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# WebSphere® Process Server V6.0.2 WebSphere Integration Developer V6.0.2

## *Business rules enhancements*



@business on demand.

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This presentation provides an overview of the enhancements made to the business rules component in V6.0.2

## Goals

- Introduce the enhancements for business rules component for WebSphere Process Server V6.0.2
- At the end of the presentation, you should be able to
  - ▶ Identify the new enhancements to Business rules Language and other enhancements
  - ▶ Describe their basic functionality
  - ▶ Understand how to approach problem determination
- Prerequisites to understand this presentation
  - ▶ Knowledgeable in business rules concepts and support provided for business rules component in previous releases
  - ▶ Development tools support

The goal of this presentation is to introduce you to the enhancements made to the business rules component in WebSphere Process Server V6.0.2. This presentation assumes that you are familiar with business rules, the functionality provided with the business rules component, and support provided by the WebSphere Integration Developer for business rules in previous versions.

## Agenda

- Enhancements in V6.0.2
- Business rules language enhancements
- Audit logging
- Importing business rules
- Support for databases
- Problem determination
- Summary and references

This slide shows the agenda for the presentation

## Agenda

- Enhancements in V6.0.2
- Business rules language enhancements
- Audit logging
- Importing business rules
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- Summary and references

The first section describes the high level overview of the enhancements made to the business rules component for V6.0.2

## Business rules enhancements in V6.0.2

- Enhancements to the business rules language
- Auditing support for business rules
- Import functionality added
- Additional databases supported



Several enhancements have been made to the business rules language. Any changes made to the business rules or selectors can now be audited. You can now import business rules exported from an application running on WebSphere Process Server V6.0.2. All databases supported by WebSphere Process Server are now supported by business rules.

## Agenda

- Enhancements in V6.0.2
- **Business rules language enhancements**
- Audit logging
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This section covers the enhancements made to the business rules language.

## Business rule language shortcomings in V6.0.1

- **In V6.0.1:** Rule language did not include support for some common actions:
  - ▶ No support for copying business object contents
  - ▶ Limited support for list type attributes in business object
  - ▶ No way to initialize data in a decision table
  - ▶ No way to handle situations which do not match a specific condition value in a decision table
  - ▶ No way to shortcut rule processing in a rule set (all rules must be evaluated)



In version 6.0 and 6.0.1, the rule language did not include support for some common actions. There was no support for copying business object contents to another business object in a rule set or decision table. Very limited support was provided for working with a business object's list attributes. There was no way to initialize data in a decision table or handle situations that did not match a specific condition value in a decision table. All rules had to be evaluated even if a rule was satisfied.

## Business rule language enhancements in V6.0.2

- Initialization rule added for a decision table
- Otherwise clause for decision table conditions
- Added copy business object function
- `return` keyword available in rule set
- Added support for `java.util.List` APIs on business object list attributes

This slide lists some of the enhancements made to the business rule language in V6.0.2. An initialization rule can now be specified for a decision table. A new clause called the “Otherwise” clause has been added to the decision table conditions to deal with default conditions. Business object contents can now be copied into other business objects in rule set actions and in initialization rules in decision tables. The “Return” keyword has been added to support exiting rule set processing as soon as a condition is met instead of processing the whole rule set. Support for `java.util.List` APIs on business object list attributes has been added.



## Copy business object (copyBO)

- New built-in function named copyBO
- Lets you initialize business object to be identical to an input business object
- Syntax is  
`BO1 = copyBO(BO2)`
- This example creates a copy of BO2 and assigns it to variable BO1

copyBO is built-in function added to copy the contents of one business object to another. The copyBO takes a business object as a parameter and makes a deep copy of the input business object, then returns the copy. The syntax for copyBO is shown here.

## Initialization rule in decision table

- An action rule that runs before the main body of a decision table is run
- Can be used to initialize data for the decision table
- Only one rule allowed, although it can have multiple actions
- Must be an action rule – no conditions

Decision tables now support specifying an initial action rule. This action rule allows preprocessing, such as creating business objects and setting initial values. For example, the initial action rule could construct a “result” business object by using copyBO to copy the incoming business object into the output business object. The values in the business object could then be overridden by the actions in the table. The initial action rule can be converted to a template and modified in the business rule manager application. Only one Action Rule will be supported although multiple actions can be part of in this one Action Rule. The initialization rule always runs before the table is processed.

## Initialization rule example

The screenshot shows the 'applyDiscount' decision table configuration in the IBM Business Rules Editor. The 'Initialize' section contains a rule named 'Rule1' with the action 'output1 = copyBO(input1)'. A purple oval labeled 'Init Rule' points to this rule. The 'Table' section shows a decision table with conditions and actions.

Input(s)	Name	Type
input1	input1	Order
output1	output1	Order

Name	Rule1
Presentation	
Action	output1 = copyBO(input1)

Conditions	Actions
input1.custStatus = "gold"	input1.orderTotal * 0.85
input1.custStatus = "silver"	input1.orderTotal * 0.90
Otherwise	input1.orderTotal * 1

This slide shows the usage of a initialization rule in a decision table created using WebSphere Integration Developer. You can also see the use of the new copyBO functionality to initialize the output variable.

## Otherwise clause in decision table

- An otherwise clause can be added to any condition in a decision table
- The otherwise clause takes effect if none of the other condition values for that condition apply

Sometimes only some of the possible values for conditions in a table need to have unique actions. For example, there may be additional customer types added on later, so instead of having a failure when they are not found in the table, an otherwise can be specified.

A decision table can have zero or one 'otherwise' per 'condition'. An otherwise condition cannot be converted to a template. This means that an otherwise column can only be added or removed in the WebSphere Integration Developer editor and not from the business rule manager application.

## Otherwise clause example

The screenshot shows the 'applyDiscount' decision table configuration in IBM Business Rules Editor. The 'Table' section contains the following data:

Conditions			
input1.custStatus	"gold"	"silver"	Otherwise
output1.orderTotal	input1.orderTotal * 0.85	input1.orderTotal * 0.90	input1.orderTotal * 1
Actions			

The 'Otherwise' clause is highlighted in a purple oval, and an arrow points to it from the text 'Otherwise' in a purple oval above the table.

This slide shows an 'otherwise' clause in a decision table created using WebSphere Integration Developer.

## Otherwise clause example

### OtherwiseTable - Decision Table

Back Edit Copy

#### General Information

Last Published	Jun 15, 2006 12:12 (Local Time)	Status	Original
Description			

#### Decision Table

##### Initialization Rule

Create MemberBO

Membership	GOLD			SILVER			Otherwise		
Age	18 : 40	41 : 60	Otherwise	18 : 40	41 : 60	Otherwise	18 : 40	41 : 60	Otherwise
RewardPoints	2	12	5	5	7	2	2	4	1

This slide shows the support for 'otherwise' in the business rules manager application. The Initialization Rule allows you to do some initialization, such as creating business objects and setting default values, before processing the decision table.

For example, in this slide, if a membership is neither GOLD nor SILVER, it is a default case, or 'Otherwise', and takes Reward Points of 2, 4, or 1 depending on Age.

In the Edit mode, you can modify the values of the Initialization Rule, conditions, and actions if all are combined with templates. Otherwise clauses cannot be added, deleted, or moved around. The 'Otherwise' column of a condition is always presented as the right-most column.

## Return statement

- Can appear in a rule set in either an action rule or in the action part of an if-then rule
- Used to short circuit evaluation of rules in the rule set
- When the return statement is run, evaluation of rules stops and the values of the output variables in effect at that time become the output of the rule set

You can discontinue rules processing at any point instead of running all of the rules in a rule set. For example, processing a set of exclusive if-then rules does not need to continue once a condition is true. Using the 'return' keyword in one if-then rule does NOT require it be used in any of the others. The 'return' should be reflected in the rule presentation to be visible in the business rule manager application.

## Return statement example

The screenshot displays the 'OrderDiscount' rule set configuration in the IBM Business Rules Editor. The interface includes sections for Rule Set, Interface, Variables, and Rules.

**Rule Set:** OrderDiscount

**Interface:**

	Name	Type
Input(s)	input1	Order
Output(s)	output1	Order

**Variables:**

Name	Type
FreeGift	LineItem

**Rules:**

Name	Rule
Rule1	output1 = copyBO( input1)
Rule2	input1.custStatus == "gold" output1.orderTotal = input1.orderTotal * 0.85 output1.lineItems.add( FreeGift) return
Rule3	input1.custStatus == "silver" output1.orderTotal = input1.orderTotal * 0.90 return

A purple oval labeled "Return" points to the 'return' statement in Rule2's 'Then' clause.

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This slide shows a rule set created using WebSphere Integration Developer. You can see the usage of the return keyword in the rules. If Rule2 is satisfied, the process will exit the rule set without processing the rest of the rules in the rule set.



## Support for operations on list attributes

- Added support for a subset of the operations on list attributes
- All operations of `java.util.List` are supported except for the iterator methods and the `toArray` methods
  - ▶ `add`, `addAll`, `clear`, `contains`, `containsAll`, `equals`, `indexOf`, `isEmpty`, `lastIndexOf`, `remove`, `removeAll`, `retainAll`, `set`, `size`, `subList`
- No iteration support
  - ▶ Example: you have a list of employees and you want to find the employee with the largest salary
  - ▶ Business rules does not support iterating through the list to do this

All methods that are available on the `java.util.List` type, except for iterator methods and `toArray` methods, are supported for the list objects used in a rule set or decision table conditions and actions. Some of the methods are overloaded to better support scenarios in business rules development.

All of the list type operations that are listed in this slide are enabled in the WebSphere Integration Developer editors for developing business rules.

## Type conversion in list operations

- Business object list attributes know the type of element that they contain
- An expression like  
`intList.add(byteVar)`  
results in the byte value being converted to a `java.lang.Integer` to be added to the list
- `byteList.add(intVar)` results in a validation error since in general the int value would have to be truncated to be converted to a byte
- Expressions like  
`intList.add(25)`  
are also allowed, the literal 25 being converted to a `java.lang.Integer`

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This slide shows the behavior of the overloaded add method for list type variables. For example when you try to add a byte value to an integer list, the byte variable value is converted to integer and added to the list instead of throwing an exception. But you cannot add an integer to a byte list since it requires the integer value to be truncated.

## Special list operations

- `removeObject` and `removeAtIndex`
- Not methods on `java.util.List`
- `removeObject` takes one argument and treats it as an object to be removed from the list. Results in a call to the `remove(Object)` method of `java.util.List`.
- `removeAtIndex` takes one argument which is treated as the index within the list of the element that is to be removed. Results in a call to the `remove(int)` method of `java.util.List`.
- If these special operations didn't exist, then an expression like `intList.remove(intVar)` would be ambiguous.

This slide shows the behavior of overloaded methods provided for `remove`, `equals` and `==` operations.

The `java.util.List` object overloads the `remove()` method by accepting an `int` or an object. When you use this method in a business rule, the meaning can not be directly determined to be 'remove at the index' or 'remove the element'. To overcome the uncertainty, two methods are provided to make the usage clear. There is a `removeAtIndex()` method and a `removeObject()` method. If the `removeAtIndex()` method is used and the parameter is an `int` or an `Integer`, the `remove(int)` method is used. If the `removeObject()` method is used and the parameter is of any type, then the `remove(Object)` method will be used. If the `remove()` method is used, the validator will warn on this usage.

The `equals` and the `==` behavior for the `java.util.List` object follows a reference comparison rather than a value comparison. The `equals()` method and `==` operator have been modified to do a value comparison of the different list elements in order to check equality rather than whether the list elements are pointing to the same list objects.

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- Enhancements in V6.0.2
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- **Audit logging**
- Importing business rules
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This section covers audit logging for business rules

## Audit logs

- Audit log entries are created when business rule information
  - ▶ is added to or changed in a server
  - ▶ is imported or exported to or from a server
- Audit log entries can be sent to either the SystemOut.log file, to a separate audit log file, or both
- Auditing is enabled and configured through the administrative console or wsadmin
- When enabled, auditing is active for all business rules
  - ▶ Can not enable for just some business rules
- Audit logs in an Network Deployment environment
  - ▶ Separate log file per server

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Business rules enhancements

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Changes made to business rules and selectors can be recorded for auditing. Information including the old object, the new object, the individual causing the change, and the location where the change was initiated are recorded into two files. One option is for the audit information to be written to the SystemOut.log file. The other option is to record the audit information in a separate log file (BRSEIAudit.log by default) which may be secured for limited access

For V6.0.2, the complete rule set, decision table, business rule group, or selector that is going to be changed, and the complete updated object is recorded as part of the audit entry. With a full set of data, the consumer of the log file can determine the appropriate delta information that is important in a given situation.

In either a stand-alone profile configuration or a Network Deployment environment, there will be one log file for the server that can be configured for auditing of all applications that contain business rules or selectors. When considering a cluster of servers that can be running on different platforms, the location of the audit file should be in an environment variable to accommodate any operating-system-specific differences.

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## Audit logs

The diagram on the left illustrates the audit process. It shows a 'WPS Server' at the center. An operator is shown installing and starting a new application with business rules. Another operator is shown importing or exporting rules through the Admin Console or wsadmin. A manager is shown modifying rules through the Business Rule Manager. The 'Rules' are then processed, resulting in 'Audit Entry' which is logged into 'SystemOut.log' and 'BRSelAudit.log'.

The screenshot on the right shows the 'Application servers' administrative console. The path is 'Application servers > server1 > Business Rules and Selectors Auditing'. The 'Configuration' and 'Runtime' tabs are highlighted. Under 'General Properties', the 'Business Rules and Selectors Auditing' section is expanded. The 'Create audit records in:' section has both 'System.out' and 'Custom audit file' checked. The 'Custom Audit File' section shows a 'File Name' of '\$(SERVER\_LOG\_ROOT)/BRSelAudit.log'. The 'Log file rotation:' section has 'File Size' checked, with a 'Maximum Size' of 1 MB and a 'Maximum Number of Historical Files' of 1. The 'Save runtime changes to configuration as well' checkbox is also checked. Buttons for 'Apply', 'OK', 'Reset', and 'Cancel' are at the bottom.

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Audit log entries are created when you update, add, import or export business rules or selectors. Auditing for Business rules and selectors can be enabled from the administrative console by navigating to Servers -> Application servers -> <target server> -> Business Rules -> Business Rules and Selectors Auditing.

The auditing function is enabled if one or both of the check boxes “System.out” and “Custom audit file” are selected. If the System.out option is selected, audit log entries are written to the System Log file of the containing server. If the Custom audit file option is selected, audit log entries are written to the custom audit file whose name and location are in the “File Name” field. The “File Size” option lets you specify the maximum size in megabytes that the custom audit file can contain. At rollover, the custom audit file is temporarily closed and saved as a new file consisting of the current name plus the rollover timestamp. The “Maximum Number of Historical Files” field specifies how many historical files are stored.

Audit configurations that are set in the configuration panel go into effect only if the server is restarted. Audit configurations that are set in the runtime panel go into effect immediately. Audit configurations are set at the server level, meaning that each server can have different audit configurations. The same audit configurations are applied for all business rules and selectors in the containing application server.

## SystemOut.log audit entry example

```
[11/28/06 16:16:58:985 CST] 00000075 AuditRecorder A   CWSTM0027I: An attempt to update a Business Rule
Group(s) was made from the Business Rule Manager.

Original Object[null]
New Object[<?xml version="1.0" encoding="utf-8"?>
<brg:BusinessRuleGroup xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:_="http://CleansePublishLibrary/com/clipsandtags/scm/Clean" xmlns:__1="http://AutoClean"
xmlns:acd="http://www.ibm.com/xmlns/prod/websphere/wbi/cf/ComponentDef/6.0.0"
xmlns:brg="http://www.ibm.com/xmlns/prod/websphere/wbi/BusinessRuleGroup/6.0.0"
targetNamespace="http://AutoClean" name="CleanseRuleGroup">
<PresentationTimezone>local</PresentationTimezone>
<OperationDef name="cleanseClip">
  <Selector>com.ibm.wbiservers.common.selection.GenericSelector</Selector>
  <ParameterDef xsi:type="acd:CodeParameterDef">
    <JavaCode><![CDATA[//@generated:com.ibm.wbit.selector.ui.CurrentDatereturn new
java.util.Date();]]></JavaCode>
  </ParameterDef>
</OperationDef>
<Interfaces>
  <Interface xsi:type="acd:WSDLPortType" portType="_:Clean"/>
</Interfaces>
<BusinessRuleGroupTable>__1:CleanseRuleGroup</BusinessRuleGroupTable>
<References/>
</brg:BusinessRuleGroup>
]
```

User[UNAUTHENTICATED]

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Business rules enhancements

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This screen shows the audit entry contents in the SystemOut.log file. As you can see, it contains all of the details of the changes made to a business rule group, the changed business rule group, and who initiated the change.

## Custom audit file example

```

<record> <date>2006-11-28T16:16:58</date> <millis>1164752218985</millis> <sequence>3721</sequence>
<logger>com.ibm.wbiservers.customization.audit.AuditRecorder</logger> <level>AUDIT</level>
<thread>I17</thread> <messageID>
  CWSTM0027I
</messageID>
<message>
  CWSTM0027I: An attempt to update a Business Rule Group(s) was made from the Business Rule Manager.
</message>
<newObject>
  &lt;?xml version="1.0" encoding="utf-8"?&gt;
  &lt;brg:BusinessRuleGroup xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns:_="http://CleansePublishLibrary/com/clipsandtags/scm/Clean" xmlns:_1="http://AutoClean"
  xmlns:acd="http://www.ibm.com/xmlns/prod/websphere/wbi/cf/ComponentDef/6.0.0"
  xmlns:brg="http://www.ibm.com/xmlns/prod/websphere/wbi/BusinessRuleGroup/6.0.0" targetNamespace="http://AutoClean"
  name="CleanseRuleGroup"&gt;
  &lt;PresentationTimezone&gt;local&lt;/PresentationTimezone&gt;
  &lt;OperationDef name="cleanseClip"&gt;
    &lt;Selector&gt;com.ibm.wbiservers.common.selection.GenericSelector&lt;/Selector&gt;
    &lt;ParameterDef xsi:type="acd:CodeParameterDef"&gt;
      &lt;JavaCode&gt;&lt;![CDATA[/@generated:com.ibm.wbit.selector.ui.CurrentDatereturn new
      java.util.Date();]]&gt;&lt;/JavaCode&gt;
    &lt;/ParameterDef&gt;
  &lt;/OperationDef&gt;
  &lt;Interfaces&gt;
    &lt;Interface xsi:type="acd:WSDLPortType" portType="_:Clean"/&gt;
  &lt;/Interfaces&gt;
  &lt;BusinessRuleGroupTable&gt;__1:CleanseRuleGroup&lt;/BusinessRuleGroupTable&gt;
  &lt;References&gt;
  &lt;/brg:BusinessRuleGroup&gt;
</newObject>
<user>
  UNAUTHENTICATED
</user></record>

```

This screen shows the audit entry contents in the custom defined log file. Although the format is a bit different from the entry in the SystemOut.log, it has the same details as an audit entry in the SystemOut.log.



## Agenda

- Enhancements in V6.0.2
- Business rules language enhancements
- Audit logging
- **Importing business rules**
- Support for databases
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This section covers the import functionality added in V6.0.2.

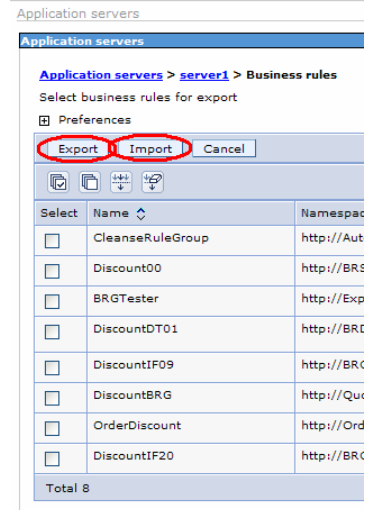
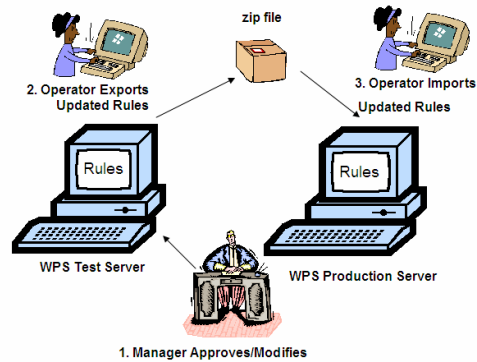
## Import business rule information

- Function allows business rule information that was previously exported, typically from another server, to be imported into this server.
- The imported artifacts replace any existing artifacts with the same target name space and name
- Intended to allow business rule changes to be tested on a test server and then moved over to a production server after testing is complete
- Function is available on the administrative console and through a provided jacl script
  - ▶ `importBusinessRuleArtifacts.jacl`  
`wsadmin -f importBusinessRuleArtifacts.jacl <file name> <user name> <password>`
- Only export files produced on a 6.0.2 server can be imported
  - ▶ 6.0.1 export files cannot be imported

Import functionality allows business rules that are previously defined and exported from one instance of Process Server to be imported into another instance. The imported artifacts replace the existing artifacts using the same target namespaces and names.

A script called `importBusinessRuleArtifacts.jacl` is provided for you to use with `wsadmin` scripting, or you can make use of the administrative console to import the business rules. Only files that have been exported from a 6.0.2 server can be imported.

## Import - Test scenario



In this scenario, the configuration consists of a test server and a production server. All changes are made and tested on the test server, exported using the administrative console, manually moved to the production server, and imported using the import command or using the administrative console of the production server. Using the import function to import artifacts does not require a server or application restart in order to take effect.

## Agenda

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This section covers the databases supported for the business rules component.

## Business rules database support

- Business rules now supports all database platforms supported by WebSphere Process Server
- Business rules does not support using the Oracle thin driver with Oracle 9i due to its 4 kilobyte size limit for a single row
  - ▶ The Oracle 9i OCI driver does not have this limitation and is supported
  - ▶ For Oracle 10g, both the OCI and thin drivers are supported

The business rules component now supports all the databases supported by WebSphere Process Server. There are some restrictions on the database drivers. The business rules component does not support using the Oracle thin driver with Oracle 9i due to its 4 kilobyte size limit for a single row. The Oracle 9i OCI driver does not have this limitation and is supported. For Oracle 10g, both the OCI and thin drivers are supported

## Business rules manager

- Access to Business Rules Manager configuration, in administrative console, select

Servers → Application servers → <target server> → Business Rules → Business Rules Manager Configuration



The business rules manager application can now be installed using a wizard in the administrative console. This slide shows the panel in the administrative console that can be used to install the business rules manager application.

## Agenda

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This section covers common mistakes and troubleshooting.

## Trace information

- When tracing business rules, turn on trace for the following packages:
  - ▶ `com.ibm.wbiserver.brules.*`
  - ▶ `com.ibm.wbiservers.brules.*`
  - ▶ `com.ibm.wbiserver.customization.*`
  - ▶ `com.ibm.wbiservers.customization.*`
  - ▶ `com.ibm.wbiservers.common.*`

Tracing can be enabled on the business rules components in the administrative console. The packages on which tracing can be enabled are listed in the slide.



## Most common problems

- When Global Security is turned on in a Network Deployment environment, run business rules manager (BRM) ( <http://9.26.236.242:908n/br/webclient>, where  $n=1-9$ ) and get some error
  - Solution: Make sure that a port  $944(n+3)$  has been configured in administrative console and its host name is `“*”`. How? In administrative console, select **Environment** → **Virtual Hosts** → **default\_host** → **Host Aliases**. If the port is not there, add the port and restart the system.
- A rule set is displayed in WebSphere Integration Developer, but not in business rules manager
  - Solution: Check whether this rule set has a Web presentation. BRM will not display any rule sets that have no Web presentations
- When importing a business rule or a selector and getting the error **“Exported artifact file version not supported for import”**
  - Solution: Make sure that the artifact being imported has the correct version (it should not be exported from a pre-version 6.0.2 server).

This slide shows some of the most common mistakes and problems.

Make sure that appropriate port numbers are added to your virtual host alias list when security is enabled for the Network Deployment environment. A rule set has to have a Web presentation in order for the rule set to be displayed in the business rules manager application. Only business rules exported from WebSphere Process Server V6.0.2 can be imported. Refer to the information center for more troubleshooting tips.

## Agenda

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- **Summary and references**

This section provides a summary of this presentation.

## Summary

- Discussed the enhancements to business rules component
  - ▶ Business rule language enhancements
    - copyBO function
    - Initialization action rule and Otherwise clause support for decision tables
    - Business object list attributes support
    - *return* keyword
  - ▶ Support for audit logging
  - ▶ Import function
  - ▶ Support for all WebSphere Process Server supported databases

In summary, this presentation covered the enhancements made to the business rules language which include support for copying business object, initialization rule for decision tables, enhanced business objects list attributes support and return keyword. Other enhancements like the Audit logging, import functionality and support for databases were also discussed

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