to be defined in the [simple form](#). For example, a query in the rule form that finds all members over 16 years old and lists them in the alphabetical order may look like this:

```
FIND Member WHERE Member.Age > 16 ORDER BY Member.LastName
```

This particular example can also be specified using the [simple form](#).

Query simple form

The simple form is a section of the query editor in the [Configuration Tool](#) where the [configurator](#) can specify a [query](#) in a simple way using visual controls to select the [business objects](#) to find and enter desired [conditions](#). Some elaborate queries, which cannot be constructed in the simple form, can be specified using the [rule form](#).

Query SQL form

The SQL form is a section of the query editor in the [Configuration Tool](#) where the [configurator](#) can specify a [query](#) using the SQL, a language that database management systems understand. It can be used by SQL experts for queries that are too complex to be defined in the [simple form](#) and, for some reasons, cannot be specified using the rule form. For example, a query in the SQL form that finds all members over 16 years old and lists them in the alphabetical order may look like this:

```
SELECT Member.* FROM Library_Member AS Member WHERE  
(Member.Age > 16) ORDER BY Member.LastName
```

This particular example can also be specified using the [simple form](#).

Reference attribute

Unlike attributes of the [basic attribute types](#), a reference attribute, or simply reference, describes a [relation](#) between the [business object](#) to which the [attribute](#) belongs and some other business object or [business object group](#). For example, to register a relation between an account and its holder the [configurator](#) may define Holder attribute for Account object as a reference to Person object.

A reference attribute can be single, as in the example above, or multiple. Multiple references are useful for linking an object with several other objects, for example an account and transactions applied to the account. It is usually beneficial to configure a [matching attribute](#) on the related object. In the first example it could be an Accounts

attribute on Person object listing all accounts held by the person, which, incidentally, would be a multiple reference.

Report

Report is a special kind of [document template](#) that can be designed to present information of multiple [business objects](#). It is primarily intended to generate comprehensive reports in the [operation mode](#) with multiple columns, groupings, element count, subtotals, etc. Reports are designed in the report designer, which offers a variety of data presentation options for designing custom layouts, including [conditional elements](#) for presenting information differently depending on conditions.

Reports are similar to [presentations](#). Both are designed using the same visual designer and share many features including the ability to reuse designs. The main difference is that presentations are displayed for users dynamically and can include [interactive elements](#) whereas reports are generated as page-oriented documents that can be printed, saved on disk, etc.

Required attribute

The [configurator](#) may specify that a value must be provided for an [attribute](#), in other words it cannot be empty. In this case [Aware IM](#) will check the value of the attribute whenever the [business object](#) (or [notification](#)) is created or updated in [operation mode](#) and disallow the operation if the attribute value is undefined.

Rule

A rule specifies one or more [actions](#) that should be executed when the rule [conditions](#) are met. The conditions are optional and if none are specified the actions are executed unconditionally. In other words a rule states what should happen and when. [Aware IM](#) follows the rules defined by the [configurator](#) to manage the [business space](#) in the [operation mode](#). Rules can perform a variety of tasks. They can create [business objects](#), perform calculations, create or print documents, display information, exchange data with other software, etc.

Rule collection

The [configurator](#) can attach [rules](#) to certain configuration elements such as [business objects](#), [processes](#) and [notifications](#). Since there may be several rules attached to the same configuration element such rules are organised into rule collections. Rule collections can be **ordered** or **unordered**, which determines how rules are [evaluated](#) and their [actions executed](#).

Rule evaluation

Rule evaluation is a process of **Aware IM** considering [rules](#) to determine whether their [actions](#) need to be executed. **Aware IM** evaluates rules attached to a configuration element when an event happens that affects that element. For example, when a [business object](#) is modified or a [process](#) is started. When such an event takes place **Aware IM** evaluates all rules in the relevant [rule collection](#). How evaluation is performed depends on the [rule order](#) in the rule collection.

Rule execution log

Rule execution log is a file containing history of [rule evaluation](#) and [action execution](#) in the [operation mode](#). It can be used to check that the [business space](#) works as expected. The [configurator](#) can control the level of details that go into the log.

Rule execution order

Rule execution order determines how [rules](#) in a [rule collection](#) are [evaluated](#) and their [actions](#) executed. Rule collections attached to [business objects](#) are unordered. When a business object is modified **Aware IM** evaluates all rules in its rule collection to find actions to be executed. It then executes one of the found actions. Since the action can make further changes to the object, **Aware IM** re-evaluates all rules in the collection that depend on the latest changes to see which actions still need to be executed. The cycle is continued until no more changes are detected.

Rule collections for [processes](#) are usually ordered, although the [configurator](#) can specify otherwise. With ordered rule collections the rules are evaluated once only, and their actions executed if the [conditions](#) are satisfied, exactly in the order the rules appear in the collection.

Rule language

The rule language used in **Aware IM** allows the [configurator](#) to define instructions on managing information in a [business space](#). It is used to specify [rules](#), [queries](#), [tags](#), and other configuration elements. The rule language is simple and intuitive and, unlike traditional programming languages, it does not require special software development skills.

Rule priority

When [actions](#) for [rules](#) in an [unordered rule collection](#) are executed their [execution order](#) is undefined. Most rules are independent of other rules so the execution order is not important. In those rare cases when an action should be executed before or after actions of some other rules in the collection, this can be achieved by setting the rule priority

higher or lower than that of the other rules. For example, a final discount may need to be applied to an insurance policy after all other calculations on the policy have been completed.

Aware IM automatically sets different rule priority to certain actions. For example, if the action of an object rule generates a document from a [template](#), the rule priority is lower to allow all [attributes](#) to be calculated before the document is created.

Rule table

Rule table is a rule editor allowing for editing several [rules](#) at the same time. It hides certain elements of the [rule language](#) and presents the rule contents in a simple and easy to understand fashion. It is especially useful for editing rules of similar nature, for example a set of rules that determine where to forward an incoming e-mail based on the contents of its address or the subject line.

Run time

Run time is another way of referring to the [operation mode](#). When some event is said to happen at run time it means the event takes place in the operation mode.

Scheduling

Scheduling is a feature of **Aware IM** allowing executing operations at a specified time. It is useful for periodic processes that should run with certain regularity at the specified time of the day. For example, overnight printing of letters to clients that have been generated during the day, or daily checking of outstanding invoices and sending reminder e-mails to customers.

Service

A service is a more formal and comprehensive way of communicating than a [notification](#). A party requesting a service from another party must first identify itself to the other party, and can expect a meaningful reply back. For example, requesting an order status for a given order number from an order management system.

Aware IM allows defining services for [intelligent business objects](#) and using these services in a [business space](#). For example, sending payment details to a payment processing system for completion of the payment. [Service discovery](#) is a feature that helps [the configurator](#) in defining services for objects communicating via a [standard channel](#).

Since a [business space](#) is an [intelligent business object](#), the [configurator](#) can define services that the business space provides to other software systems via standard or custom [channels](#).

Service implementation

A [service](#) provided by a [business space](#) is implemented by a [process](#) in the business space. When an outside service request is received into the business space the implementing process is started.

Service input

Service input is one or more [business objects](#) containing information that the [service](#) expects from the service requestor. If the service is defined in a [business space](#) the service input objects are passed to the [implementing process](#) as the [process input](#) when the service is requested in the [operation mode](#).

Service reply

Service reply is a [notification](#) containing information that the [service](#) passes back to the service requestor as the service result.

Shortcut attribute

Shortcut attribute allows displaying an [attribute](#) that belongs to a [related business object](#) on a [form](#) for the object to which the shortcut attribute belongs. For example, an order item form could display a name of the product for the item with a shortcut attribute that uses an [expression](#) OrderItem.Product.Name, which is called shortcut path.

Sub-presentation

Sub-presentation is a [presentation](#) embedded into another presentation. It is used when a presentation needs to show [business objects](#) other than those shown by the presentation. For example, if a presentation showing details of one or several customers should include orders and outstanding invoices for each customer, the orders and invoices would be shown by separate sub-presentations embedded into the main presentation for customers.

Sub-query

Sub-query is a part of a [query](#) that performs search on [business objects](#) other than those of the main query. For example, in a query that searches for customers who placed

more than one order within last month, the part checking the orders would be a sub-query since the main query searches for customers.

Note that not all databases support sub-queries.

Sub-report

Sub-report is a [report](#) embedded into another report. It is used when a report needs to show [business objects](#) other than those shown by the report. For example, if a report on customers should also include orders and outstanding invoices for each customer, the orders and invoices would be shown by separate sub-reports embedded into the main report for customers.

Tag

A tag is placeholder used to indicate [business object](#)-specific information inside [document templates](#), [presentations](#), [reports](#) and other elements containing text. When a document is generated from a template in the [operation mode](#), or a presentation is displayed, the tag is replaced with actual data taken from business objects. For example a template for a customer letter may start with a line that includes a tag:

```
Dear <<Customer.Name>>,
```

When a letter is generated for a customer in the operation mode the tag will be replaced with the actual customer name.

Testing mode

Testing mode allows the [configurator](#) to try out a new [version](#) of a [business space](#) in the [operation mode](#) without disrupting the normal operation of the application. When the configurator moves a business space version under test, [Aware IM](#) creates a separate test business space in the operation mode according to the configuration of the new version. Nominated users can [login](#) into the testing mode of the business space to perform necessary testing.

User Defined Processes (workflows)

User defined processes (or workflows) are processes that end users define for themselves using the special module available in the Operation Mode. For more details please watch this [video tutorial](#).

Validation rule

Aware IM considers [rules](#) with a certain pattern to be validation rules. Here is an example of a validation rule:

```
If Customer.Name IS UNDEFINED Then REPORT ERROR 'Customer name  
is empty'
```

Aware IM applies such rules when a user edits a [business object](#) on the [object form](#) and does not accept changes if the entered data is invalid. Also, **Aware IM** [automatically generates](#) validation rules to handle conditions the [configurator](#) may specify for object attributes such as [required attributes](#) or [range of values](#).

Visual perspective

Visual perspective determines what appears on screen when users access their [business space](#) in the [operation mode](#). It includes such layout elements as menu, header and footer panels, font type and size, colors and other visual settings. A [configurator](#) can define several visual perspectives within a business space for different parts of the business space or to create a different interface for users with different [access levels](#).

While semantics

'While semantics' is an option for [rules](#) in [unordered collections](#) the [configurator](#) may use in some rare circumstances to tell **Aware IM** that it should keep executing rule [actions](#) while the rule [conditions](#) are satisfied. Normally **Aware IM** executes rule actions once, and only executes them again if [attributes](#) mentioned in the rule change.

This is an advanced rule option and should be used with care since it may cause an endless execution loop.

Appendix A. Aware IM Property Files

The following section explains the settings used in the **Aware IM** property files to initialize various software components.

Aware IM uses the following property files (all are located in the BIN directory of the **Aware IM** Installation):

1. *BASServer.props* – this property file is used by the **Aware IM** server
2. *UIConfig.props* – this property file is used by the Configuration Tool
3. *webapp.props* – this property file determines the properties of the **Aware IM** web application

Setting Properties of the Aware IM server

The following table lists and explains the property settings of the BASServer.props file that are used to initialize the Aware IM Server:

Property	Comments
Database Settings	
DatabaseComponent	Fully classified name of the component implementing the database specific functionality: 1. com.bas.basserver.persistence.dbplugins.MySQLInterface – for MySQL database 2. com.bas.basserver.persistence.dbplugins.CloudscapeInterface – for IBM Cloudscape/Derby database 3. com.bas.basserver.persistence.dbplugins.MSSQLServerInterface – for MS SQL Server / SQL Server Express databases 4. com.bas.basserver.persistence.dbplugins.OracleInterface – for Oracle database 5. com.bas.basserver.persistence.dbplugins.MariaDBInterface – for Maria DB 6. com.bas.basserver.persistence.dbplugins.PostgreSQLInterface – for PostgreSQL
DatabaseName	Name of the database used in the regular (non-testing) mode
DatabaseNameTest	Name of the database used in the testing mode (see Testing Mode)
DriverClassName	Fully qualified name of the JDBC driver. Only relevant if data source is not supported (see “Aware IM Installation Guide”)
DriverURL	URL used by the JDBC driver in the regular (non-testing mode). Only relevant if data source is not supported (see “Aware IM Installation Guide”)
DriverTestURL	URL used by the JDBC driver in the testing mode. Only relevant if data source is not supported (see “Aware IM Installation Guide”)
DataSource	Name of the data source to be used when connecting to the database in the regular (non testing) mode. This property (and DataSourceTest) is mutually exclusive with DriverClassName, DriverURL and DriverTestURL properties. Only one or the others should be used
DataSourceTest	Name of the data source to be used when connecting to the database in the testing mode. This property (and DataSource) is mutually exclusive with DriverClassName, DriverURL and DriverTestURL properties. Only one or the others should be used

Java Settings	
RequestQueue, ReplyTopic, LocalQueue, LocalTopic, NotificationInQueue, NotificationOutTopic	Names of mandatory Java Messaging System (JMS) topics and queues that the Aware IM Server requires. Three queues and three topics must be defined (see also “Aware IM Installation Guide”)
JMSFactory	Name of mandatory JMS Factory
DirectoryService	Fully qualified name of the class that implements Java directory service (JNDI). This property is mandatory
DirectoryServiceProvider	Optional URL of the directory service provider
Aware IM Plug-In's	

DocumentEngines	A list of comma separated fully qualified names of the classes implementing document types (see “Aware IM Programmer’s Reference”)
ChannelTypexxx	Properties starting with the ChannelType prefix identify the communication channels (see Communication with Other Systems and “Aware IM Programmer’s Reference”)
Clustering Settings	
StartRange, EndRange, Hub	Reserved for future use
Other Settings	
SystemPort	The port number that the Aware IM Server requires.
SessionTimeout	The value in milliseconds that determines the timeout of the idle session. If no requests are made on behalf of the session to the Aware IM Server within the specified time interval Aware IM logs out the session
UIProcessTimeout	The value in milliseconds that determines how long Aware IM will wait for the User Interface operation to provide a reply before suspending the current request (see Rules and Transactions).
MaxNmbOfRepeats	Determines how many iterations the Rule Engine allows before deciding that the actions of the rules went into an infinite loop (assuming that the action pattern repeating over and over again performs changes to the system while it is executing). See also Evaluation of Unordered Rule Collections .
MaxNmbOfRepeatsWithoutChange	Determines how many iterations the Rule Engine allows before deciding that the actions of the rules went into an infinite loop (assuming that the action pattern repeating over and over again does not perform any changes to the system while it is executing). See also Evaluation of Unordered Rule Collections .
AwaresoftHost	DNS name of the server hosting Awaresoft Web Site. Relevant only for online product registration – see Registering Software .
AwaresoftPort	Port number of the server hosting Awaresoft Web Site. Relevant only for online product registration – see Registering Software .
PublicHolidays	A collection of days identifying public holidays in the country or state of operation. This information is used by BUSINESS_DAY_FORWARD and BUSINESS_DAY_BACK functions of the Rule Language (see “Aware IM Rule Language Reference”). The days must be in the format “dd/MM/yyyy” and must be separated by comma, for example: 25/12/2004,26/12/2004,... If this property is not specified BUSINESS_DAY_FORWARD and BUSINESS_DAY_BACK functions will only consider weekends as non-working days.

Setting Properties of the Configuration Tool

The following table lists and explains the property settings of the UIConfig.props file that are used to initialize the Configuration Tool:

Property	Comments
ModelFactories, Commands	These are settings used by the system. Not to be changed.
HostServer	DNS name of the computer hosting the Aware IM Server
HostServerPort	Port number used by the Aware IM Server (see also SystemPort setting in the BASServer.props file).

WebServer	DNS name of the computer hosting the Web Server such as Tomcat
WebServerPort	Port number used by the Web Server such as Tomcat.
OperationMode	The URL that will be used by the Configuration Tool to login into the Operation mode – see Logging into the Operation Mode .

Setting Properties of the Aware IM Web Application

The following table lists and explains the property settings of the webapp.props file that are used to initialize Aware IM web application. These properties are mostly relevant if the Aware IM Server and web server are running on the separate computers (see “Aware IM Installation Guide”).

Property	Comments
ServerName	DNS name of the computer hosting the Aware IM Server
ServerPort	Port number used by the Aware IM Server (see also SystemPort setting in the BASServer.props file).
SessionTimeout	The value in milliseconds that determines the timeout of the idle session of the web server (such as Tomcat). If no requests are made on behalf of the session to the web server within the specified time interval web server logs out the session

Appendix B. Known Bugs and Limitations

The following table lists all known problems and limitations of the Aware IM software and suggests workarounds where possible:

Problem/Limitation Description	Workaround
1 . Arithmetic operations with dates are not supported in FIND action, for example using the following will not work: FIND Account WHERE Account.Date=CURRENT_DATE-1	Use functions with dates (such as DATE_ADD) instead of arithmetic operations, for example: FIND Account WHERE Account.Date= DATE_ADD(CURRENT_DATE, -1)
2. The following functions and expressions are not supported if used in queries: - WAS CHANGED - WAS CHANGED TO	None

<ul style="list-style-type: none"> - TYPE - OLD_VALUE 	
3. The following functions are supported only in Cloudscape/Derby database: <ul style="list-style-type: none"> - WORD_NUMBER - WORDS_FROM_LEFT - WORDS_FROM_RIGHT 	None
4. Printing of documents of HTML type from rules is not supported	None
5. Printing of documents of MS Excel type from rules is not supported under Linux and Mac OS X operating systems	None
6. Documents of MS Word type are not supported under Linux and Mac OS X operating systems (MS Word XML format can be used instead if browsers are running on the Windows platform)	None
7. If the Aware IM Server is started when either LAN or Internet connection is up and then either LAN goes down or Internet is disconnected, the server goes down too	Start the Aware IM Server within the configuration that you intend to work with. For example, if you only use dial-up Internet connection occasionally make sure that you start the Aware IM Server first and then connect to the Internet. This way when you disconnect from the Internet Aware IM will continue to work properly.
8. If two business objects are related through a parent/child relationship (see Reference Attributes) and the reference attribute to a child is defined as “Value must be provided” it is impossible to add a new child instance from a form of the parent instance using Add New button (see Working with References in the Operation Mode)	Do not force “Value must be provided” flag for reference attributes or create child instance first and then add it to a parent using Add button.
9. If you drag the bottom line of the Summary pane in the Report/Presentation Designer the height of the Summary band is not changed even though it appears visually that it is.	Change height of the Summary band using Band Properties – see Setting Band Properties
10. Sorting on reference attributes in a query will not work if query searches business object group. For example, sorting in the following query will not work if Account is	Define a shortcut attribute and sort by it, for example: FIND Account ORDER BY Account.OwnerName

<p>business object group: FIND Account ORDER BY Account.Owner.Name</p>	<p>Where OwnerName is the shortcut to Account.Owner.Name</p>
<p>11. Checking for UNDEFINED value of a multiple reference attribute (see Reference Attributes) in queries does not work correctly. For example, the following will not work:</p> <pre>FIND Account WHERE Account.Transactions IS UNDEFINED</pre>	<p>Use EXISTS or COUNT expressions, for example</p> <pre>FIND Account WHERE COUNT Transaction WHERE (Transaction IN Account.Transactions) = 0</pre>
<p>12. MIN, MAX and AVG expressions are not supported if used in subqueries on groups. For example the following query is not supported if Transaction is a group:</p> <pre>FIND Account WHERE (COUNT Transaction WHERE (MAX.Transaction.Amount = 1000))</pre>	<p>Avoid using these expressions in subqueries</p>
<p>13. Negated IN expression is not supported in queries. For example, the following expression is not supported:</p> <pre>FIND Event WHERE NOT(LoggedInMember IN Event.Participants)</pre>	<p>In many cases the negated IN expression can be replaced by using the equivalent COUNT or EXISTS expression, for example:</p> <pre>FIND Event WHERE COUNT Member WHERE(Member IN Event.Participants AND Member=LoggedInMember) = 0</pre>
<p>14. IN expressions using complex identifier of the reference list are not supported if used in subqueries. For example, the following query is not supported:</p> <pre>FIND Client WHERE (COUNT Account WHERE (Account IN Client.Carrier.Accounts) > 3)</pre> <p>Note that the following query is supported:</p> <pre>FIND Client WHERE (COUNT Account WHERE (Account IN Client.Accounts) > 3)</pre>	<p>Avoid using such constructs in queries</p>
<p>15. Dragging bands in Report Designer to change their height is not supported on Mac OS X</p>	<p>Hold down Apple key and click on the band's header to bring up the bands property dialog. Specify the height of the band in the dialog</p>

Appendix C. Number Format in Java Programming Language

The following section describes the format of the number used in the Java Programming Language. This format can be used for attributes of Number type – see [Setting Properties of Number Attributes](#).

The string representing the number format has the following form:

```
positive-pattern[;negative-pattern]
```

If the negative pattern is omitted, negative numbers are formatted using the positive pattern with a “-“ character prepended to the result. Each pattern has the following form:

```
[prefix]integer[.fraction][suffix]
```

The following symbols are significant in the pattern string.

Symbol Description

0	A digit
#	A digit where 0 is not shown
.	A placeholder for a decimal separator
,	A placeholder for a grouping separator
;	The format separator
-	The default negative prefix
%	Multiplies value by 100 and shows as a percentage

Any characters other than these special characters can appear in the prefix or the suffix. A single quote can be used to escape a special character, if you need to use one of these symbols in a prefix or a suffix.

For example, the pattern string for U.S. currency values is:

```
$#,##0.00; ($#,##0.00)
```

This indicates that a \$ character is prepended to all formatted values. The grouping separator character , is inserted every three digits. Exactly two digits after the decimal place are always shown. Negative values are shown in parentheses. Thus, the value -1234.56 produces output like:

```
($1,234.56)
```

Appendix D. Links to **Aware IM** operations

The following section lists the links to **Aware IM** operations that can be invoked from the hyperlinks of HTML pages included either in a visual perspective, custom menu or custom forms. All links have to call a particular JavaScript function supported by **Aware IM** in a special object called AwareApp, so the general format of a link is as follows:

```
<a href="#" onclick="AwareApp.functionName(parameters)">Name of the link</a>
```

Many of these functions use “renderOption” parameter. This parameter indicates where the output of the function will be directed. Possible values are:

- ‘main’
Output will be displayed in the main page replacing the current contents
- ‘new_tab’
Output will be displayed in a new closable tab
- ‘popup’
Output will be displayed in a popup window
- Javascript object that defines properties of a modeless window

Output will be displayed in a modeless window. The object describing properties of a modeless window can have the following properties:

- o ‘modeless’ (Boolean - must be defined and set to true)
- o ‘centered’ (Boolean - if defined the window will be centered on the screen)
- o ‘position’ – an object with two properties (‘left’ and ‘top’) that define where the window will appear (if centered=false)

Example: { modeless: true, position: { top: 100, left: 50 } }

- AwareApp.getPanelId(frameType, tabName, panelName)

Use this function to send the output of the operation to the specified panel of the specified tab in the specified frame, for example:

```
AwareApp.getPanelId ('main', 'MyTab', 'MyPanel')
```

All supported JavaScript functions are presented in the table below:

Function	Example	Comments
startProcess (processName, renderOption)	AwareApp.startProcess (‘MyProcess’, ‘main’)	Start the process with the specified name
startProcess2 (proces sName, ctxObjectName, ctxObjectId, renderOption)	AwareApp.startProcess2 (‘MyProcess’, ‘MyObject , 256, ‘main’)	Start the process with the specified name and provide the specified object as a context
startProcessWithInit (processName, renderO	AwareApp.startProcessW ithInit(‘MyProcess’, ‘m	Create an object with the specified initialisation

<code>ption, initObjName, initObjParams, proce sContext)</code>	<code>ain', 'MyObject', 'Attr1 =Value1@Attr2=Value2@... "</code>	values and start a process that uses the created object as input. Initialisation values must be either a string in the form <u>Attr1=Value1@Attr2=Value2@...</u> etc where Attr1, Attr2 are attribute names in the object or it should be a JSON object with attribute values hashed by attribute names. If this function is used as firstCommand (see firstCommand) initialisation values will be appended automatically from the remaining URL parameters, for example: http://localhost:8080/AwareIM/logonOp.aw?domain=BS&firstCommand=startProcessWithInit,MyProcess,main,MyObject&Attr1=Value1&Attr2=Value2...
<code>startProcessFromForm (processName, renderOption, htmlElem, saveFlag)</code>	<code>AwareApp.startProcessF romForm ('MyProcess', 'main', this, true)</code>	Usually used from a custom HTML element on an object form (button or hyperlink). HtmlElem parameter indicates this element. If saveFlag is true will save the form before starting a process. The saved object will be used as a parameter to the process
<code>runQuery(queryName, renderOption)</code>	<code>AwareApp.runQuery ('My query', 'main')</code>	Run the query with the specified name
<code>runQueryWithParams (queryName, params, renderOption)</code>	<code>AwareApp.runQueryWithP arams ('My query', params, 'main')</code>	Run the query that requires user input. Provide the input values entered by the user in the params hashtable hashed by query parameter name
<code>newObject (objectName, renderOption)</code>	<code>AwareApp.newObject('My Object', 'main')</code>	Display a form to create a new object with the specified name
<code>getObjectData(object)</code>	<code>AwareApp.getObjectData</code>	Asks the server to

Name, objectId, callbackFunction)	(context[0].objectName, context[0].objectId, function (objData) { alert(objData["Code"]);});	provide attribute values for the specified instance of the object(objectName and objectId). The callback function receives objData parameter that contains returned attribute values).
createOrUpdateObject (objectName, objectId, objectData,callbackFunction	AwareApp.createOrUpdateObject ('A', null, { Txt: "abc", Nmb: 3 }, function (objectId, objectVersion) { alert ('Created' + objectId + " " + objectVersion);});	Calls the server to create or update the instance of the object with the specified data. The data is a JSON object with attribute names and values. The callback will receive the id and version of the object. If objectId is null a new instance will be created, otherwise an existing one will be updated.
saveForm (htmlElem)	AwareApp.saveForm (this)	Saves the current form. This can be used by custom buttons to perform save operation instead of the standard buttons. htmlElem defines an element on the form that performs the operation (button or hyperlink)
recalculateObject (htmlElem)	AwareApp.recalculateObject(this)	Similar to saveForm. However, if the form was displayed by a process, the process will continue displaying the form after the form has been saved.
recalculateObject2(htmlElem) - shortcut key on forms is F8	AwareApp.recalculateObject2(this)	Causes execution of rules of the object being edited or created using the values currently entered on the form. Displays recalculated values on the form
runDocument (docName)	AwareApp.runDocument ('My document template')	Run the document template with the specified name. The result is displayed in a new window
userDetails (renderOption)	AwareApp.userDetails ('main')	Display a form with the details of the currently

		logged in user
newUser(objectName, renderOption)	AwareApp.newUser ('MyUser', 'main')	Display a new user registration form for the user object with the specified name
showPerspective (perspective)	AwareApp.showPerspective ('MyPerspective')	Display the specified perspective
systemSettings (renderOption)	AwareApp.systemSettings ('main')	Display the form of the SystemSettings object
logout(logoutPage)	AwareApp.logout (null)	Logout from Aware IM. Optionally provide the URL of the logout page

Appendix E. Regular Expressions.

Summary of regular-expression constructs

Construct	Matches
Characters	
X	The character x
\\\	The backslash character
\on	The character with octal value on (0 <= n <= 7)
\onn	The character with octal value onn (0 <= n <= 7)
\omnn	The character with octal value omn (0 <= m <= 3, 0 <= n <= 7)
\xhh	The character with hexadecimal value 0xhh
\uhhhh	The character with hexadecimal value 0xhhhh
\t	The tab character ('\u0009')
\n	The newline (line feed) character ('\u000A')
\r	The carriage-return character ('\u000D')
\f	The form-feed character ('\u000C')
\a	The alert (bell) character ('\u0007')
\e	The escape character ('\u001B')
\cx	The control character corresponding to x
Character classes	
[abc]	a, b, or c (simple class)
[^abc]	Any character except a, b, or c (negation)
[a-zA-Z]	a through z or A through Z, inclusive (range)
[a-d[m-p]]	a through d, or m through p: [a-dm-p] (union)

[a-z&& [def]]	d, e, or f (intersection)
[a-z&& [^bc]]	a through z, except for b and c: [ad-z] (subtraction)
[a-z&& [^m-p]]	a through z, and not m through p: [a-lq-z] (subtraction)
Predefined character classes	
.	Any character (may or may not match <u>line terminators</u>)
\d	A digit: [0-9]
\D	A non-digit: [^0-9]
\s	A whitespace character: [\t\n\x0B\f\r]
\S	A non-whitespace character: [^\s]
\w	A word character: [a-zA-Z_0-9]
\W	A non-word character: [^\w]
POSIX character classes (US-ASCII only)	
\p{Lower}	A lower-case alphabetic character: [a-z]
\p{Upper}	An upper-case alphabetic character: [A-Z]
\p{ASCII}	All ASCII: [\x00-\x7F]
\p{Alpha}	An alphabetic character: [\p{Lower}\p{Upper}]
\p{Digit}	A decimal digit: [0-9]
\p{Alnum}	An alphanumeric character: [\p{Alpha}\p{Digit}]
\p{Punct}	Punctuation: One of !#\$%&'()*+,-./:;<=>?@[\]^_`{ }{~}
\p{Graph}	A visible character: [\p{Alnum}\p{Punct}]
\p{Print}	A printable character: [\p{Graph}]
\p{Blank}	A space or a tab: [\t]
\p{Cntrl}	A control character: [\x00-\x1F\x7F]
\p{XDigit}	A hexadecimal digit: [0-9a-fA-F]
\p{Space}	A whitespace character: [\t\n\x0B\f\r]
Classes for Unicode blocks and categories	
\p{InGreek}	A character in the Greek block (simple block)
\p{Lu}	An uppercase letter (simple category)
\p{Sc}	A currency symbol
\P{InGreek}	Any character except one in the Greek block (negation)
[\p{L}&&[^ \p{Lu}]]	Any letter except an uppercase letter (subtraction)
Boundary matchers	
^	The beginning of a line
\$	The end of a line
\b	A word boundary

\B	A non-word boundary
\A	The beginning of the input
\G	The end of the previous match
\z	The end of the input but for the final <u>terminator</u> , if any
\z	The end of the input
Greedy quantifiers	
X?	X, once or not at all
X*	X, zero or more times
X+	X, one or more times
X{n}	X, exactly n times
X{n, }	X, at least n times
X{n, m}	X, at least n but not more than m times
Reluctant quantifiers	
X??	X, once or not at all
X*?	X, zero or more times
X+?	X, one or more times
X{n}?	X, exactly n times
X{n, }?	X, at least n times
X{n, m}?	X, at least n but not more than m times
Possessive quantifiers	
X?+	X, once or not at all
X*+	X, zero or more times
X++	X, one or more times
X{n}+	X, exactly n times
X{n, }+	X, at least n times
X{n, m}+	X, at least n but not more than m times
Logical operators	
XY	X followed by Y
X Y	Either X or Y
(X)	X, as a <u>capturing group</u>
Back references	
\n	Whatever the n th <u>capturing group</u> matched
Quotation	

\	Nothing, but quotes the following character
\Q	Nothing, but quotes all characters until \E
\E	Nothing, but ends quoting started by \Q
Special constructs (non-capturing)	
(?:X)	X, as a non-capturing group
(?idmsux-idmsux)	Nothing, but turns match flags on - off
(?idmsux-idmsux:X)	X, as a <u>non-capturing group</u> with the given flags on - off
(?=X)	X, via zero-width positive lookahead
(?!X)	X, via zero-width negative lookahead
(?<=X)	X, via zero-width positive lookbehind
(?<!X)	X, via zero-width negative lookbehind
(?>X)	X, as an independent, non-capturing group