Working with Business Rules in My webMethods

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WEBMETHODS

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About this Guide

Working with Business Rules in My webMethods is for users of My webMethods who want to modify rule projects that were exported from Software AG Designer to the My webMethods Server repository.

Business Rules are created with the Rules Development feature in Software AG Designer. For more information, see *webMethods BPM Rules Development Help*.

Working with Business Rules in My webMethods contains supporting documentation on the following main topics:

With respect to processing of personal data according to the EU General Data Protection Regulation (GDPR), appropriate steps are documented in *webMethods BPM Rules Development Help*, *Processing Personal Data*.

Document Conventions

Convention	Description
Bold	Identifies elements on a screen.
Narrowfont	Identifies service names and locations in the format *folder.subfolder.service*, APIs, Java classes, methods, properties.
Italic	Identifies: Variables for which you must supply values specific to your own situation or environment. New terms the first time they occur in the text.

Convention	Description
	References to other documentation sources.
`Monospace font`	Identifies: Text you must type in. Messages displayed by the system. Program code.
{ }	Indicates a set of choices from which you must choose one. Type only the information inside the curly braces. Do not type the { } symbols.
|	Separates two mutually exclusive choices in a syntax line. Type one of these choices. Do not type the | symbol.
[ ]	Indicates one or more options. Type only the information inside the square brackets. Do not type the [ ] symbols.
...	Indicates that you can type multiple options of the same type. Type only the information. Do not type the ellipsis (...).

Online Information and Support

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- Link to external websites that discuss open standards and web technology.

Data Protection

Software AG products provide functionality with respect to processing of personal data according to the EU General Data Protection Regulation (GDPR). Where applicable, appropriate steps are documented in the respective administration documentation.

1 Getting Started

Before you can get started, you must have a My webMethods user account, with full permissions (read and write) for the application page you want to modify.

My webMethods provides an extremely flexible framework for granting or restricting user access to virtually every aspect of the My webMethods interface. Administrators assign permissions known as access privileges and functional privileges. Access privileges define the application pages you can display. Functional privileges define the actions you can perform in My webMethods. If this guide lists pages or menu items that you cannot access, it is likely because you do not have the access privileges to view the page. If this guide lists user interface controls (e.g. buttons) that are greyed out, it is likely because you do not have the functional privileges to perform the actions associated with the user interface controls. If you have any questions about your access privileges, consult with your My webMethods administrator.

For information about permissions management and customizing the tools, see *Administering My webMethods Server*.

Installation and Configuration Information for My webMethods System Administrators

You must install and configure several Software AG products before you can modify rule projects that were exported from Software AG Designer to My webMethods. For complete information about installation, see *Installing Software AG Products*.

To exchange rule projects with the Rules Development feature of Software AG Designer:

- The Business Rules User Interface must be installed on My webMethods Server. This creates the folder in which the rule projects are stored (`My webMethods Applications\webMethods Application Data\Rule Projects`).
- There must exist at least one My webMethods Server user (other than “sysadmin”) with full write access to this folder. The permissions for the folder can be set by the “sysadmin” user using the tools in the folder view.

To set up Business Rules user accounts in My webMethods:

- The My webMethods Server administrator must create a role for Business Rules users and assign **ALL** access rights to this role for the `Rule Projects` folder.
- The My webMethods Server administrator must add the My webMethods Server user who will be accessing the rule projects to this role. For more information about creating and managing user accounts and roles, see *Administering My webMethods Server*.
- The Business Rules user will not see the newly exported rule project until an administrator gives him permission to do so (see *Administering My webMethods Server*). This has to be done once for each rule project.

2 Rules Development Terminology

The following table explains the terminology that applies to *Working with Business Rules in My webMethods*:

Term	Explanation
Business Rule	A business rule is a rule that defines or constrains an aspect of your business. It is intended to create a business structure or to influence the behavior of the business.
Condition	A condition is the left hand side part of a rule: `IF Condition THEN Result`.
Condition Value	A condition value determines a condition. It can consist of: ■ An operator and a literal value. ■ An operator and a parameter element (marked by a dotted line). ■ An operator and an action that delivers an output value (marked by a dotted line and () behind the action name). ■ An operator and a constant (marked by a dotted line). ■ An operator and an expression.
Data Model	Rules must be able to interact with application data from other systems. This external application data is mapped to a data model, which is then stored in your workspace as part of the rule project.
Data Model Element	A data model element is an entity of a data model. For example, a `customer` data model can contain the data model elements `name` and `age`.
Decision Entity	A decision entity is a way to display one or more rules. Decision tables, decision trees, and event rules are different decision entities, even though they can contain the very same rule. Some decision entities are more suited for displaying certain kinds of rules than others.

Term	Explanation
Decision Table	A decision table is a decision entity. In the decision table, the conditions and corresponding results are sorted into rows and columns. A column can either represent a condition (the IF part) or a result (the THEN part) of a rule. Each row in a decision table represents one individual rule.
Decision Tree	A decision tree is a decision entity. In a decision tree, the conditions and corresponding results are displayed in a tree-like structure that consists of nodes that are linked to each other. A node can either represent the root, a condition (the IF part), or a result (the THEN part) of a rule. A link can be a root link or a condition link. A root node can be linked to one or more condition nodes, and a condition node can be linked to one or more condition nodes or result nodes.
Event Model	Event rules can operate on the basis of predefined event types. This event type is mapped to an event model, which is then stored in your workspace as part of the rule project.
Event Rule	An event rule is a decision entity that specifies the reaction to an event. There are two types of events: ■ Internal Events. ■ External Events. Internal events are triggered by other event rules and decision tables during rule execution. External events are predefined event types that were created with the Event Type Editor, see *webMethods Event Processing Help*.
Expression	An expression may contain function calls, literals, parameter references, the mathematical operators +, -, *, /, groups of parentheses, or combinations of all of these. You can assign an expression to a decision table condition, a decision table assignment result, a decision tree condition, a decision tree assignment result, or an event rule assignment result.
New Data Action	A new data action is an action that was mapped from a data model. It creates a new instance of this data model in the Rules Engine. In this way, a new output parameter that was mapped from this data model is introduced to the Rules Engine. It can then trigger other decision entities within one rule set that use this output parameter as an input.
Parameter	A parameter is an instance of a data model or an event model.
Parameter Element	A parameter element is an entity of a parameter.

Term	Explanation
Process Action	A process action is an action that was mapped from an existing process and can be used in a decision entity to: ■ Start a new process instance. ■ Join a running process instance. ■ Invoke a user task.
Result	A result is the right hand side part of a rule: `IF Condition THEN Result`. There are two types of results: ■ Assignment Result. This result type is applied, whenever you want to assign a value to a result. ■ Action Result. This result type is applied, whenever you want to execute an action from a decision entity.
Result Value	A result value determines a result. There are two types: ■ Assignment result values. ■ Action result values. An assignment result value can consist of: ■ An operator and a literal value. ■ An operator and a parameter element (marked by a dotted line). ■ An operator and an action that delivers an output value (marked by a dotted line and () behind the action name). ■ An operator and a constant (marked by a dotted line). ■ An operator and an expression. An action result value determines the action status: ■ Active. ■ Inactive.
Rule	A rule is a single element that specifies a decision in a `IF Condition THEN Result` syntax.
Rule Set	A rule set is a grouping of logically related decision entities. Every rule set belongs to a rule project.
Rule Project	A rule project is used as a container for different rule sets and other elements, such as data models, event models, decision

Term	Explanation
	entities, actions, etc. In a rule project, these different elements can be defined and used by all parts of the rule project.
Service Action	A service action is an action that was mapped from an existing Integration Server service (IS service). Then you can execute this service from a decision entity or use an output value from the service in a decision entity.

3 Understanding the User Interface

To access the Business Rules User Interface in My webMethods, log on to an instance of My webMethods where the Business Rules User Interface has been installed.

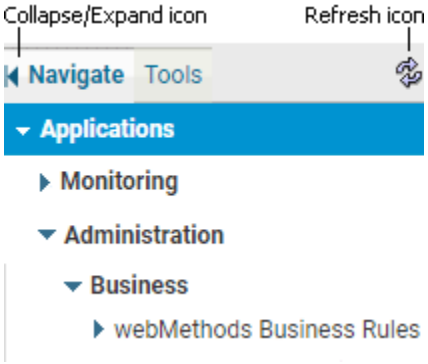
The overall layout of My webMethods is described in detail in *Working with My webMethods*. This section contains the following main topics:

- "The Navigation Pane" on page 16.
- "The Workspace Area" on page 17.

The Navigation Pane

The overall layout of the navigation pane is described in detail in *Working with My webMethods*.

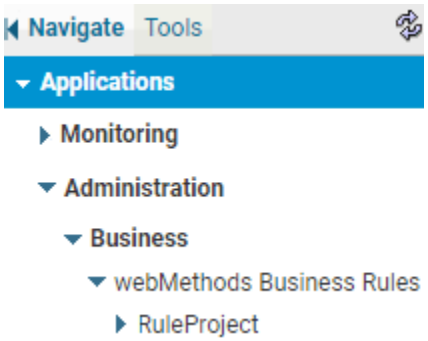
The rule projects that were exported from the Rules Development feature in Software AG Designer can be accessed on the **Navigate** tab under **Applications** > **Administration** > **Business** > **webMethods Business Rules**.



Business Rules Structure

Click **webMethods Business Rules** to open the entries for the Business Rules application pages.

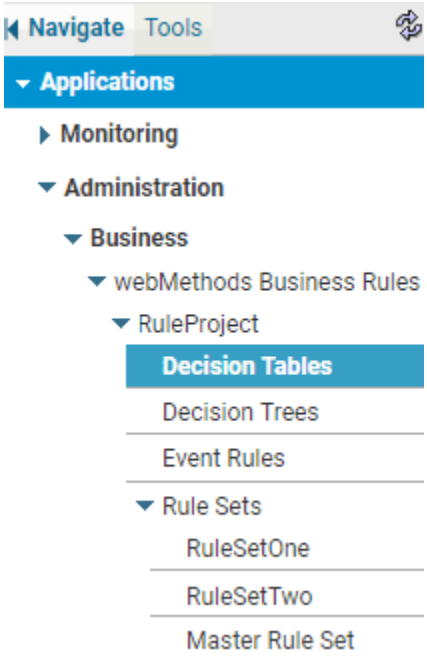
Note:
You can only see the application pages you have permission for, see "Getting Started" on page 9.



Rule Project Menu Items

Click a rule project entry to open the menu items for this rule project. These menu items are categorized into **Decision Tables**, **Decision Trees**, **Event Rules**, and **Rule Sets**. The **Rule Sets** menu item is subcategorized into the items for the individual rule sets used in the rule project and the **Master Rule Set**.

The menu item of the application page that is currently displayed in the workspace area is highlighted.

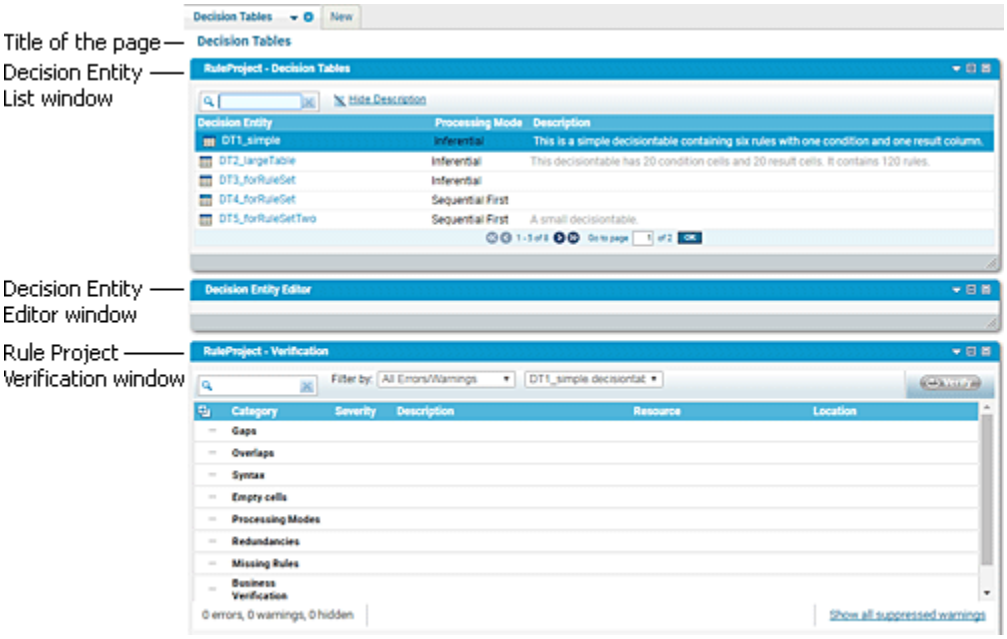


The Workspace Area

The workspace area is located on the right side of the user interface. This area contains the content of the Business Rules application pages you selected from the navigation pane.

The Format of the Business Rules Page

The following graphic shows the format of a Business Rules page.



A Business Rules page contains the windows listed in the following table:

Name of the Window	Description
Decision Entity List window	See "The Decision Entity List Window" on page 18.
Decision Entity Editor window	See "The Decision Entity Editor Window" on page 22.
Rule Project Verification window	See "The Rule Project Verification Window" on page 24.

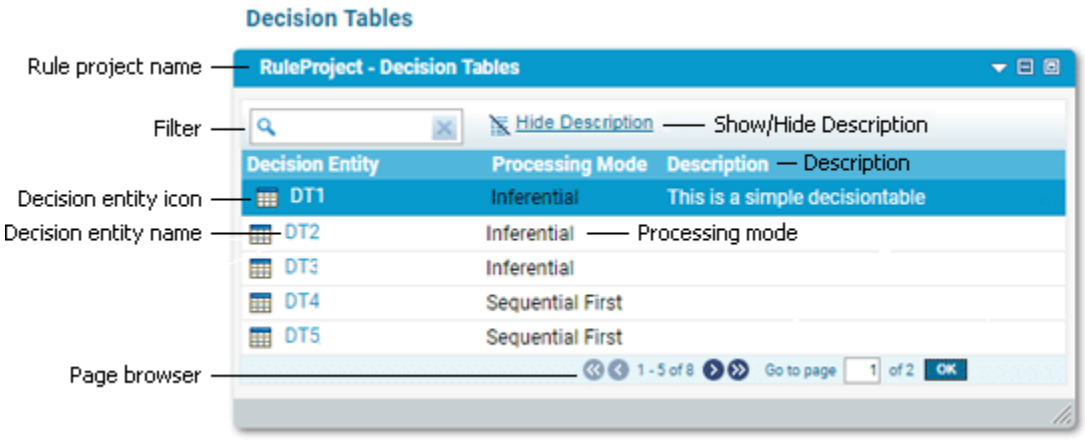
The Decision Entity List Window

The format of the Decision Entity List window depends on the Business Rules page that you selected from the navigation pane as is shown in the following table.

Selected Application Page	Decision Entities in the Decision Entity List Window
Decision tables	List of all decision tables used in a rule project.
Decision trees	List of all decision trees used in a rule project.
Event rules	List of all event rules used in a rule project.
Rule set	List of all decision entities used in the rule set.
Master rule set	List of all decision entities used in a rule project (except decision trees and external event rules).

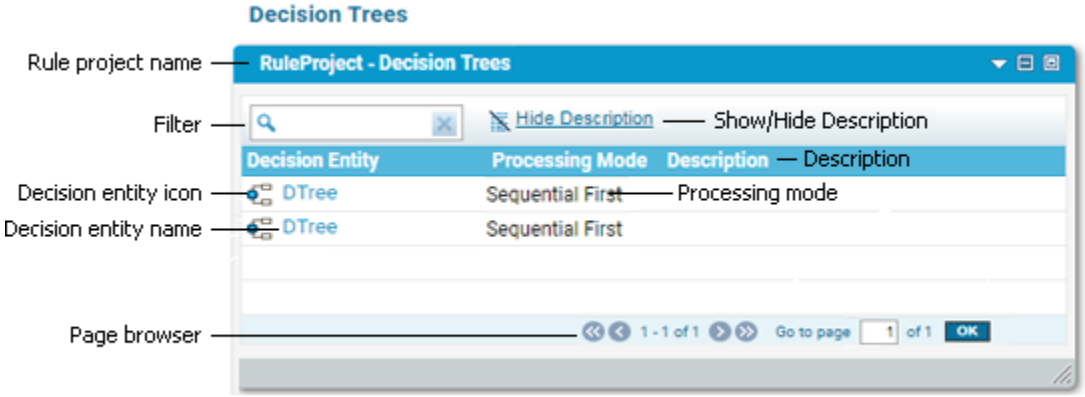
Interface for Decision Tables

The following graphic shows the format of the Decision Entity List window if you select **Decision Tables** from the navigation pane.



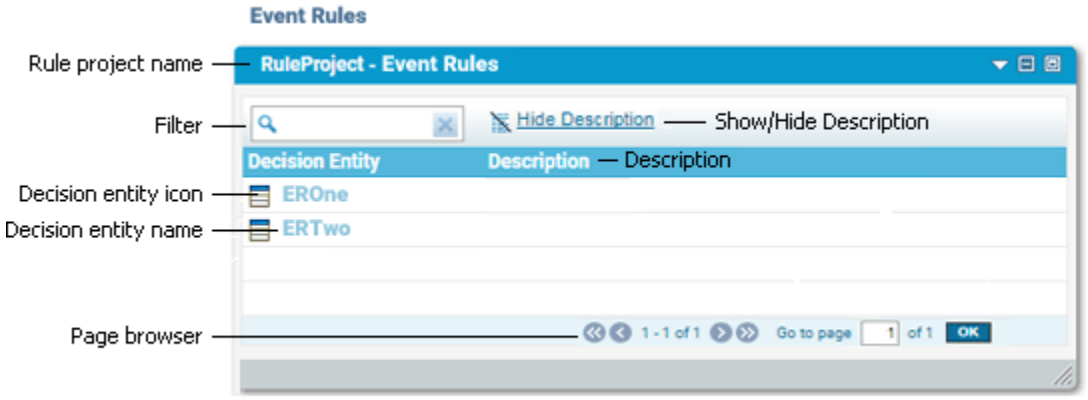
Interface for Decision Trees

The following graphic shows the format of the Decision Entity List window if you select **Decision Trees** from the navigation pane.



Interface for Event Rules

The following graphic shows the format of the Decision Entity List window if you select **Event Rules** from the navigation pane.



Interface for Rule Sets

The following graphic shows the format of the Decision Entity List window if you select **Rule Sets >*[YourRuleSetName]*** from the navigation pane.

Note:
The decision entities of a rule set are sorted by the types **Decision Tables**, **Decision Trees**, and **Event Rules**. The order of the decision entities within a type corresponds to the order that was determined by the rule developer when creating the rule set in Software AG Designer.

Overview of Functions

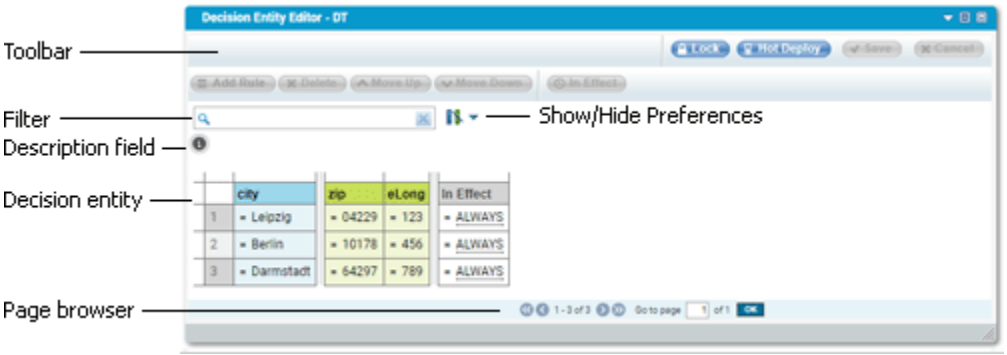
The following table explains the different functions of the Decision Entity Editor window:

Function	Explanation
Rule project name	The name of the rule project that the selected decision entities or rule set belong to, followed by the type of decision entity or the rule set name.

Function	Explanation
Filter	The input field of the text filter. To automatically filter the list of decision entities, type your filter text in the input field. To delete the filter text, click  .
Show/Hide Description	The button to suppress or restore the descriptions entered by the rule developer. To hide the descriptions, click **Hide Description**. To restore them, click **Show Description**. To modify a description, see "Modifying the Description of a Decision Entity" on page 71.
Decision entity category (only applicable for rule sets)	The category that the decision entities are sorted by in a rule set: **Decision Tables**, **Decision Trees**, or **Event Rules**.
Decision entity icon	The icon that specifies the type of decision entity:  (decision table icon),  (decision tree icon), or  (event rule icon).
Decision entity name	The name of the decision entity. Clicking a decision entity name opens the decision entity in the Decision Entity Editor window where it can be modified as described in "Modifying a Decision Table" on page 32, "Modifying a Decision Tree" on page 48, and "Modifying an Event Result" on page 62.
Processing mode (only applicable for decision tables, decision trees, and rule sets)	The processing mode specified by the rule developer: **Inferential** (order of decision entities does not correspond to order of execution), **Sequential All** (order of decision entities corresponds to order of execution; rules are executed from top to bottom), or **Sequential First** (order of decision entities corresponds to order of execution; rules are executed from top to bottom; execution stops when first rule fires). For rule sets, the processing mode is shown in the table header, above the list of decision entities. For decision tables and decision trees, the processing mode of each decision table or decision tree is shown in the same row along with the name and description. For more information about processing modes, see *webMethods BPM Rules Development Help*.
Description	The description of the decision entity entered by the rule developer.
Page browser	The buttons and input field of the page browser. Use the backward and forward arrows to browse through the list of decision entities. To jump to a page, type the page number in the **Go to page** input field, and click **OK**.

The Decision Entity Editor Window

The following graphic shows the format of the Decision Entity Editor window.



Overview

The Decision Entity Editor window shows the decision entity that you selected from the Decision Entity List window. You can modify this decision entity as described in "Modifying a Decision Table" on page 32, "Modifying a Decision Tree" on page 48, and "Modifying an Event Result" on page 62.

Decision Entity Editor Toolbar

The following table explains the buttons in the toolbar:

Button	Description
Filter (decision tables only)	Filters the displayed rules of a decision table, see "Filtering Rules" on page 39.
(decision tables only)	Drop-down menu to show all hidden condition or result columns, or to open show/hide user preference dialog, see "Setting Viewing Preferences for Conditions or Results" on page 38.
Add Rule **(decision tables only)**	Inserts a new rule after the last rule in a decision table, see "Adding a Rule" on page 36.
Delete **(decision tables only)**	Deletes the selected row(s) of a decision table, see "Deleting a Rule" on page 36.
Move Up **(decision tables only)**	Moves the selected row(s) of a decision table up, see "Reordering Rules" on page 37.
Move Down **(decision tables only)**	Moves the selected row(s) of a decision table down, see "Reordering Rules" on page 37.

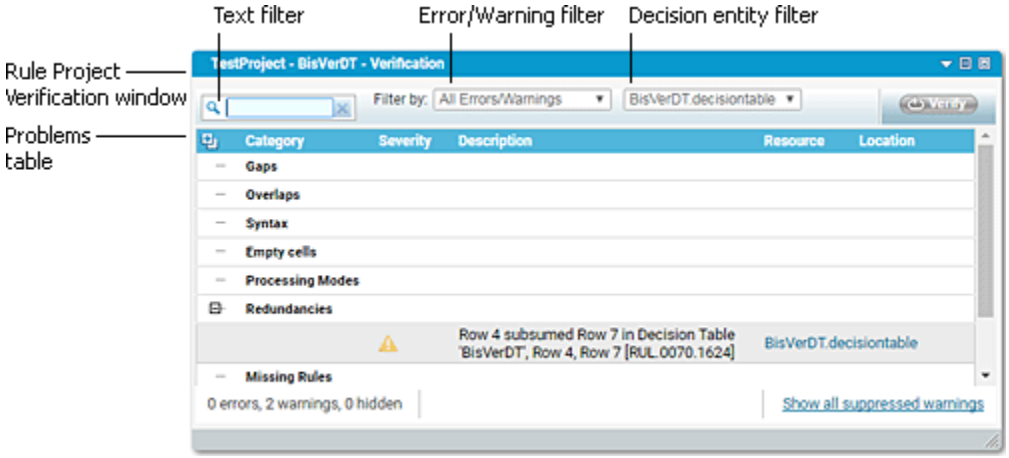
Button	Description
In Effect **(decision tables only)**	Specifies the in effect date of a decision table, see "Setting an In Effect Date at Decision Table Level" on page 39.
Lock **(decision tables and event rules only)**	Locks the decision entity, see "Locking a Decision Entity" on page 70.
Unlock **(decision tables and event rules only)**	Unlocks a locked decision entity, see "Locking a Decision Entity" on page 70.
Hot Deploy	Hot deploys the rule project the displayed decision entity is part of, see "Hot Deploying a Rule Project" on page 85.
Save **(decision tables and event rules only)**	Saves the changes to the decision entity, see "Saving Changes to a Decision Entity" on page 71.
Cancel **(decision tables and event rules only)**	Discards the changes to the decision entity.
Expand All **(decision trees only)**	Expands all nodes of a decision tree.
Collapse All **(decision trees only)**	Collapses all nodes of a decision tree.
Show Information **(decision trees only)**	Shows the properties of a decision tree (description, missing value approach, and processing mode).
Hide Information **(decision trees only)**	Hides the properties of a decision tree.
(decision trees only)	Maximizes the depiction of a decision tree.
(decision trees only)	Minimizes the depiction of a decision tree.
(decision trees only)	Resets the zoom of a decision tree.
Page browser (decision tables only)	The buttons and input field of the page browser (only for decision tables with more than 100 lines). Use the backward and forward arrows to browse through the lines of the decision table. To jump to a page, type the page number in the **Go to page** input field, and click **OK**.

Decision Entity Description

Clicking the button opens the description field that shows the description entered by the rule developer. To modify a description, see "Modifying the Description of a Decision Entity" on page 71.

The Rule Project Verification Window

Errors and warnings that are detected when verifying rules are logged in the Rule Project Verification window. The following graphic shows the format of this window.



The upper part of the Rule Project Verification window contains the filters and the **Verify** button. The following table explains the existing filters:

For this filter	You can do this
Text filter	Type a filter text in the input field to filter the entries in the problems table. To delete the filter text, click .
Error/Warning filter	Select **All Errors/Warnings** to see all errors and warnings in the problems table, or select **All Errors** to see only errors in the problems table, or select **All Warnings** to see only warnings in the problems table.
Decision entity filter	After you verified a rule set, select a decision entity to see only the errors and warnings that are associated with this decision entity in the problems table.

The middle part of the Rule Project Verification window contains the problems table. The table lists all errors and warnings sorted by verification categories. For more information about verification categories, see "About Verification Categories" on page 78.

If you click a link in the **Resource** column of the problems table, the respective decision entity opens in the Decision Entity Editor window, and it is highlighted in the Decision Entity List window.

On the left side of the lower part, there are the numbers of errors, warnings and hidden warnings. Hidden warnings are warnings that were suppressed by the filters. On the right side of the lower part, you can click **Show all suppressed warnings** to display warnings that were suppressed when creating the decision entities in Software AG Designer. To hide the warnings, click **Hide all**

suppressed warnings after the page has been reloaded. For more information, see "Showing or Hiding Suppressed Warnings" on page 78.

4 Modifying Rule Projects Overview

The following table explains the stages to be done when modifying rule projects with My webMethods:

Stage 1	Log on to My webMethods. Ask your My webMethods administrator to assign the needed access privileges. For more information, see "Getting Started" on page 9.
Stage 2	Modify the rule project. For more information, see "Working with Decision Tables" on page 29, "Working with Decision Trees" on page 45, "Working with Event Rules" on page 59, and "Global Functions Overview" on page 69.
Stage 3 (optional)	Hot deploy the rule project. For more information, see "Hot Deploying Rule Projects to Integration Server" on page 83.

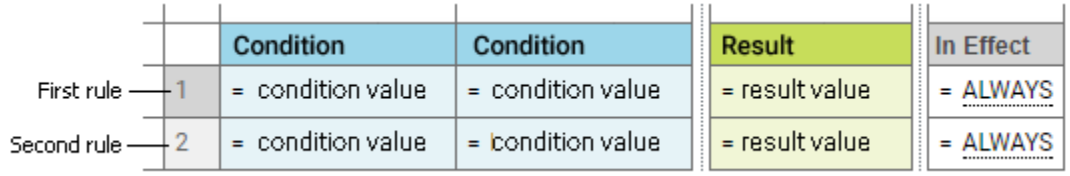
5 Working with Decision Tables

A decision table is a decision entity. It is a compact way to depict a complex set of rules in an `IF Condition THEN Result` syntax.

Decision Table Structure

In a decision table, the conditions and corresponding results are sorted into rows and columns. A column can either represent a condition (blue color) or a result (green color) of a rule. There can be more than one condition and more than one result. Each row in a decision table represents one individual rule.

Figure 1. Decision Table in the Decision Entity Editor



Condition

A condition is specified by a parameter element.

Condition Value

A condition value can consist of:

- An operator and a literal value.
- An operator and a parameter element (marked by a dotted line).
- An operator and an action that delivers an output value (marked by a dotted line and () behind the name).
- An operator and a constant (marked by a dotted line).
- An operator and an expression (marked by a dotted line).

Result

The following table explains the result types.

Result	Description
Assignment Result	An assignment result is specified by a parameter element. This result type is applied, whenever you want to assign a value to a result.

Result	Description
Action Result	An action result is specified by an action. This result type is applied, whenever you want to execute an action from a decision table.

Assignment Result Value

An assignment result value can consist of:

- An operator and a literal value.
- An operator and a parameter element (marked by a dotted line).
- An operator and an action that delivers an output value (marked by a dotted line and () behind the name).
- An operator and a constant (marked by a dotted line).
- An operator and an expression (marked by a dotted line).

Action Result Value

The action result value expresses the action status. There are two types:

- ✓ (action is enabled).
- ✗ (action is disabled).

The following table shows two sample rules can be modeled in a decision table:

Rule 1:	IF a customer has a good credit history, and the annual order value is equal to or larger than $ 5,000, THEN this customer is a VIP customer.
Rule 2:	IF a customer is a VIP customer, THEN he/she will receive a bonus at the end of a year and will be notified of this by email.

The corresponding decision table uses two conditions, two assignment results, and one action result:

Figure 2. Decision Table Example

	Order Value	Credtit History	VIP-Status	Bonus	sendEmail()	In Effect
1	<= 5,000	= poor	= no	= no	✗	= ALWAYS
2	<= 5,000	= good	= no	= no	✗	= ALWAYS
3	>= 5,000	= poor	= no	= no	✗	= ALWAYS
4	>= 5,000	= good	= yes	= yes	✓	= ALWAYS

Modifying a Decision Table

The Decision Entity Editor supports the following actions for decision tables:

- Adding and modifying condition values or result values.
- Clearing condition values or result values.
- Adding and deleting rules.
- Reordering rules.
- Assigning a principal to condition values or result values.
- Setting viewing preferences for conditions or results.
- Filtering rules.
- Specifying the in effect date at decision table level or at rule level.
- Working with a preconfigured data provider service.

Important:
You must lock the decision table before you can modify it. For more information, see "Locking a Decision Entity" on page 70.

Adding an Operator and a Literal Value in Direct Edit Mode

You can add an operator and a literal value in direct edit mode.

To add an operator and a literal value:

1. Open the decision table as described in "Opening a Decision Entity" on page 70.
2. Lock the decision table as described in "Locking a Decision Entity" on page 70.
3. Click the cell you want to modify.
4. Select an operator as specified in "About Condition Operators" on page 41 or "About Result Operators" on page 42.

   Important:
   Adding only an operator without entering a literal value results in a semantically invalid cell.

5. Enter a literal value in the input field as explained in the following table:

   Note:
   The literal value must match the data type as specified in "About Data Type Assignment" on page 43.

For this data type	You can do this
Boolean	Select **true** or **false** from the drop-down list.
Date	a. Click  . b. Select the date. c. Enter a time of day (optional). **Note:** The format and time zone of displayed date and time values can be configured in the **My Profile** settings. Business Rules only supports hours, minutes, and seconds.
Byte Character Double Float Integer Long Short	Type the literal value.
String	Type the literal value.

6. Press ENTER, or click anywhere in the Decision Entity Editor window to remove the focus from the cell.

Modifying an Operator in Direct Edit Mode

You can modify any operator you set in direct edit mode.

To modify an operator:

1. Open the decision table as described in "Opening a Decision Entity" on page 70.
2. Lock the decision table as described in "Locking a Decision Entity" on page 70.
3. Click the operator you want to modify.
4. Select a new operator as specified in "About Condition Operators" on page 41 or "About Result Operators" on page 42.

Modifying a Literal Value in Direct Edit Mode

You can modify any literal value you set in direct edit mode.

To modify a literal value:

1. Open the decision table as described in "Opening a Decision Entity" on page 70.
2. Lock the decision table as described in "Locking a Decision Entity" on page 70.
3. Click the literal value you want to modify.
4. Do one of the following:
   a. Type a new literal value as described in "Adding an Operator and a Literal Value in Direct Edit Mode" on page 32, Step 4.
   b. Press DEL to delete the literal value.
5. Press ENTER.

Adding a Condition or Result Value with the Editor

You can add a condition value or a result value with a built-in editor.

To add a condition value or a result value with the editor:

1. Open the decision table as described in "Opening a Decision Entity" on page 70.
2. Lock the decision table as described in "Locking a Decision Entity" on page 70.
3. Click the cell you want to modify.
4. Click  (in conditions) or  (in results).
5. In the *[Value Type]* Modification dialog box, modify the value as explained in the following table:

For this field or option	You can do this
Select an operator	Select an operator as specified in "About Condition Operators" on page 41 or respectively "About Result Operators" on page 42. **Note:** If you select a range operator, the dialog box splits so that you can specify a literal value or parameter element for each side of the range.

For this field or option	You can do this
Select an option > Literal	Enter a literal value in the **Enter value** field as described in "Adding an Operator and a Literal Value in Direct Edit Mode" on page 32, Step 5. **Note:** The literal value must match the data type as specified in "About Data Type Assignment" on page 43.
Select an option > Constants	From the **Select constant** drop-down, select a constant. For more information on constants, see "About Constants" on page 72. **Note:** The constant must match the data type as specified in "About Data Type Assignment" on page 43.
Select an option > Parameters	Expand the parameter, and select a parameter element from the list. The parameter element is then displayed above the parameter element list. To filter the list of parameter elements, enter a filter text in the search field above the parameter element list. **Note:** The data type of the parameter element must match the data type as specified in "About Data Type Assignment" on page 43.
Select an option > Expression	Add an expression as described in "Adding an Expression" on page 94.

6. Click Finish.

Modifying a Condition or Result Value with the Editor

You can modify any condition value or result value you set with a built-in editor.

To modify a condition value or a result value with the editor:

1. Open the decision table as described in "Opening a Decision Entity" on page 70.
2. Lock the decision table as described in "Locking a Decision Entity" on page 70.
3. Click the cell you want to modify.
4. Click (in conditions) or (in results).

5. Modify the condition or result value as described in "Adding a Condition or Result Value with the Editor" on page 34.

Clearing a Condition or Result Value

You can clear condition values or result values in direct edit mode.

To clear a condition value or a result value:

1. Open the decision table as described in "Opening a Decision Entity" on page 70.
2. Lock the decision table as described in "Locking a Decision Entity" on page 70.
3. Click the operator of the cell you want to clear.
4. Select **Clear** from the context menu.

Adding a Rule

You can add a new rule to a decision table.

To add a rule:

1. Open the decision table as described in "Opening a Decision Entity" on page 70.
2. Lock the decision table as described in "Locking a Decision Entity" on page 70.
3. Do one of the following:
   a. Select one or multiple contiguous rules by clicking the row number, and click 

in the upper left corner of the Decision Entity Editor window. The new rule is inserted after the last rule you selected.
   b. Click 

in the upper left corner of the Decision Entity Editor window. The new rule is inserted after the last rule of the decision table.

Deleting a Rule

You can delete a rule from a decision table.

To delete a rule:

1. Open the decision table as described in "Opening a Decision Entity" on page 70.

2. Lock the decision table as described in "Locking a Decision Entity" on page 70.

3. Select the rules you want to delete by clicking the row number. To deselect a rule, click the row number again.

4. Click 

in the upper left corner of the Decision Entity Editor window.

Note:
If you delete the only rule of a decision table, an empty rule is automatically inserted.

Reordering Rules

You can determine a specific order for rules. In inferential processing, this does not affect the order of execution. In sequential processing, the order of rules corresponds to the order of execution. For more information about processing modes, see *webMethods BPM Rules Development Help*.

To reorder rules:

1. Open the decision table as described in "Opening a Decision Entity" on page 70.

2. Lock the decision table as described in "Locking a Decision Entity" on page 70.

3. Select one or more contiguous rules by clicking the row number. To deselect a rule, click the row number again.

4. Click 

or 

in the upper left corner of the Decision Entity Editor window.

The rule order is modified as requested.

Assigning a Principal to a Condition or Result Value

A principal is a user, a group, or a role on My webMethods Server. You can assign a principal to a condition value or result value of a string type condition or result. This is only possible if the rules developer who created the decision table with the Rules Development feature in Software AG Designer annotated the condition or result column as principal. For more information, see *webMethods BPM Rules Development Help*.

You can configure if users, groups, or roles are available to the user for selection in the Select Principals window. For more information, see "Configuring Principal Types" on page 38.

To assign a principal to a condition value or a result value:

1. Open the decision table as described in "Opening a Decision Entity" on page 70.

2. Lock the decision table as described in "Locking a Decision Entity" on page 70.

3. Click the condition value cell or result value cell you want to modify.

4. Click (in conditions) or (in results).

5. In the Select Principals window, select one or more principals, and click Apply. For more information on the Select Principals window, see *Working with My webMethods*.

Configuring Principal Types

You can configure if users, groups, or roles are available to the user when assigning a principal to a condition value or a result value.

To configure principal types:

1. Navigate to **Applications > Administration > My webMethods > System Settings > webMethods Business Rules Settings**.

2. Under **PRINCIPAL TYPES**, select **Users**, **Groups**, or **Roles**. You can select multiple or no choices.

3. Click **Save**.

Setting Viewing Preferences for Conditions or Results

You can specify which condition columns or result columns of a decision table should be displayed. These preferences only apply to your user account.

To set viewing preferences for a decision table:

1. Open the decision table as described in "Opening a Decision Entity" on page 70.

2. Click **> Show/hide columns for current user**.

3. In the Show/Hide Decision Table Columns dialog, select the conditions or results to be displayed from the **Available** list on the left side.

4. Click to move the selection to the **Selected** list on the right side.

5. To hide conditions or results, select the conditions or results to be hidden from the **Selected** list on the right side, and click .

6. Click Finish.

Only the conditions or results in the **Selected** list are displayed. A dotted line between conditions or results indicates hidden columns. To restore all hidden conditions or results, click > **Show all hidden columns**.

Important:
Restoring all hidden columns discards the viewing preferences for a decision table.

Filtering Rules

You can specify which rules of a decision table should be displayed.

Note:
Any selected rules are deselected when you modify the filter.

To filter the rules to be displayed:

1. Open the decision table as described in "Opening a Decision Entity" on page 70.
2. Lock the decision table as described in "Locking a Decision Entity" on page 70.
3. Do one of the following:
   a. In the toolbar, enter a text in the filter, and press ENTER.

      Important:
      When filtering rules with the text filter, the data in hidden columns is ignored. If any hidden column contains filtered data, a warning message is displayed.

   b. In the toolbar, click in the filter, and select a user, a group, or a role from the drop-down list.
4. To restore all rules, click in the filter.

Setting an In Effect Date at Decision Table Level

As a default, the rules of a decision table are always in effect. You can set an in effect date at rule level or at decision table level. If you set an in effect date at rule level, it only applies to this rule. If you set an in effect date at decision table level, it applies to all rules of this decision table.

To set an in effect date at decision table level:

1. Open the decision table as described in "Opening a Decision Entity" on page 70.
2. Lock the decision table as described in "Locking a Decision Entity" on page 70.

3. In the toolbar, click In Effect.

4. In the Edit in effect dates dialog box, select **Always in effect** (default), **Never in effect**, or **Date and time frame in effect**. If you click **Date and time frame in effect**, select an operator as described in "About In Effect Operators" on page 43, and specify a date and time (optional). Click Finish.

The decision table is now marked with a clock icon in the upper left corner. If you move the pointer over the clock icon, a tooltip indicates the specified in effect date.

Setting an In Effect Date at Rule Level

As a default, the rules of a decision table are always in effect. You can set an in effect date at rule level or at decision table level. If you set an in effect date at rule level, it only applies to this rule. If you set an in effect date at decision table level, it applies to all rules of this decision table.

To set an in effect date at rule level:

1. Open the decision table as described in "Opening a Decision Entity" on page 70.

2. Lock the decision table as described in "Locking a Decision Entity" on page 70.

3. In the **In Effect** column, select the rule you want to edit.

4. Do one of the following:

   a. Click , and select a date. Enter a time (optional).

   b. Click . In the Edit in effect dates dialog box, select **Always in effect** (default), **Never in effect**, or **Date and time frame in effect**. If you click **Date and time frame in effect**, select an operator as described in "About In Effect Operators" on page 43, and specify a date and time (optional). Click Finish.

Working with a Preconfigured Data Provider Service

When creating a decision table with the Rules Development feature of Software AG Designer, the rules developer can restrict the input options for a condition column or a result column by assigning a preconfigured REST service that provides a predefined list of values. For instance, the service can provide a list of valid zip codes for a `zipCode` condition or result column.

For more information about the required structure of this REST service, see *webMethods Business Rules Reference*. For more information about how to assign the REST service to a condition column or a result column of a decision table, see *webMethods BPM Rules Development Help*.

When you modify the corresponding decision table cells in the Rules Management Console, you are only allowed to select an item from a drop-down list that offers the predefined values and

their descriptions. Before you can use the data provider service, you must configure the connection to the server the REST service is running on. For more information, see "Configuring a Server Connection for a Preconfigured Data Provider Service" on page 41.

Configuring a Server Connection for a Preconfigured Data Provider Service

You must configure a connection for the server the preconfigured data provider service is running on.

To configure a server connection:

1. Navigate to **Applications > Administration > My webMethods > System Settings > webMethods Business Rules Settings**.
2. Under **DATA PROVIDER**, select **Enabled**, and define **Protocol**, **Host**, **Port**, and **Base Path**.
3. (Optional) Specify an authentication method, and enter a **User Name** and **User Password** if required.
4. Click **Save**.

About Condition Operators

The following table lists the operators that can be assigned to the different data types of decision table conditions:

Data Type(s)	Operator	Definition
Boolean	=	(Equals; default operator)
	!=	(Does not equal)
Character	=	(Equals; default operator)
	!=	(Does not equal)
	<	(Less than)
	<=	(Less than or equal)
	>	(Greater than)
	>=	(Greater than or equal)
	< ... <=	(Less than ... less than or equal)
	<= ... <=	(Less than or equal ... less than or equal)
	< ... <	(Less than ... less than)
	<= ... <	(Less than or equal ... less than)

Data Type(s)	Operator	Definition
Date	=	(Equals; default operator)
	!=	(Does not equal)
	<	(Less than)
	<=	(Less than or equal)
	>	(Greater than)
	>=	(Greater than or equal)
	< ... <=	(Less than ... less than or equal)
	<= ... <=	(Less than or equal ... less than or equal)
	< ... <	(Less than ... less than)
	<= ... <	(Less than or equal ... less than)
Numeric (Byte Double Float Long Integer Short)	=	(Equals; default operator)
	!=	(Does not equal)
	<	(Less than)
	<=	(Less than or equal)
	>	(Greater than)
	>=	(Greater than or equal)
	< ... <=	(Less than ... less than or equal)
	<= ... <=	(Less than or equal ... less than or equal)
	< ... <	(Less than ... less than)
	<= ... <	(Less than or equal ... less than)
String	=	(Equals; default operator)
	!=	(Does not equal)

About Result Operators

The following table lists the operators that can be assigned to the different data types of decision table assignment results:

Data Type(s)	Operator	Definition
Boolean	=	(Equals; default operator)
Boolean list	=	(Equals; default operator)
Byte array	=	(Equals; default operator)
Date	=	(Equals; default operator)
Date list	=	(Equals; default operator)
Document	=	(Equals; default operator)
Document list	=	(Equals; default operator)
Numeric (Byte	=	(Equals; default operator)

Data Type(s)	Operator	Definition
Character Double Float Integer Long Short)		
Numeric list (Byte list Character list Double list Float list Integer list Long list Short list)	=	(Equals; default operator)
String	=	(Equals; default operator)
String list	=	(Equals; default operator)
String table	=	(Equals; default operator)

About In Effect Operators

The following table lists the operators that can be assigned when specifying an in effect date:

In Effect	Operator	Definition
In Effect	!=	(Does not equal)
	<	(Less than)
	<=	(Less than or equal)
	>	(Greater than)
	>=	(Greater than or equal)
	< ... <=	(Less than ... less than or equal)
	<= ... <=	(Less than or equal ... less than or equal)
	< ... <	(Less than ... less than)
	<= ... <	(Less than or equal ... less than)

About Data Type Assignment

The following table lists the data types that can be assigned to a parameter element that was specified for a condition or result:

Data type of the parameter element for the condition or result is	Literal value must be	Constant must be	Data type of assigned parameter element must be
Boolean	Boolean	NULL	Boolean
Boolean list (results only)	n/a	NULL	Boolean list
Byte array (results only)	n/a	NULL	Byte array
Date	Date	NULL	Date
Date list (results only)	n/a	NULL	Date list
Document (results only)	n/a	NULL	Document
Document list (results only)	n/a	NULL	Document list
Numeric (Byte, Character, Double, Float, Integer, Long, Short)	Same data type or numeric data type with a smaller value.	NULL	Any numeric data type. Numeric data types with a greater value are truncated.
Numeric list (Byte list, Character list, Double list, Float list, Integer list, Long list, Short list) (results only)	n/a	NULL	Any numeric list. Numeric data types with a greater value are truncated.
String	String	NULL or EMPTY_ STRING	String
String list (results only)	n/a	NULL	String list
String table (results only)	n/a	NULL	String table

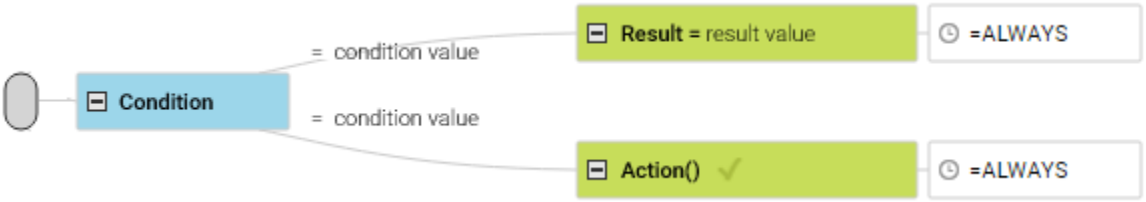
6 Working with Decision Trees

A decision tree is a decision entity. It uses a tree-like structure to depict a complex set of rules in an `IF Condition THEN Result` syntax.

Decision Tree Structure

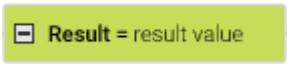
A decision tree consists of nodes and links. A node can represent the root, a condition (blue color), an assignment result and its assigned result value (green color), or an action result and its action status (green color). A link can be a root link or a condition link. A root node can be linked to one or more condition nodes, and a condition node can be linked to one or more condition nodes or result nodes.

Figure 3. Decision Tree in the Decision Entity Editor



The following table explains the decision tree elements and their graphical representation:

Element Name	Graphical Representation	Description
Root Node		The root node is the root of the decision tree. All decision branches start from here.
Root Link		A root link connects the root node with a condition node on the first level. A root link represents an unconditional branch to a condition node and is not evaluated.
Condition	Condition	A condition node contains a reference to one input or input/output parameter element. Condition links can branch off of this node.
Condition Link	= condition value	Three types of condition links exist: ■ Condition link that contains an operator and a condition value. It represents a conditional branch to the element on the right side of the condition line when the condition evaluates to true. ■ Condition link that is left empty. It represents an unconditional branch and is not evaluated. Tree evaluation continues with the successor node if there is any. ■ Otherwise condition link. It contains the otherwise operator and a condition value,

Element Name	Graphical Representation	Description
		and it represents the last branch of a condition node. Its path is taken if none of the previous branches from the parent condition evaluate to true. The following types of condition values exist: ■ Literal value. ■ Value range. ■ Parameter element (marked by a dotted line). ■ Action that delivers an output value (marked by a dotted line and () behind the action name). ■ Constant (marked by a dotted line). ■ Expression.
Assignment Result Node		An assignment result node contains a reference to one output or input/output parameter element, an operator, and the assigned result value. The following types of result values exist: ■ Literal value. ■ List. ■ Parameter element (marked by a dotted line). ■ Action that delivers an output value (marked by a dotted line and () behind the action name). ■ Constant (marked by a dotted line). ■ Expression. Assignment result nodes can be chained together along with action result nodes.
Action Result Node		An action result node contains a reference to the action that is to be invoked and one of the following action statuses: ■ ✓ (action is enabled). ■ ✗ (action is disabled).

Element Name	Graphical Representation	Description
		Mapping can be specified. Action result nodes can be chained together along with assignment result nodes.
In Effect Indicator	=ALWAYS	The in effect indicator shows the date at which a rule is in effect.

Example

The following table shows two rules that can be modeled in a decision tree:

Rule 1:	IF a customer has customer status silver, THEN this customer gets a discount of 10%.
Rule 2:	IF a customer has customer status gold, THEN this customer gets a discount of 20%.

The decision tree uses one condition node with two condition values and two assignment result nodes:

Figure 4. Decision Tree Example

The following image shows the decision table that corresponds to this decision tree:

	CustStatus	Discount	In Effect
1	= silver	= 10%	= ALWAYS
2	= gold	= 20%	= ALWAYS

Modifying a Decision Tree

The Decision Entity Editor supports the following actions for decision trees:

- Modifying condition links and assignment result nodes.
- Setting a label for condition nodes, condition links, and assignment result nodes.
- Setting a default value for condition nodes.
- Setting an in effect date at decision tree level or at branch level.

- Showing and hiding the properties of a decision tree.
- Expanding and collapsing decision tree nodes.
- Zooming and reseting the decision tree depiction.

Important:
You must lock the decision tree before you can modify it. For more information, see "Locking a Decision Entity" on page 70.

Modifying Condition Links or Assignment Result Nodes in Direct Edit Mode

You can modify condition links or assignment result nodes in direct edit mode.

To modify a condition link or assignment result node in direct edit mode:

1. Open the decision tree as described in "Opening a Decision Entity" on page 70.
2. Lock the decision tree as described in "Locking a Decision Entity" on page 70.
3. Click the condition link or assignment result node you want to modify.
4. In the inline editor, select an operator as specified in "About Condition Operators" on page 54 or "About Result Operators" on page 56.

   Important:
   Adding only an operator without entering a literal value results in a semantically invalid condition link or assignment result node.

5. Enter a literal value in the input field as explained in the following table:

   Note:
   The literal value must match the data type as specified in "About Data Type Assignment" on page 57.

For this data type	You can do this
Boolean	Select **true** or **false** from the drop-down list.
Date	a. Click  . b. Select the date. c. Enter a time of day (optional). **Note:**

For this data type	You can do this
	The format and time zone of displayed date and time values can be configured in the **My Profile** settings. Business Rules only supports hours, minutes, and seconds.
Byte Character Double Float Integer Long Short	Type the literal value.
String	Type the literal value.

6. Click  to save the changes,  to discard the changes, or  to clear the values. To open the built-in editor, click (condition link) or (assignment result node), and modify the condition link or assignment result node as described in "Modifying Condition Links or Assignment Result Nodes with the Editor" on page 50.

Modifying Condition Links or Assignment Result Nodes with the Editor

You can modify condition links and assignment result nodes with a built-in editor.

To modify condition links and assignment result nodes with the editor:

1. Open the decision tree as described in "Opening a Decision Entity" on page 70.

2. Lock the decision tree as described in "Locking a Decision Entity" on page 70.

3. Click (condition link) or (assignment result node).

4. In the **Link Modification** dialog or the **Result Node Modification** dialog, modify the value info as explained in the following table:

For this field or option	You can do this
Select an operator	Select an operator as specified in "About Condition Operators" on page 54 or respectively "About Result Operators" on page 56.
	Note:

For this field or option	You can do this
	If you select a range operator, the dialog box splits so that you can specify a literal value or parameter element for each side of the range.
Select an option > Literal	Enter a literal value in the **Enter value** field as described in "Modifying Condition Links or Assignment Result Nodes in Direct Edit Mode" on page 49, Step 5. **Note:** The literal value must match the data type as specified in "About Data Type Assignment" on page 57.
Select an option > Constants	From the **Select constant** drop-down, select a constant. For more information on constants, see "About Constants" on page 72. **Note:** The constant must match the data type as specified in "About Data Type Assignment" on page 57.
Select an option > Parameters	Expand the parameter, and select a parameter element from the list. The parameter element is then displayed above the parameter element list. To filter the list of parameter elements, enter a filter text in the search field above the parameter element list. **Note:** The data type of the parameter element must match the data type as specified in "About Data Type Assignment" on page 57.
Select an option > Expression	Add an expression as described in "Adding an Expression" on page 94.

5. Click Finish.

Setting and Modifying Labels

You can set and modify a label (meaningful name) for a condition node, a condition link, or an assignment result node.

To set or modify a label:

1. Open the decision tree as described in "Opening a Decision Entity" on page 70.

2. Lock the decision tree as described in "Locking a Decision Entity" on page 70.

3. Click (condition node, condition link) or (assignment result node).

4. In the **Condition Node Configuration** dialog, the **Link Modification** dialog, or the **Result Node Modification** dialog, enter a value in the **Label** field.

5. Click Finish.

Setting a Default Value for a Condition Node

In the Rules Development feature of Software AG Designer, you can specify an execution behavior for a decision tree if parameter elements that are used by condition nodes are missing at runtime.

The following missing value approaches are available:

- **Null resolves to false.** (Default.) The decision tree is executed. When a condition is checked, it evaluates to false if the referenced parameter element is missing. The execution then continues.
- **Null value.** Referenced parameter elements for conditions are checked before execution. If a referenced parameter element is missing, the decision tree is not executed.
- **Default value.** You can specify a default value that is evaluated substitutionally if a referenced parameter element for a condition is missing.

In My webMethods, you can set a default value for a condition node.

To set a default value for a condition node:

1. Open the decision tree as described in "Opening a Decision Entity" on page 70.

2. Lock the decision tree as described in "Locking a Decision Entity" on page 70.

3. Click in the condition node for which you want to specify a default value.

4. In the **Condition Node Configuration** dialog, enter a value in the **Default Value** field.

   Note:
   Note that you can only enter literal values. The data type of the literal value must correspond to the data type of the parameter element that was assigned to the condition node.

5. Click Finish.

Setting an In Effect Date at Decision Tree Level

As a default, the rules of a decision tree are always in effect. You can set an in effect date at branch level or at decision tree level. If you set an in effect date at branch level, it only applies to the rule

that is represented by this branch. If you set an in effect date at decision tree level, it applies to all rules of this decision tree.

To set an in effect date at decision tree level:

1. Open the decision tree as described in "Opening a Decision Entity" on page 70.
2. Lock the decision tree as described in "Locking a Decision Entity" on page 70.
3. In the toolbar, click In Effect.
4. In the Edit in effect dates dialog box, select **Always in effect** (default), **Never in effect**, or **Date and time frame in effect**. If you click **Date and time frame in effect**, select an operator as described in "About In Effect Operators" on page 56, and specify a date and time (optional). Click Finish.

Setting an In Effect Date at Branch Level

As a default, the rules of a decision tree are always in effect. You can set an in effect date at branch level or at decision tree level. If you set an in effect date at branch level, it only applies to the rule that is represented by this branch. If you set an in effect date at decision tree level, it applies to all rules of this decision tree.

To set an in effect date at branch level:

1. Open the decision tree as described in "Opening a Decision Entity" on page 70.
2. Lock the decision tree as described in "Locking a Decision Entity" on page 70.
3. Select the **In Effect** node at the end of the branch.
4. Click . In the Edit in effect dates dialog box, select **Always in effect** (default), **Never in effect**, or **Date and time frame in effect**. If you click **Date and time frame in effect**, select an operator as described in "About In Effect Operators" on page 56, and specify a date and time (optional). Click Finish.

Showing and Hiding Decision Tree Properties

You can show and hide the properties of a decision tree. Properties are description, missing value approach, and processing mode. If you lock the decision tree, you can also modify the description.

To show or hide properties:

1. Open the decision tree as described in "Opening a Decision Entity" on page 70.

2. Lock the decision tree as described in "Locking a Decision Entity" on page 70.

3. Click Show Information in the upper right corner to show the decision tree properties, or click Hide Information to hide them.

4. To modify the description, click in the properties field. Click to save the changes, or click to discard the changes.

Expanding and Collapsing Nodes

You can expand and collapse single nodes or all nodes of a decision tree.

To expand or collapse nodes:

1. Open the decision tree as described in "Opening a Decision Entity" on page 70.

2. To expand or collapse a single node, click or in the node.

3. To expand or collapse all nodes, click Expand All or Collapse All in the toolbar.

Zooming In and Out

You can minimize or maximize the depiction of the decision tree in the Decision Entity Editor window.

To zoom in or out:

1. Open the decision tree as described in "Opening a Decision Entity" on page 70.

2. Select (zoom in) or (zoom out) from the left side of the Decision Entity Editor window.

3. To reset the zoom, click .

About Condition Operators

The following table lists the operators that can be assigned to a condition link depending on the data type of the value this link contains:

Data Type(s)	Operator	Definition
Boolean	=	(Equals; default operator)
	!=	(Does not equal)
	otherwise	(Only last branch of condition node)
Character	=	(Equals; default operator)
	!=	(Does not equal)
	<	(Less than)
	<=	(Less than or equal)
	>	(Greater than)
	>=	(Greater than or equal)
	< ... <=	(Less than ... less than or equal)
	<= ... <=	(Less than or equal ... less than or equal)
	< ... <	(Less than ... less than)
	<= ... <	(Less than or equal ... less than)
	otherwise	(Only last branch of condition node)
Date	=	(Equals; default operator)
	!=	(Does not equal)
	<	(Less than)
	<=	(Less than or equal)
	>	(Greater than)
	>=	(Greater than or equal)
	< ... <=	(Less than ... less than or equal)
	<= ... <=	(Less than or equal ... less than or equal)
	< ... <	(Less than ... less than)
	<= ... <	(Less than or equal ... less than)
	otherwise	(Only last branch of condition node)
Numeric (Byte Double Float Long Integer Short)	=	(Equals; default operator)
	!=	(Does not equal)
	<	(Less than)
	<=	(Less than or equal)
	>	(Greater than)
	>=	(Greater than or equal)
	< ... <=	(Less than ... less than or equal)
	<= ... <=	(Less than or equal ... less than or equal)
	< ... <	(Less than ... less than)
	<= ... <	(Less than or equal ... less than)
	otherwise	(Only last branch of condition node)
String	=	(Equals; default operator)
	!=	(Does not equal)
	otherwise	(Only last branch of condition node)

About Result Operators

The following table lists the operators that can be assigned to a result node depending on the data type of the value this node contains:

Data Type(s)	Operator	Definition
Boolean	=	(Equals; default operator)
Boolean list	=	(Equals; default operator)
Character	=	(Equals; default operator)
Character list	=	(Equals; default operator)
Date	=	(Equals; default operator)
Date list	=	(Equals; default operator)
Document	=	(Equals; default operator)
Document list	=	(Equals; default operator)
Numeric (Byte Double Float Integer Long Short)	=	(Equals; default operator)
Numeric list (Byte array Byte list Double list Float list Integer list Long list Short list)	=	(Equals; default operator)
String	=	(Equals; default operator)
String list	=	(Equals; default operator)
String table	=	(Equals; default operator)

About In Effect Operators

The following table lists the operators that can be assigned when specifying an in effect date:

In Effect	Operator	Definition
In Effect	!=	(Does not equal)
	<	(Less than)
	<=	(Less than or equal)
	>	(Greater than)
	>=	(Greater than or equal)
	< ... <=	(Less than ... less than or equal)
	<= ... <=	(Less than or equal ... less than or equal)
	< ... <	(Less than ... less than)
	<= ... <	(Less than or equal ... less than)

About Data Type Assignment

The following table lists the data types that can be assigned to a parameter element that was specified for a condition link or assignment result node:

Data type of the parameter element for the condition link or result node is	Literal value must be	Data type of assigned parameter element must be	Data type of action output must be	Constant must be
Boolean	Boolean	Boolean	Boolean	NULL
Boolean list (results only)	n/a	Boolean	Boolean	NULL
Character	Character	Character	Character	NULL
Character list (results only)	n/a	Character	Character	NULL
Date	Date	Date	Date	NULL
Date list (results only)	n/a	Date	Date	NULL
Document (results only)	n/a	Document	Document	NULL
Document list (results only)	n/a	Document list	Document list	NULL
Numeric (Byte, Double, Float, Integer, Long, Short)	Same data type or numeric data type with a smaller value.	Any numeric data type. Numeric data types with a greater value are truncated.	Any numeric data type. Numeric data types with a greater value are truncated.	NULL

Data type of the parameter element for the condition link or result node is	Literal value must be	Data type of assigned parameter element must be	Data type of action output must be	Constant must be
Numeric list (Byte array, Byte list, Double list, Float list, Integer list, Long list, Short list) (results only)	n/a	Any numeric list. Numeric data types with a greater value are truncated.	Any numeric list. Numeric data types with a greater value are truncated.	NULL
String	String	String	String	NULL or EMPTY_STRING
String list (results only)	n/a	String list	String list	NULL
String table (results only)	n/a	String table	String table	NULL

Important:
Integer values are converted to Java doubles before being assigned to parameter elements. The conversion might introduce imprecision due to truncation or rounding. As the conversion to a Java double only handles up to 15 significant digits, it is highly recommended not to use integers with more than 15 digits in conjunction with decimal point parameter elements.

7 Working with Event Rules

An event rule is a decision entity that specifies the results triggered by an event. There are two types of events:

- Internal Events.
- External Events.

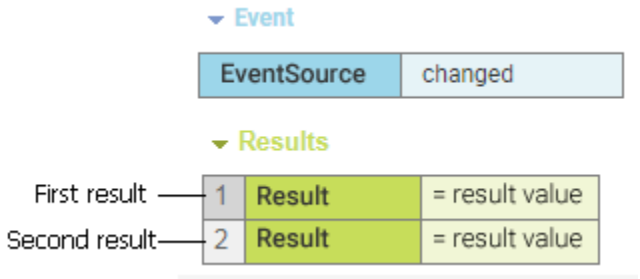
Internal events are triggered by other event rules and decision tables during rule execution. External events are predefined event types that were created with the webMethods Event Type Editor, see *webMethods Event Processing Help*.

Important:
To work properly, internal and external event rules must be part of a rule set.

Event Rule Structure

An event rule consists of an event (blue color) and one or more results (green color).

Figure 5. Event Rule in the Decision Entity Editor



Event

The event consists of an event source that is specified by a parameter element and a type. The following table explains the supported types:

Event	Type	Description
Internal Event	`changed`	This type triggers one or more results whenever the event source changes. The change must be triggered by other event rules or decision tables. `Changed` type event rules have the following syntax: `WHENEVER an Event Source CHANGED THEN Result.`
External Event	`occurred`	This type triggers one or more results whenever the external event has occurred. `Occurred` type event rules have the following syntax:

Event	Type	Description
		`WHENEVER an Event Source OCCURRED THEN Result.`

Results

There are two types of results which are explained in the following table:

Result	Description
Assignment Result	An assignment result is specified by a parameter element. This result type is applied whenever you want to assign a value to a result.
Action Result	An action result is specified by an action. This result type is applied whenever you want to execute an action from an event rule.

Assignment Result Value

An assignment result value can consist of:

- An operator and a literal value.
- An operator and a parameter element (marked by a dotted line).
- An operator and an action that delivers an output value (marked by a dotted line and () behind the action name).
- An operator and a constant (marked by a dotted line).
- An operator and an expression (marked by a dotted line).

Action Result Value

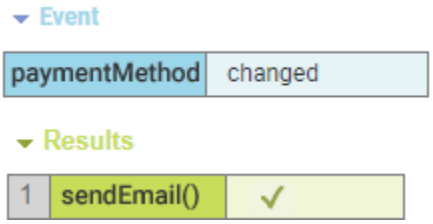
The action result value expresses the action status. There are two types:

- ✓ (action is enabled).
- ✗ (action is disabled).

The following table shows a rule that can be modeled in an event rule using an action result:

Rule	WHENEVER a permitted payment method changes for a customer, THEN this customer is notified of this by email.

Figure 6. Event Rule Example



Modifying an Event Result

The Decision Entity Editor supports the following actions for event rule results:

- Adding and modifying result values.
- Clearing result values.

Important:
You must lock the event rule before you can modify it. For more information, see "Locking a Decision Entity" on page 70.

Adding an Operator and a Literal Value in Direct Edit Mode

You can add an operator and a literal value in direct edit mode.

To add an operator and a literal value:

1. Open the event rule as described in "Opening a Decision Entity" on page 70.
2. Lock the event rule as described in "Locking a Decision Entity" on page 70.
3. Click the cell you want to modify.
4. Select an operator as specified in "About Result Operators" on page 66.

   Important:
   Adding only an operator without entering a literal value results in a semantically invalid cell.

5. Enter a literal value in the input field as explained in the following table:

   Note:
   The literal value must match the data type as specified in "About Data Type Assignment" on page 67.

For this data type	You can do this
Boolean	Select **true** or **false** from the drop-down list.

For this data type	You can do this
Date	a. Click  . b. Select the date. c. (Optional) Enter a time of day. **Note:** The format and time zone of displayed date and time values can be configured in the **My Profile** settings. Business Rules only supports hours, minutes, and seconds.
Byte Character Double Float Integer Long Short	Type the literal value.
String	Type the literal value.

6. Press ENTER, or click anywhere in the Decision Entity Editor window to remove the focus from the cell.

Modifying an Operator in Direct Edit Mode

You can modify any operator you set in direct edit mode.

To modify an operator:

1. Open the event rule as described in "Opening a Decision Entity" on page 70.
2. Lock the event rule as described in "Locking a Decision Entity" on page 70.
3. Click the operator you want to modify.
4. Select a new operator as specified in "About Result Operators" on page 66.

Modifying a Literal Value in Direct Edit Mode

You can modify any literal value you set in direct edit mode.

To modify a literal value:

1. Open the event rule as described in "Opening a Decision Entity" on page 70.
2. Lock the event rule as described in "Locking a Decision Entity" on page 70.
3. Click the literal value you want to modify.
4. Do one of the following:
   a. Type a new literal value as described in "Adding an Operator and a Literal Value in Direct Edit Mode" on page 62, Step 4.
   b. Press DEL to delete the literal value.
5. Press ENTER.

Adding a Result Value with the Editor

You can add a result value with a built-in editor.

To add a result value with the editor:

1. Open the event rule as described in "Opening a Decision Entity" on page 70.
2. Lock the event rule as described in "Locking a Decision Entity" on page 70.
3. Click the cell you want to modify.
4. Click  .
5. In the Result Value Modification dialog box, modify the value info as explained in the following table:

For this field or option	You can do this
Select an operator	Select an operator as specified in "About Result Operators" on page 66.
Select an option > Literal	Enter a literal value in the **Enter value** field as described in "Adding an Operator and a Literal Value in Direct Edit Mode" on page 62, Step 5. **Note:** The literal value must match the data type as specified in "About Data Type Assignment" on page 67.

For this field or option	You can do this
Select an option > Constants	From the **Select constant** drop-down, select a constant. For more information on constants, see "About Constants" on page 72. **Note:** The constant must match the data type as specified in "About Data Type Assignment" on page 67.
Select an option > Parameters	Expand the parameter, and select a parameter element from the list. The parameter element is then displayed above the parameter element list. To filter the list of parameter elements, enter a filter text in the search field above the parameter element list. **Note:** The data type of the parameter element must match the data type as specified in "About Data Type Assignment" on page 67.
Select an option > Expression	Add an expression as described in "Adding an Expression" on page 94.

6. Click Finish.

Modifying a Result Value with the Editor

You can modify any result value you set with a built-in editor.

To modify a result value with the editor:

1. Open the event rule as described in "Opening a Decision Entity" on page 70.
2. Lock the event rule as described in "Locking a Decision Entity" on page 70.
3. Click the cell you want to modify.
4. Click .
5. Modify the result value as described in "Adding a Result Value with the Editor" on page 64, Step 4.

Clearing a Result Value

You can clear result values in direct edit mode.

To clear a result value:

1. Open the event rule as described in "Opening a Decision Entity" on page 70.
2. Lock the event rule as described in "Locking a Decision Entity" on page 70.
3. Click the operator of the cell you want to clear.
4. Select **Clear** from the context menu.

About Result Operators

The following table lists the operators that can be assigned to the different data types of an event rule assignment result:

Data Type(s)	Operator	Definition
Boolean	=	(Equals; default operator)
Boolean list	=	(Equals; default operator)
Byte array	=	(Equals; default operator)
Date	=	(Equals; default operator)
Date list	=	(Equals; default operator)
Document	=	(Equals; default operator)
Document list	=	(Equals; default operator)
Numeric (Byte Character Double Float Integer Long Short)	=	(Equals; default operator)
Numeric list (Byte list Character list Double list Float list Integer list Long list Short list)	=	(Equals; default operator)

Data Type(s)	Operator	Definition
String	=	(Equals; default operator)
String list	=	(Equals; default operator)
String table	=	(Equals; default operator)

About Data Type Assignment

The following table lists the data types that can be assigned to a parameter element that was specified for an event result:

Data type of the parameter element for the result is	Literal value must be	Constant must be	Data type of assigned parameter element must be
Boolean	Boolean	NULL	Boolean
Boolean list	n/a	NULL	Boolean list
Byte array	n/a	NULL	Byte array
Date	Date	NULL	Date
Date list	n/a	NULL	Date list
Document	n/a	NULL	Document
Document list	n/a	NULL	Document list
Numeric (Byte, Character, Double, Float, Integer, Long, Short)	Same data type or numeric data type with a smaller value.	NULL	Any numeric data type. Numeric data types with a greater value are truncated.
Numeric list (Byte list, Character list, Double list, Float list, Integer list, Long list, Short list)	n/a	NULL	Any numeric list. Numeric data types with a greater value are truncated.
String	String	NULL or EMPTY_STRING	String
String list	n/a	NULL	String list
String table	n/a	NULL	String table

8 Global Functions Overview

The Business Rules User Interface in My webMethods supports the following functions that apply to all decision entities:

- Opening a decision entity.
- Saving changes to a decision entity.
- Modifying the description of a decision entity.
- Locking a decision entity.
- Creating and modifying lists with the inline editor (decision table results and event rule results only).

Important:
You must lock the decision entity before you can modify it. For more information, see "Locking a Decision Entity" on page 70.

Opening a Decision Entity

You can open a decision entity.

To open a decision entity:

1. On the **Navigate** tab, do one of the following:

   a. Click ***[RuleProjectName]*** **> Decision Tables** (for decision tables).

   b. Click ***[RuleProjectName]*** **> Decision Trees** (for decision trees).

   c. Click ***[RuleProjectName]*** **> Event Rules** (for event rules).

   d. Click ***[RuleProjectName]*** **> Rule Sets >*****[RuleSetName]*** (for all decision entities of a rule set).

2. In the Decision Entity List window, click the decision entity name.

The decision entity opens in the Decision Entity Editor window. The order of rules corresponds to the order specified by the rule developer in Software AG Designer.

Locking a Decision Entity

You must lock a decision entity before you can modify it.

To lock a decision entity:

1. Open the decision entity as described in "Opening a Decision Entity" on page 70.

2. Click Lock in the upper right corner of the Decision Entity Editor window.

3. Modify and save the decision entity.

4. To make the decision entity available to others for modification, click Unlock in the upper right corner of the Decision Entity Editor window.

Saving Changes to a Decision Entity

You can save changes you made to a decision entity.

To save your changes:

1. Open the decision entity as described in "Opening a Decision Entity" on page 70.

2. Lock the decision entity as described in "Locking a Decision Entity" on page 70.

3. Modify the decision entity.

4. For decision tables and event rules, click Save in the upper right corner of the Decision Entity Editor window. For decision trees, changes are saved automatically after modification, and the save status is displayed in the upper left corner of the Decision Entity Editor window.

   Note:
   You cannot save a decision entity that contains errors.

Modifying the Description of a Decision Entity

You can modify the description text of a decision table or an event rule.

To modify the description of a decision entity:

1. Open the decision entity as described in "Opening a Decision Entity" on page 70.

2. Lock the decision entity as described in "Locking a Decision Entity" on page 70.

3. In the Decision Entity Editor window, click .

4. Type a new description.

5. Click Save.

Creating and Modifying Lists with the Inline Editor

In decision table assignment results and in event rule results of any list data type, you can create and modify lists with an inline editor.

Note:
You can only create a list if the result cell is empty or contains a createList function.

To create and modify lists:

1. Open the decision entity as described in "Opening a Decision Entity" on page 70.
2. Lock the decision entity as described in "Locking a Decision Entity" on page 70.
3. Click the result cell, and select **=** from the operator list.
4. In the inline editor, click  .
5. Do one of the following:
   a. Type a value in the entry field.
   b. Click  , and select a parameter from the pop-up list.
   c. For date list entries: Select a date from the calendar that opens if you click the entry field.
6. To use the cell editor, click  . Add the result value as described in "Adding a Condition or Result Value with the Editor" on page 34 (for decision tables) or "Adding a Result Value with the Editor" on page 64 (for event rules).

   Note:
   You cannot add a literal value.
7. To delete an entry, select it, and click  .
8. To sort entries, click or behind the entry.
9. Click  .

The list is created. To see the entries, mouse over the respective result cell in the decision entity.

About Constants

There are two types of predefined constants:

- EMPTY_STRING.
- NULL.

They can be used in decision table condition values, decision table assignment result values, decision tree condition values, decision tree assignment result values and event rule assignment result values.

If EMPTY_STRING is assigned to a parameter element in a condition value of a decision table or a decision tree, the condition is fulfilled if the parameter element contains an empty string as a value in a parameter instance at runtime.

If NULL is assigned to a parameter element in a condition value of a decision table or a decision tree, the condition is fulfilled if:

- The parameter element is missing in a parameter instance at runtime.
- The parameter element exists and contains null as a value in a parameter instance at runtime.
- The superordinated parameter element is missing in a parameter instance at runtime.

Example

You work with a `customer` parameter that contains the parameter elements `name`, `age` and `address`, and the parameter element `address` contains the subordinated parameter elements `street`, `street_number`, `zip` and `city`. You assign the constant NULL to the parameter element `customer.address.zip` in a decision table condition value.

	Customer.address.zip
1	= NULL

Then the condition is fulfilled if:

- The parameter element `zip` is missing in a specific instance of the `customer` parameter at runtime.
- The parameter element `zip` exists but contains null as a value in a specific instance of the `customer` parameter at runtime.
- The superordinated parameter element `address` is missing in a specific instance of the `customer` parameter at runtime.

9 Rule Verification Overview

The Business Rules User Interface in My webMethods supports three kinds of verification:

- **Automatic Verification** is performed on decision entities when they are opened or saved after modification. It can reflect both errors and warnings. For more information, see "About Automatic Verification" on page 76.
- **Manual Verification** is performed on-demand at rule set or at decision entity level. It is designed to detect potential logic problems in decision entities and only creates warnings. For more information, see "Verifying Rules Manually" on page 76.
- **Preconfigured Verification Services**. You can verify decision tables on the basis of preconfigured REST services. For more information, see "Working with a Preconfigured Verification Service" on page 77.

For more information about verification categories, see "About Verification Categories" on page 78.

About Automatic Verification

Automatic verification is performed on decision entities when they are opened or saved after modification. It can reflect both errors and warnings.

Representation of Warnings and Errors in the Decision Entity List Window

Decision tables with errors or warnings are marked by  or  . Event rules with errors or warnings are marked by  or  .

Representation of Warnings and Errors in the Decision Entity Editor Window

The respective cell of the decision entity in the Decision Entity Editor window is marked red (error) or yellow (warning).

Representation of Warnings in the Rule Project Verification Window

The warnings and errors appear in the Rule Project Verification window in the verification categories **Syntax**, **Empty cells**, **Processing Modes**, or **Other**. For more information about verification categories, see "About Verification Categories" on page 78.

Errors are marked by  , warnings are marked by  .

If you click a link in the **Resource** column of the problems table, the respective decision entity opens in the Decision Entity Editor window, and it is highlighted in the Decision Entity List window.

Verifying Rules Manually

Manual Verification is performed on-demand at rule set or at decision entity level. It is designed to detect potential logic problems in decision entities and only creates warnings.

Keep the following points in mind when verifying rules:

- Rules can be verified at rule set or at decision entity level.
- If you verify a rule set, all of its decision entities are combined and tested as a single entity.
- Decision entities with errors cannot be verified.
- Only conditions with more than one value are considered, and each condition value is processed independently.
- Condition values containing a parameter element or an action are not considered.
- There can be multiple warnings for one condition value.
- Event rules are not considered as they do not have condition values.
- Condition values of the data type date are not considered.

To verify rules manually:

1. Click 

in the upper right corner of the Rule Project Verification window.

The warnings appear in the problems table of the Rule Project Verification window and are sorted by verification categories. For more information about verification categories, see "About Verification Categories" on page 78. If the warning can be associated with a decision entity, the respective decision entity is marked by  (decision table) or  (event rule) in the Decision Entity List window.

Working with a Preconfigured Verification Service

You can verify a condition column or a result column of a decision table on the basis of a preconfigured REST service. For instance, you can check if the values at runtime for a `zipCode` parameter start with the figure `0`.

To enable verification on the basis of a preconfigured verification service, the following is necessary:

- You need a preconfigured REST service. For more information about the required structure of this REST service, see *webMethods Business Rules Reference*.
- The REST service must run on a server, and you must configure the server connection. For more information, see "Configuring a Server Connection for a Preconfigured Verification Service" on page 78.
- You must assign the REST service to a condition column or result column of a decision table in the Rules Development feature of Software AG Designer. For more information, see *webMethods BPM Rules Development Help*.

You can then verify the rules manually in My webMethods as described in "Verifying Rules Manually" on page 76. Rules are automatically verified when a rule project is hot deployed. The verification results of a preconfigured verification service can be seen in the Rule Project Verification window in the category Business Verification.

Configuring a Server Connection for a Preconfigured Verification Service

You must configure a connection for the server the preconfigured verification service is running on.

To configure a server connection:

1. Navigate to **Applications > Administration > My webMethods > System Settings > webMethods Business Rules Settings**.
2. Under **BUSINESS VERIFICATION**, select **Enabled**, and define **Protocol**, **Host**, **Port**, and **Base Path**.
3. (Optional) Specify an authentication method, and enter a **User Name** and **User Password** if required.
4. Click **Save**.

Showing or Hiding Suppressed Warnings

Warnings can be suppressed when creating decision entities in Software AG Designer. You can make these suppressed warnings visible or hide them again in the Rule Project Verification window.

To show or hide suppressed warnings:

1. Click **Show all suppressed warnings** in the lower right corner of the Rule Project Verification window.
2. To hide the warnings again, click **Hide all suppressed warnings** in the lower right corner of the Rule Project Verification window after the page has been reloaded.

The warnings are shown or hidden in the Rule Verification window, in the Decision Entity List window, and in the Decision Entity window.

About Verification Categories

The following verification categories exist:

Gaps

The following table describes a gap warning.

Explanation A gap warning is reported if a value or a range of values for one condition is not explicitly tested in a decision entity or a rule set.

Example

	Order value
1	< 5,000
2	> 5,000

A gap warning is reported, because the value = *5,000* is not tested for the condition *Order value*.

Action If the gap is not intended, specify the missing value or range of values for the condition.

Overlaps

The following table describes an overlap warning.

Explanation An overlap warning is reported if the same value or range of values for one condition is tested multiple times in a decision entity or a rule set.

Example

	Order value
1	<= 5,000
2	>= 5,000

An overlap warning is reported, because the value = *5,000* is tested multiple times for the condition *Order value*.

Action If the overlap is not intended, modify the rules so that the condition value is only tested once.

Syntax

The following table describes a syntax warning.

Explanation A syntax warning is for instance reported if data is lost due to truncation.

Example

ByteVar
= LongVar

A syntax warning is reported, because a result value of the data type `long` is assigned to a result of the data type `byte` and is therefore truncated.

Action If the data loss is not tolerable, assign a value of the correct data type.

Empty cells

The following table describes an empty cell warning.

Explanation An empty cell warning is reported if a condition value or a result value is not specified.

Example

	Order value
1	
2	>= 5,000

An empty cell warning is reported, because the condition value for the first rule is not specified.

Action If the empty cell is not intended, specify the missing value.

Processing Modes

The following table describes a processing mode warning.

Explanation A processing mode warning is reported if the processing mode of a decision table within a rule set differs from the processing mode of this rule set, because the processing mode of the rule set overwrites that of the decision table.

Example Differences in processing modes can occur if you add an inferential decision table to a sequential rule set or vice versa; or if you modify the processing mode of a rule set or of a decision table within this rule set.

Action If the different processing mode is not intended, set the same processing mode for the decision table and rule set.

Redundancies

The following table describes a redundancy warning.

Explanation A redundancy warning is reported if parts of one rule, or rules of one decision table, or rules of several decision tables within one rule set are dispensable.

Example

	Order Value	Country	Discount
1	> 500		= 4
2	> 500	= Germany	= 4

A redundancy warning is reported, because as in the first rule no value is specified for the condition *Country*, any value applies to this rule. This makes the second rule superfluous.

Action If the redundancy is not intended, delete the dispensable rules or parts of rules.

Missing Rules

The following table describes a missing rule warning.

Explanation A missing rule warning is reported if a probable combination of conditions is not explicitly tested in a decision entity or a rule set.

Example

	gender	olderThan45
1	= male	= true
2	= male	= false
3	= female	= true

A missing rule warning is reported, because the condition combination *gender=female AND olderThan45=false* is not explicitly tested.

Action If the missing rule is not intended, specify the missing combination(s) of conditions.

Business Verification

The following table describes preconfigured verification services.

Explanation Verification results for preconfigured verification services, see "Working with a Preconfigured Verification Service" on page 77.

Other

The following table describes other verification categories.

Explanation All warnings and errors that do not fit into the other categories.

10 Hot Deploying Rule Projects to Integration Server

webMethods Rules Engine executes the rules that were created with the Rules Development feature in Software AG Designer. Rules Engine exists on Integration Server as part of the WmBusinessRules package.

You can deploy your modified rules to Integration Server, which is used as a target runtime environment. There these rules can be accessed and used by multiple business processes. For more information, see *webMethods BPM Process Development Help*.

The Business Rules User Interface in My webMethods supports the deployment of rule projects to a single or multiple Integration Server(s) using the hot deploy command as described in "Hot Deploying a Rule Project" on page 85.

Before you can hot deploy a rule project, you must be connected to Integration Server(s). To configure an Integration Server connection, follow the instructions as described in "Configuring an Integration Server Connection" on page 84.

Note:
You can also use Command Central to configure an Integration Server connection.

Configuring an Integration Server Connection

Before you can hot deploy a rule project, you must configure the Integration Server connection(s).

If you use a cluster or a non-clustered group of Integration Servers (Integration Servers that share the same database components), you only need to configure the connection to one Integration Server of the group.

To configure an Integration Server connection:

1. On the **Navigate** tab, click **Administration > My webMethods > System Settings > webMethods Business Rules Settings**.

2. In the workspace area, click **Add Integration Server**.

3. Modify the Integration Server info as explained in the following table:

For this field	You can do this
Logical Name	Type an Integration Server name.
Host	Type the Integration Server address.
Port	Type the Integration Server port.
Username	Type your Integration Server user name.
Password	Type your Integration Server password.
Use SSL	Select the check box if you want to use SSL for the Integration Server connection.

For this field	You can do this
	Note: To use SSL, all target Integration Servers must be configured to use SSL as their primary port. For more information on primary ports, see *webMethods Integration Server Administrator's Guide*.

4. Click **Save**.

Hot Deploying a Rule Project

Once you have configured an Integration Server connection, you can hot deploy a rule project.

To hot deploy a rule project:

1. Open any decision entity that is part of the rule project as described in "Opening a Decision Entity" on page 70.

2. Click 

in the upper right corner of the Decision Entity Editor window.

   Note:
   You cannot hot deploy a decision entity that contains unsaved changes or errors. In this case, the **Hot Deploy** button is disabled.

3. In the Hot Deployment Confirmation dialog box, the **Verify rule project** check box is selected by default, and all decision entities of the rule project are verified in all verification categories before the rule project is deployed. If the rule project contains any errors, an error dialog box informs you in which rule sets the errors occur. You must eliminate all errors before you can hot deploy the rule project. To skip the long-running verification of gaps, overlaps, missing rules, and redundancies, deselect the **Verify rule project** check box. This accelerates hot deployment.

4. Click 

to deploy the decision entity and all other components of the rule project to the Integration Server runtime.

The Hot Deployment Results dialog box lists the results of the operation. To see a detailed list of successfully and unsuccessfully deployed rule projects, click **See Details**.

11 Hot Deploying and Merging Rule Projects with webMethods Deployer

You can deploy rule projects to a My webMethods Server repository with webMethods Deployer. For detailed information about working with webMethods Deployer, see *webMethods Deployer User's Guide*.

To enable usage of webMethods Deployer, you must configure My webMethods Server as described in "Configuring My webMethods Server" on page 88.

When deploying, you can merge the structure of a new rule project contained in the deployment set with the data of an equally named rule project that already exists in the My webMethods Server repository. Only decision tables can be merged. The merged rule project only contains the data of the rule project that already exists in the My webMethods Server repository. Any data in the newly deployed rule project is deleted.

Example

The following decision table exists in the My webMethods Server repository:

Figure 7. Existing Decision Table

	Name	Age	Salary
1	= Arthur	= 40	= 50,000
2	= Emil	= 20	= 25,000

A new version of the decision table is deployed to the My webMethods Server repository:

Figure 8. New Decision Table

	Name	Zip Code	Salary
1			
2			

The merged decision table consists of the new structure filled with the existing data:

Figure 9. Merged Decision Table

	Name	Zip Code	Salary
1	= Arthur		= 50,000
2	= Emil		= 25,000

Configuring My webMethods Server

Before you can hot deploy and merge a rule project using webMethods Deployer, you must configure the file system location used by webMethods Deployer for Business Rules asset deployment.

To configure the file system location:

1. On your file system, open *YourInstallationFolder*\profiles\<*MWS profile*>\configuration\custom_wrapper.conf.
2. Add the path to the file system location wrapper.java.additional.110=-DBRMS_SPI2_PERSISTENCE_PATH=*YourPath*.
3. Save file.
4. Restart My webMethods Server.

12 Working with Expressions

An expression may contain function calls, literals, parameter references, mathematical operators (`+`, `-`, `*`, `/`), groups of parentheses, or combinations of all of these. You can assign an expression to a decision table condition, a decision table assignment result, a decision tree condition, a decision tree assignment result, or an event rule assignment result. Any referenced data element in a condition must exist and have a non-null value in order for the condition to be evaluated. To assign the expression, you can use the operators `=` or `!=` for conditions in decision tables and decision trees and `=` for assignment results in decision tables, decision trees, and event rules. For expressions returning numeric values, you can also use range operators.

Note:
If you use a boolean function in a condition that is not of data type boolean, the return value of the function is not compared to the condition, but it is compared against the value `True`. You cannot use a boolean function in a result that is not of data type boolean, as the return value of a function that is used in a result must match the data type that was specified for the result.

The most powerful component of expressions are function calls. The Business Rules User Interface in My webMethods provides a set of predefined functions that you can use within expressions to perform simple or even complex functionality with a minimal amount of effort. A function call can require arguments. These arguments can be manually entered literal values, they can be mapped to existing parameter elements, they can be the return values of other function calls, or they can be mathematical expressions involving parameter references and/or other function calls.

Five categories of functions exist:

- Date Functions.
- Conversion Functions.
- List and Range Functions.
- Math Functions.
- String Functions.

Important:
Note that all functions are truncated in the Decision Entity Editor window. To view functions in full length, on the **Navigate** tab, click **Administration > My webMethods > System Settings > webMethods Business Rules Settings**. In **DISPLAY OPTIONS**, deselect **Truncate functions**.

For more information about the individual functions, see *webMethods Business Rules Reference*.

For detailed information about how to add expressions and specify their components, see "Adding an Expression" on page 94.

Example of a Simple Function

As an example of a simple function, you can check if the input values for a `Customer.city` parameter start with the string `New`.

```
startsWith("New")
```

Example of a Chained Function

You can call multiple functions by chaining them. As an example of a chained function, you can check if the trimmed input values for a `Customer.city` parameter end with the string `York`.

```
trim().endsWith("York")
```

Example of a Nested Function

You can nest functions. In this case, the return value of the inner function serves as input parameter for the outer function. As an example of a nested function, you can check if the input values for a `Customer.city` parameter contains the upper case value of an `Order.city` parameter.

```
Contains(%”Order,city”%.toUpper())
```

Example of a Mathematical Operation

You can perform mathematical operations on the return value of functions or parameter references. As an example of a mathematical operation, you can compute the area of a rectangle:

```
%"Shapes_1.Rect_Height"% * %"Shapes_1.Rect_Width"%
```

Example of Parentheses Groups

You can nest sub-expressions in parentheses. As an example of an expression using parentheses, you can compute the perimeter of a rectangle:

```
(2* %"Shapes_1.Rect_Height"%) + (2 * %"Shapes_1.Rect_Width"%)
```

Example of an Expression Using a Combination of Components

You can combine the different components of expressions. As an example of an expression using combined components, you can compute the area of a circle rounded and turn the result into a string:

```
round(pi() * pow((%"Shapes_1.Circle_Diameter"% / 2),2.0)).toString()
```

Syntax Overview

To make a reference to a parameter element, use `%”fullyqualifiedparametername”%`, for example `startsWith(%”customer.name”%)`.

To specify a date, use single quotes `'2015/02/12 12:00 AM'`, for example `diffInDays('2015/02/12 12:00 AM')`.

To specify a string array, use single curly braces `{}`, for example `inList({"gold","silver"})`.

To specify a string table, use double curly braces `{{}}`, for example `inRange({{"a","c"},{"f","h"}},null)`.

To specify a date array, use single curly braces `{}` and a single quote, for example `inRange('2015/02/02 12:00 AM','2015/02/12 12:00 AM',{'2015/02/04 12:00 AM','2015/02/05 12:00 AM'}).`

To specify a date table, use double curly braces `{{}}`, and use single quotes for values, for example `inRange({{'2015/02/03 12:00 AM','2015/02/06 12:00 AM'},{'2015/02/16 12:00 AM','2015/02/20 12:00 AM'}},null).`

To specify a double table and double array, use single curly braces `{}` and double curly braces `{{}}`, for example `inRange({{10.0,40.0},{50.0,70.0}},{60.0,65.0}).`

Example of specifying parameter references inside an array and table: `inRange({{10,%"datatypeTest_1.eInteger"%},{30,40}},{35,%"datatypeTest_1.eLong"%}).`

Adding an Expression

You can assign an expression to a decision table condition, a decision table assignment result, a decision tree condition, a decision tree assignment result, or an event rule assignment result. Expressions are automatically verified as they are added. Problems appear in the Rule Project Verification window in the **Syntax** category.

Note:
Escaping is supported. A typed in value such as `\n` is interpreted as a single new line character.

To add a function:

1. For decision tables, execute steps 1 to 4 as described in "Adding a Condition or Result Value with the Editor" on page 34. For decision trees, execute steps 1 to 3 as described in "Modifying Condition Links or Assignment Result Nodes with the Editor" on page 50. For event rules, execute steps 1 to 4 as described in "Adding a Result Value with the Editor" on page 64.

2. In the *[Value Type]* Modification dialog box, select an operator as specified in "About Condition Operators" on page 41 (for decision table conditions), "About Result Operators" on page 42 (for decision table assignment results), "About Condition Operators" on page 54 (for decision tree conditions), "About Result Operators" on page 56 (for decision tree assignment results), or "About Result Operators" on page 66 (for event rule assignment results).

3. Select the **Expression** tab. There are two sub-tabs for entering functions and parameters. To filter the functions by the data type of their return values and source elements, select a data type from the drop-down list in the **Type** select field. To filter the functions by filter text, enter the filter text in the input field below the **Type** select field.

4. A function always operates on the parameter element that was specified for the condition or result (default). You may specify a different source element for the function by selecting a parameter element that is used within the decision entity or by selecting a function that returns a value of a compatible data type. To specify a different parameter element as source element for the function, click the **Parameters** tab, expand a parameter in the list, and select a parameter element. Move the parameter element to the right by double-clicking it. Insert the period

character as separator after the parameter element name. To select a function to be provided as a source element to another function, see Step 7.

5. To select a function, do one of the following:

   a. Double-click a function. If the function has input parameters, the Function Argument dialog pops up. Specify the input parameters as described in Step 6, and click **OK**.

   b. Enter the function manually in the **Enter/edit expression** field. Press CTRL+SPACE for auto-complete.

6. To specify the input parameters of the function, do one of the following in the Function Argument dialog:

   a. Enter a literal value.

   b. Select a parameter element from the list in the pop-up window that opens after you click  . The list contains input and/or input/output parameter references whose types are compatible with the input parameter selected for the function. After you close the dialog by clicking **OK**, the input parameter is inserted in the **Enter/edit expression** field, where you can modify it. To add a parameter element, select the input parameter you want to replace with the parameter element in the **Enter/edit expression** field, click the **Parameters** tab, expand a parameter in the list, and double-click a parameter element. The list contains all parameters and their elements that are used in the decision table or event rule regardless of their data type. If the data type of the selected parameter element is not compatible with the data type of the input parameter, an error is displayed.

   c. Enter the input parameters manually in the **Enter/edit expression** field inside %" "%. Use the syntax as described in "Working with Expressions" on page 91, Syntax Overview.

   Note:
   To specify an empty string as input parameter, enter "" in the **Enter/edit expression** field, or select **EMPTY STRING CONSTANT** from the parameter picker in the Function Argument dialog.

7. To chain functions, do one of the following:

   a. Enter the period character after a function, press CTRL+SPACE. In the pop-up dialog, double-click a second function.

   b. Enter the period character, select the **Functions** tab, and double-click a function in the list. In the Function Argument dialog, enter the input parameters and click **OK**. For more information about nesting functions, see "Working with Expressions" on page 91.

8. To nest functions, enter a function instead of an input parameter in the **Enter/edit expression** field. The return value of the inner function then serves as input parameter of the outer function. For more information about nesting functions, see "Working with Expressions" on page 91.

9. To perform mathematical operations on the return value of functions or parameter references, place the cursor where you want the operator to be inserted, and type it in. The mathematical operators `+`, `-`, `*` and `/` are supported. For more information about performing mathematical operations, see "Working with Expressions" on page 91.

10. To nest sub-expressions in parentheses, place the cursor where you want the open parenthesis to be inserted, and type it in. Do the same for the closed parenthesis. For more information about nesting sub-expressions, see "Working with Expressions" on page 91.

11. Click **OK**.

13 Using CSV Import

You can prepare a CSV file with the rules you want to add to a decision table and then import this CSV file to the Business Rules User Interface in My webMethods to fill an existing decision table. The content in the CSV file does not override the content of the existing decision table but the input from the CSV file is appended after the last rule of the decision table.

For instructions on how to import a CSV file, see "Importing a CSV File" on page 102.

Scope

The following limitations apply to the import of CSV files:

- CSV import is only enabled for decision tables.
- The CSV file can contain the following content:
  - Operators for condition columns (including range operators): =, !=, >=, <=, <, >, <...<=, <=...<, <...<, <=...<=
  - Operators for assignment result columns: =
  - Literals
  - Principal definitions
  - Expressions
- Constants, parameter elements, actions, and in effect dates must not be contained.
- You can import values for the following column types:
  - Condition columns
  - Assignment result columns
  - Verification service columns
  - Data provider service columns
- Values for action result columns cannot be imported.

Requirements

For a successful import, keep the following points in mind:

- The CSV file must have the same number of columns as the decision table in My webMethods, with exception of the **In Effect** column. The in effect date cannot be specified in the CSV file but is set to **Always** as a default.
- The column names in the header line of the CSV file do not have to match the column names of the decision table in My webMethods. The columns of the CSV file are assigned from left to right.

- Very large CSV files may result in an import error if they exceed the allowed HTTP request size. By default, this is 20 MB on My webMethods Server. Should your CSV file be very large, you can split up the data into two or more CSV files and import them one after the other.
- The values in the CSV file must be formatted as described in "CSV Formatting" on page 99.

CSV Formatting

The following describes how data in the CSV file must be formatted.

For instructions on how to import a CSV file, see "Importing a CSV File" on page 102.

Separator

Use ; (semicolon) as separator.

Example: `=North;=yes;=SupportTeam;>= 300;=GROUPS[ServiceCenterNorth]`

Header Line

The first line of the CSV file must be a header line. The number of values in the header line must match the number of columns in the target decision table, with exception of the **In effect** column.

Example: `targetGroup;isVIP;team;score;assignee`

for a decision table with 5 columns and 1 **In effect** column.

CSV Data Contains Separator

If a value in the CSV file contains the separator character ; (semicolon), the whole value must be wrapped in double quotes "".

Example: `= North;East` must be written as `"= North;East"`.

CSV Data Contains Double Quotes

If a value in the CSV file contains a double quote, the whole value must be wrapped in double quotes "", and a double quote " must be prepended to each double quote in the value.

Note:
Excel does this automatically when saving as CSV.

Example: `!= Team "VipCustomers" North` must be written as

`"!= Team ""VipCustomers"" North"`.

CSV Data Contains Line Break

If a value in the CSV file contains a line break, the whole value must be wrapped in double quotes "".

Example:

```
= North
East
```

must be written as

```
"= North
East".
```

Whitespace

Whitespace before or after a CSV value will be trimmed during import.

Example: `;>= 5;, ; >=5;,` or `;>=5 ;`

will all be imported as operator `>=` and literal `5`.

Ranges

Write ranges with upper and lower bounds as follows:

- <...<=
- <=...<
- <...<
- <=...<=

Example: `10 <...<= 20` specifies a range where the value is greater than 10 and less than or equal to 20.

Decimal Separator

Use `.` (dot) as decimal separator.

Example: `> 3.141592`

UTF-8 Characters

Values containing UTF-8 characters can be imported without any special considerations.

Example: `= @`

Date Columns

If the target decision table contains a column of data type Date, the corresponding value in the header line must contain the date pattern and timezone information. For more information about time formats, see the Java documentation for `SimpleDateFormat`.

Example:

```
targetGroup;isVIP;team;incidentSubmission[dd/MM/yyyy
HH:mm:ss|Europe/Berlin];score;assignee
```

(values for header line)

```
=North;=yes;=SupportTeam;>=31/10/2019 18:00:00;>= 300;= GROUPS[ServiceCenterNorth]
```

(values for rule)

Expressions

If you import an expression into a decision table, the expression must be wrapped in `FUNC[]`.

Example: `= isLeapYear(2015)` must be written as `= FUNC[isLeapYear(2015)]`.

If an expression contains

- a double quote, the whole value must be wrapped in double quotes `""`, and a double quote `"` must be prepended to each double quote in the value.
- a semicolon, the whole value must be wrapped in double quotes `""`.
- a line break, the whole value must be wrapped in double quotes `""`.

Note:
Excel does this automatically when saving as CSV.

Example: For example, an expression containing a double quote and a semicolon,

e.g. `= inList({"North;East", "APAC", "East"})`

must be written as

```
"=FUNC[inList({""North;East"", ""APAC"", ""East""})]".
```

Principals

If the target decision table contains a column which was annotated as principal, you can specify any combination of users, groups, and roles. The CSV value must be formatted as follows:

```
= USERS[userId1] GROUPS[groupId1] ROLES[roleId1]
```

If more than one user, group, or role is specified, they must be separated by a comma:

```
=USERS[userId1,userId2] GROUPS[groupId1,groupId2] ROLES[roleId1,roleId2]
```

Principals from a directory service such as LDAP must follow their backend-specific notation (e.g., `cn=James,ou=marketing,o=ABC`). For more information, see *Administering My webMethods Server*, *Managing External Directory Services*.

If a user ID itself contains a comma, the comma must be escaped by a backslash `\`.

Example: `= USERS[cn=James\,ou=marketing\,o=ABC],`

```
= USERS[userId1,cn=James\,ou=marketing\,o=ABC]
```

If a user ID itself contains a semicolon or double quote, the whole value must be wrapped in double quotes "", and a double quote " must be prepended to each double quote in the value.

Example: `= "USERS[Tom ""T"" Miller,cn=James;Smith\,ou=marketing\,o=ABC]"`

Example of a CSV File

The following is an example of a CSV file to be imported into a decision table that contains 5 columns and 1 **In effect** column:

```
targetGroup;isVIP;team;score;assignee
= North;= no;=SupportTeamVIP;> 0.50;=GROUPS[082358North]
= East;= no;=SupportTeamVIP;> 0.50;=GROUPS[082379East]
= East;= yes;=SupportTeamVIP;> 0.70;=USERS[Supervisor]
```

Importing a CSV File

You can add values to an existing decision table by importing a CSV file.

For more information on scope and requirements, see "Using CSV Import" on page 97.

For more information on formatting and examples, see "CSV Formatting" on page 99.

To import a CSV file:

1. Open the decision table as described in "Opening a Decision Entity" on page 70.
2. Lock the decision table as described in "Locking a Decision Entity" on page 70.
3. In the toolbar, click **Import CSV**.
4. In the file picker, select the CSV file on your harddrive.

   The file is imported and validated. If an error occurs, an error message is shown. Click **Show details** to see the error details. Click **Copy to clipboard** to save the error details to your clipboard.
5. Click 

in the upper right corner of the Decision Entity Editor window to save your changes to the decision table.