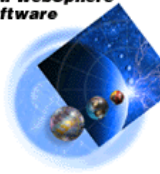


IBM WebSphere
Software



WebSphere Application Server for z/OS and OS/390

Configuring Connectors in WAS 5.1 for z/OS

Bob Teichman - TEICHMN@US.IBM.COM

IBM Americas Advanced Technical Support -- Washington Systems Center
Gaithersburg, MD, USA

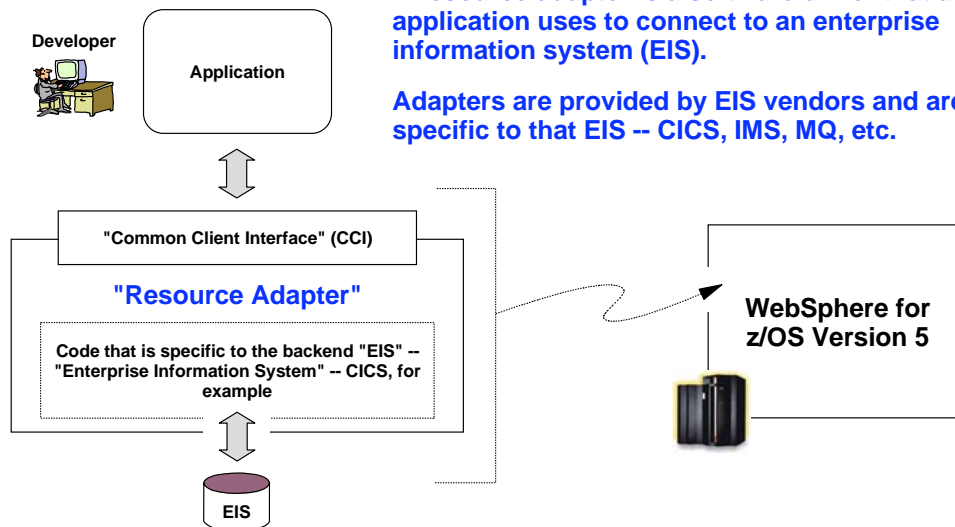
J2EE Connector Architecture



JCA provides "resource adapters" that plug into the J2EE runtime server

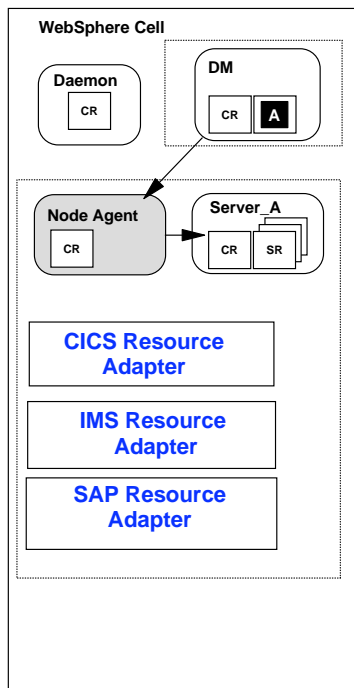
A resource adapter is a software driver that a Java application uses to connect to an enterprise information system (EIS).

Adapters are provided by EIS vendors and are specific to that EIS -- CICS, IMS, MQ, etc.



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Resource Adapters



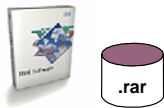
Resource adapters plug into the application server and provide connectivity between the EIS, the application server, and the enterprise application.

You can have more than one resource adapter installed.

Resource Adapters are installed at the node level.

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Resource Archives



Packaged as part of
CTG
IMS Connect
etc.

A Resource Adapter Archive (RAR) file is a Java archive (JAR) file used to package a resource adapter for the Java 2 Connector (J2C) Architecture for WebSphere Application Server.

A RAR file can contain the following:

- Enterprise information system (EIS) supplied resource adapter implementation code in the form of JAR files or other executables, such as dynamic link lists (DLL).
- Utility classes.
- Static documents, such as HTML files, images, and sound files.
- J2C common client interfaces, such as cci.jar.

The standard file extension of a RAR file is .rar.

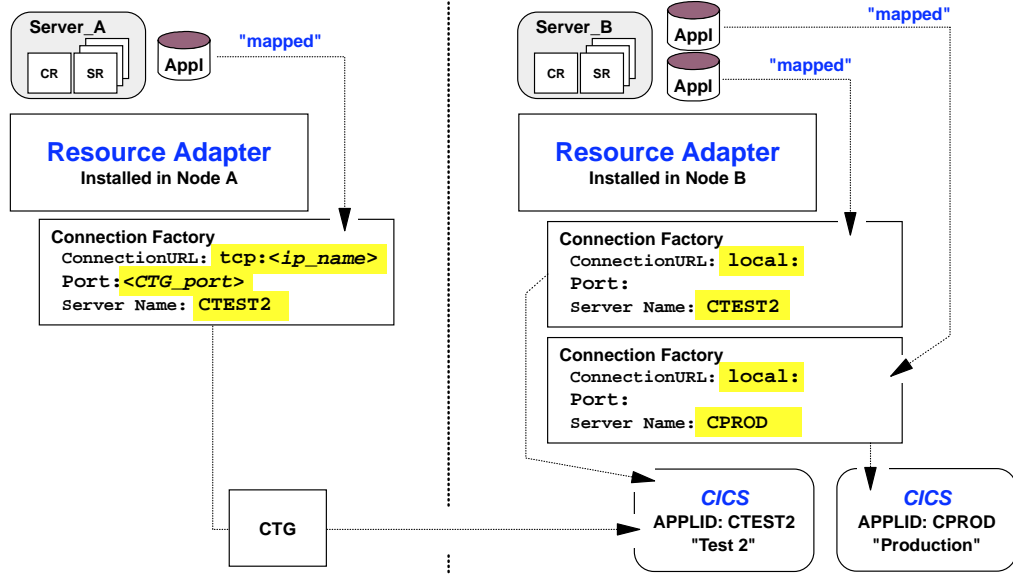
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Connection Factories in Concept



Connection factories are simply a list of properties related to a connection. Applications are mapped to the connection factory at time of installation:

CICS example

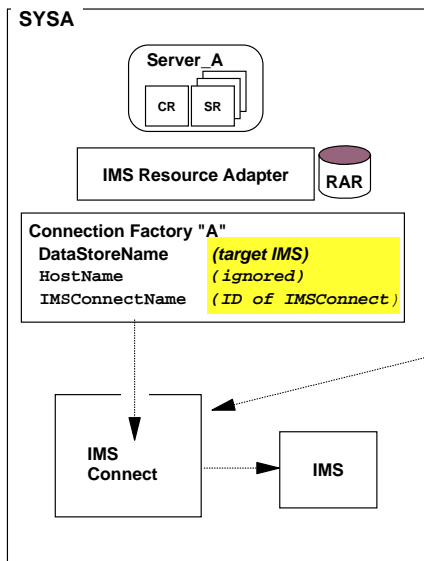


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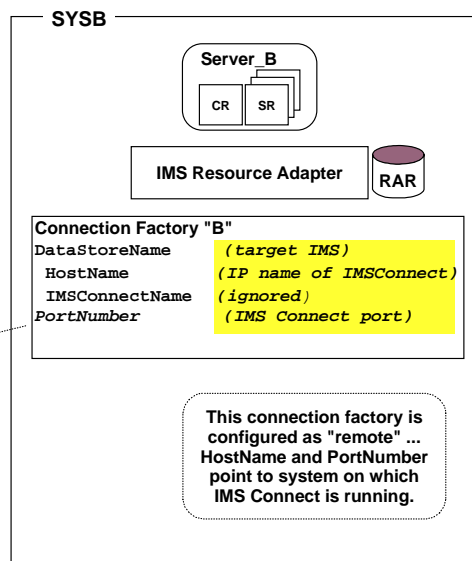
IMS Connection Factory Properties



"Local" Connection Factory



"Remote" Connection Factory



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Defining Resources



WebSphere provides some built in adapters called providers and the capability to plug in adapters. For example JDBC and MQ Series (JMS).

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Installing Resource Adapters into WAS



p5cell

- Servers
- Applications
- Resources
 - JDBC Providers
 - Generic JMS Providers
 - WebSphere JMS Provider
 - WebSphere MQ JMS Provider
 - Mail Providers
 - Resource Environment Providers
 - URL Providers
 - Resource Adapters

Path Browse the local machine or a remote server:

Local path:

Server path:

Scope Node:

General Properties

Scope * cells:p5cell:nodes:p5noded

Name

Description

Archive Path

Classpath

Native Path

The name that will appear in admin console for this adapter. May be anything you wish.

Resource adapters are installed at the node level. Use this pulldown to choose which node into which this adapter will be installed.

"Archive Path" and "Classpath" will be filled in for you.

Depending on the adapter, this should point to the directory containing any necessary dll files (* .so files).

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Defining Connection Factories



This is a two-step process:

- Create connection factory, then
- Create "custom properties" for factory

1 Display your resource adapter

2 Click on adapter link

3 Click on "J2C Connection Factories"

4 Click on "New" to create new Connection Factory

5 Provide name for definition and JNDI name for resource

6 Click on "OK" to edit "Custom Properties"

An existing Connection Factory

Name	JNDI Name
ECL	eis/ECL

General Properties

Scope: * cells:p5cell:nodes:p5noded

Name: *

JNDI name:

Buttons: Apply, OK, Reset, Cancel

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Defining Factory Properties - CICS



Custom properties for factory is where specific information is provided:

1 Click on new factory link

2 Scroll to "Custom Properties" and click

3 Set properties as needed

CICS

CICS APPLID

General Properties

Scope: * cells:p5cell:nodes:p5noded

Name: * MyECL

JNDI name: eis/MyECL

Buttons: Apply, OK, Reset, Cancel

Name	Value
ClientSecurity	-
ConnectionURL	-
KeyRingClass	-
KeyRingPassword	-
Password	-
PortNumber	2006
ServerName	-
ServerSecurity	-
TPNName	-
TraceLevel	1
TranName	-
UserName	-

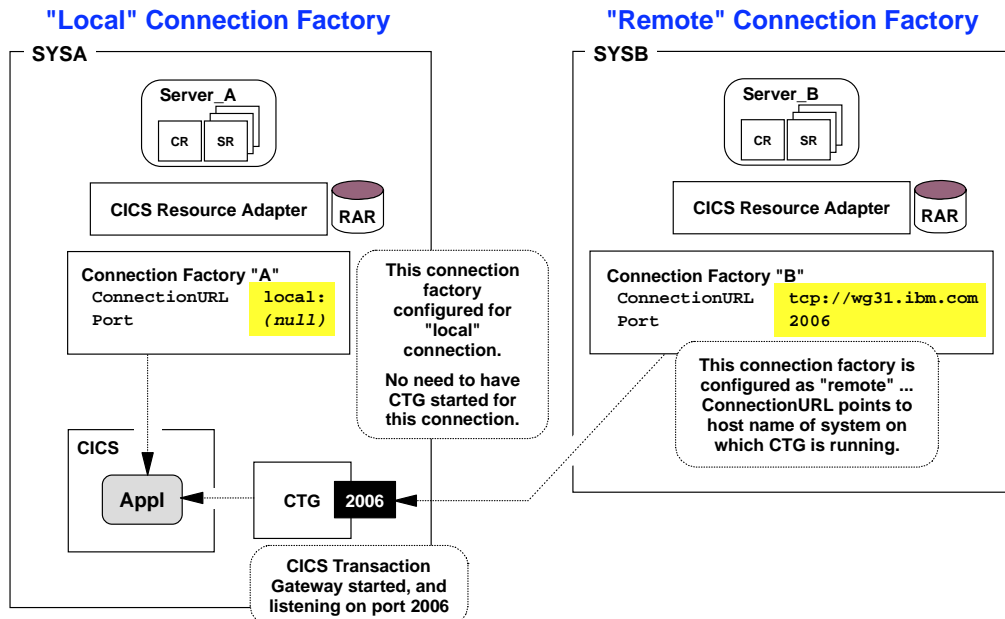
Additional Properties

Connection Pool: An optional set of connection...

Custom Properties: Properties that may be required for resource factories; additional custom properties for data sources that will access the database.

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CICS Connection Factory Properties



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Defining Factory Properties - IMS



Custom properties for factory is where specific information is provided:

1 Click on new factory link

2 Scroll to "Custom Properties" and click

3 Set properties as needed

Name	Value
IMSConnectName	-
HostName	myHostNm
PortNumber	0
DataStoreName	myDStrNm
SSLEnabled	FALSE
SSLEncryptionType	Weak
SSLKeyStoreName	-

General Properties

Scope: * cells:p5cell:nodes:p5noded

Name: * MyECI

JNDI name: eis/MyECI

Additional Properties

Connection Pool: An optional set of connection

Custom Properties: Properties that may be required for resource factories; additional custom properties for data sources that will access the database.

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Hooking Applications to Conn. Factories



The connection to a Connection Factory is made by specifying the JNDI name of the Connection Factory:

- Step 1 Provide options to perform the installation
- Step 2 Provide JNDI Names for Beans
- Step 3 Map EJB references to beans

→ **Step 4: Map resource references to resources**

Each resource reference defined in your application must

javax.resource.cci.ConnectionFactory

Specify existing Resource JNDI name:

Module	EJB	URI	Reference Binding	JNDI Name
<input type="checkbox"/>	BeCashAcEJB	BeCashAcSession	BeCashAcEJB.jar,META-INF/ejb-jar.xml	CICSConnectionFactory

Previous Next Cancel

```

<resource-ref>
  <description></description>
  <res-ref-name>CICSConnectionFactory</res-ref-name>
  <res-type>javax.resource.cci.ConnectionFactory</res-type>
  <res-auth>Container</res-auth>
</resource-ref>
    
```

JAR **ejb-jar.xml**

Annotations:

- This pulldown will include all the Connection Factories previously defined
- You can "apply" your choice to the module making the resource reference
- Multiple refs would result in multiple lines on this panel

- Step 5 Map virtual hosts for web modules
- Step 6 Map modules to application servers
- Step 7 Ensure all unprotected 2.0 methods
- Step 8 Summary

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Creating WebSphere Variables



Variables are "name/value" pairs created under the "Environment" section of Administrative Console:

p5cell

- [-] Servers
- [-] Applications
- [-] Resources
- [-] Security
- [-] Environment

- Update Web Server Plugin
- Virtual Hosts
- Manage WebSphere Variables
- Shared Libraries
- Internal Replication Domains

Total: 25 Page: 1, Total Pages: 2

Scope: Cell=p5cell

→ Cell p5cell

Node

Server

Filter

Preferences

Name	Value
DAEMON ras trace BufferCount	4
DAEMON ras trace BufferSize	128K
DAEMON ras trace ctraceParms	00

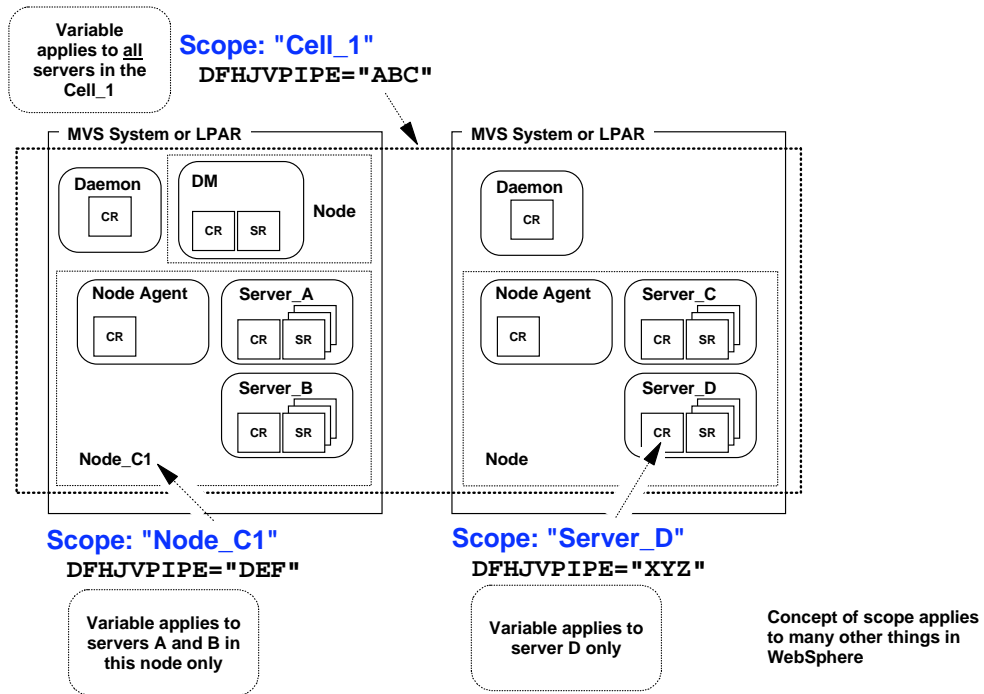
Annotations:

- This section is used to define the "scope" of the variables ...
- This section displays the variables created for this "scope"

Scope determines where within the WebSphere configuration a variable applies ...

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Effect of "Scope"

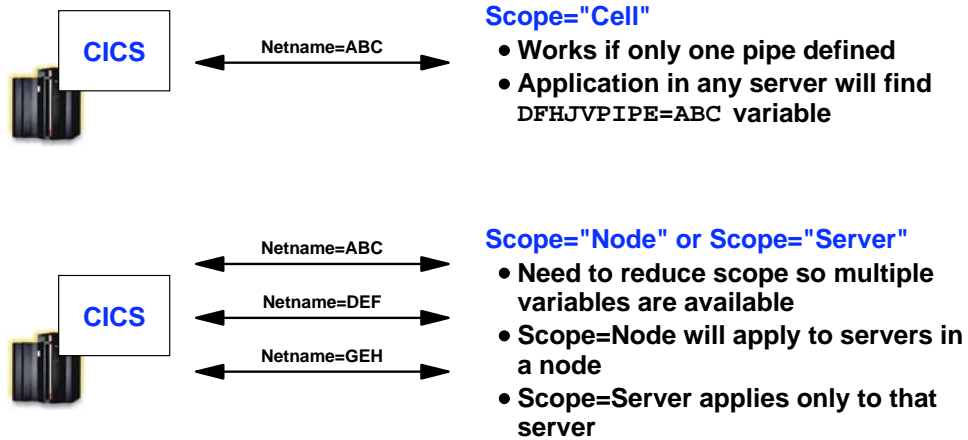


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Scoping DFHJVPIPE Variable



Scope the DFHJVPIPE variable based on how many specific pipes are in play, and how granular you want the variable to be:



Lower-level scopes take precedence over higher-level scopes
 Server scope value overrides Cell scope value

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Creating DFHJVPIPE Variable



The image shows two screenshots from the IBM WebSphere configuration console. The top screenshot shows the 'p5cell' configuration page with a 'New' button under the 'Filter' section. A callout box says 'Apply the appropriate scope'. The bottom screenshot shows the 'Configuration' page for the 'General Properties' of the variable. The 'Name' field contains '*DFHJVPIPE' and the 'Value' field contains 'P5SRV1'. Callout boxes point to these fields with the text: 'Variable name of DFHJVPIPE' and 'Value set to the NETNAME value set in CICS connection definition'. Below the screenshots, there are three lines of blue text: 'Again, DFHJVPIPE variable only needed when using specific pipes.', 'Only needed in WebSphere for local connections. Defined in CTG configuration file for remote connections', and 'If no variable defined, generic pipe used.'

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Setting Up JDBC



Select a provider

Define Datasource

Set properties

DB2 location Name

Driver type

Define Authentication Alias

Map Alias to Datasource

Create jcc properties file (Type-2 only)

DB2 SSID

Update JVM properties (Type-2 only)

Set PATH variables

Recycle server

Deploy application

map resource reference to datasource

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JDBC Drivers



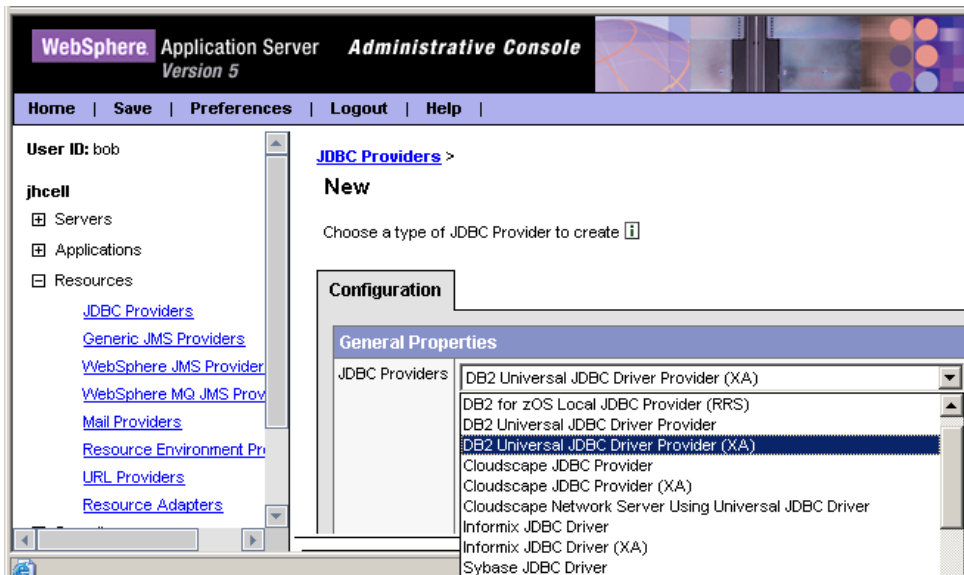
Class File	Driver Name	Type	Notes
db2j2classes.zip	COM.ibm.db2os390.sqlj.jdbc.DB2SQLJDriver	2	Legacy driver. Supports WAS 3.5, 4.0 & 5.0
db2jcc.jar	com.ibm.db2.jcc.DB2Driver	2 or 4	Supports WAS 5.0 at service level W502002 or higher and WAS 5.1

Combination Type 2/4 driver is available either:

- As part of DB2 V8
- An optional (free) feature with DB2 V7
z/OS Application Connectivity to DB2 for z/OS feature, available as no-charge feature #0825 for DB2 V7
- A PTF for APAR PQ80841

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JDBC Providers



WebSphere includes 3 DB2 JDBC providers.

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JDBC Providers



DB2 for zOS Local JDBC Provider (RRS)

- Legacy provider
- DB2 for z/OS Local JDBC type-2 compliant provider
- Supports 2-phase commit processing.

DB2 Universal JDBC Driver Provider -

- J2EE non-XA DB2 Universal JDBC Driver-compliant Provider.
- Supports type-2 or type-4 driver.
 - Type-2 driver, 2-phase commit processing is provided by RRS.
 - Type-4 driver, 2-phase commit processing is not available.

DB2 Universal JDBC Driver Provider (XA) -

- J2EE XA DB2 Universal JDBC Driver-compliant Provider.
- Only used for JDBC type-4 driver.
- Supports the use of J2EE XA to perform 2-phase commit processing.

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Type 2 vs. Type 4



	Type 2	Type 4
connections	local	over IP
security	thread level	no thread level security
2-phase commit	yes - RRS	yes - XA
properties file	yes- DB2 SSID	none required

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Correct CLASSPATH



User ID: bo

WG31

- Servers
 - Application Servers
- Applications
- Resources
 - JDBC Providers
 - Generic JMS Providers
 - WebSphere JMS Provider
 - WebSphere MQ JMS Provider
 - Mail Providers
 - Resource Environment Providers
 - URL Providers
 - Resource Adapters
- Security
- Environment
- System Administration
- Troubleshooting

General Properties

Scope	* cells:WG31:nodes:WG31
Name	* DB2 Universal JDBC Driver Provider
Description	Non-XA DB2 Universal JDBC Driver-compliant Provider. Datasources created under this provider support only 1-phase commit processing except in the case where driver type 2 is used under WAS z/OS. On WAS z/OS, driver type 2 uses RRS and supports 2-phase commit processing.
Classpath	\$(DB2UNIVERSAL_JDBC_DRIVER_PATH)\db2jcc.jar \$(UNIVERSAL_JDBC_DRIVER_PATH)\db2jcc_license_cu.jar \$(DB2UNIVERSAL_JDBC_DRIVER_PATH)\db2jcc_license_cisu z.jar
Native Library Path	\$(DB2UNIVERSAL_JDBC_DRIVER_NATIVEPATH)

Remove this entry from the CLASSPATH

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Defining Data Sources



Select

Additional Properties

- Data Sources: Data Source is used by the application to access the data from the database. A data source is created under a JDBC provider which provides the specific JDBC driver implementation class.
- Data Sources (Version 4): This is the WebSphere 4.x data source that uses the WebSphere old ConnectionManager architecture. All the EJB1.x modules must use this data source.

Internet

Click 'New'

Total: 0

- Filter
- Preferences

New Delete Test Connection

<input type="checkbox"/>	Name	JNDI Name	Description	C
	None			

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Data Source Name



Configuration

General Properties		
Scope	* cells:WG31:nodes:WG31	The scope of the configured source. This value indicates the configuration location for the configuration file.
Name	* DB2TEST	The required display name for the resource.
JNDI Name		The JNDI name for the resource.
Container managed persistence	<input type="checkbox"/> Use this Data Source in container managed persistence (CMP)	Enable if this data source will be used for container managed persistence of EJBs. This will cause a corresponding CMP connection factory which corresponds to this datasource to be created for the relational resource adapter.
Description	DB2 Universal Driver Datasource	An optional description for the resource.
Category		An optional category string which can be used to classify or group the resource.

Provide a name for your DataSource

Click 'OK'

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Generated JNDI Name



General Properties		
Scope	* cells:WG31:nodes:WG31	The scope resource. This configuration file.
Name	* DB2TEST	The required resource.
JNDI Name	jdbc/DB2TEST	The JNDI resource.
Container managed persistence	<input type="checkbox"/> Use this Data Source in container managed persistence (CMP)	Enable if be used for persistence cause a connection correspond be created resource a
Description	DB2 Universal Driver Datasource	An optional resource.

Generated JNDI Name

Click on 'Custom Properties'

Connection Pool	An optional set of connection pool settings.
Custom Properties	Properties that may be required for Resource Providers and Resource Factories. For example, most database vendors require additional custom properties for data sources that will access the database.

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Data Source Properties (Type-2)



<input type="checkbox"/> Name	Value	Description
<input type="checkbox"/> databaseName	DB2810A	This is a required property. This is an actual database name, and its not the locally catalogued database name. The Universal JDBC Driver does not rely on information catalogued in the DB2 database directory.
<input type="checkbox"/> driverType	2	The JDBC connectivity-type of a data source. If you want to use type 4 driver, set the value to 4. If you want to use type 2 driver, set the value to 2. On WAS z/OS, driverType 2 uses RRS and supports 2-phase commit processing.
<input type="checkbox"/> serverName	-	The TCP/IP address or host name for the DRDA server. If custom property driverType is set to 4, this property is required.
<input type="checkbox"/> portNumber	50000	The TCP/IP port number where the DRDA server resides. If custom property driverType is set to 4, this property is required.

DB2 Location Name

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Data Source Properties (Type-4)



<input type="checkbox"/> Name	Value	Description
<input type="checkbox"/> databaseName	sample	This is a required property. This is an actual database name, and its not the locally catalogued database name. The Universal JDBC Driver does not rely on information catalogued in the DB2 database directory.
<input type="checkbox"/> driverType	4	The JDBC connectivity-type of a data source. If you want to use type 4 driver, set the value to 4. If you want to use type 2 driver, set the value to 2. On WAS z/OS, driverType 2 uses RRS and supports 2-phase commit processing.
<input type="checkbox"/> serverName	WG31.WASHINGTON.IBM.COM	The TCP/IP address or host name for the DRDA server. If custom property driverType is set to 4, this property is required.
<input type="checkbox"/> portNumber	50000	The TCP/IP port number where the DRDA server resides. If custom property driverType is set to 4, this property is required.
<input type="checkbox"/> description	-	The description of this datasource.
<input type="checkbox"/> traceLevel	-	The DB2 trace level for logging to the logWriter or trace file. Possible trace levels are: TRACE_NONE = 0, TRACE_CONNECTION_CALLS = 1, TRACE_STATEMENT_CALLS = 2, TRACE_RESULT_SET_CALLS = 3, TRACE_DRIVER_CONFIGURATION = 4

System on which DB2 subsystem resides

Port number that DB2 listens on for remote requests

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Authentication Data Entries



JDBC Providers > DB2 Universal JDBC Driver Provider > Data Sources >

Component-managed Authentication Alias	<input type="text"/>	functions. <input type="checkbox"/> References authentication data for component-managed alias to the resource.
Container-managed Authentication Alias	<input type="text"/>	<input type="checkbox"/> References authentication data for container-managed alias to the resource.
Mapping-Configuration Alias	DefaultPrincipalMapping	<input type="checkbox"/> Select a suitable JAAS login configuration from the security-JAAS configuration panel to map the user identity and credentials to a resource principal and credentials that is required to open a connection to the back-end server.

Apply OK Reset Cancel

Additional Properties

Connection Pool	An optional set of connection pool settings.
Custom Properties	Properties that may be required for Resource Factories. For example, most database vendors require additional custom properties for data sources.

Related Items

J2C Authentication Data Entries	Specifies a list of userid and password for use by Java 2 Connector security.
---	---

Annotations:

- Callout: "To be able to select an Authentication Alias...." with arrows pointing to the Alias dropdowns.
- Callout: "You must define an Authentication Entry" with an arrow pointing to the Custom Properties section.

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Defining Authentication Alias



Total: 0

Filter

Preferences

New Delete

Alias	User ID	Description
None		

Configuration

General Properties

Alias	* Alias for DB2TEST
User ID	* BOB
Password	* *****
Description	

Annotations:

- Callout: "Click 'New'" with an arrow pointing to the New button.
- Callout: "UserID and password. Multiples can be defined" with an arrow pointing to the User ID and Password fields.

Selection made on next panel

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Select the Alias



General Properties	
Scope	* cells:WG31:nodes:WG31
Name	* DB2TEST
JNDI Name	jdbc/DB2TEST
Container managed persistence	<input type="checkbox"/> Use this Data Source in container managed persistence (CMP)
Description	DB2 Universal Driver Datasource
Category	
Statement Cache Size	10 statements
Datasource Helper Classname	com.ibm.websphere.rsadapter.DB2L
Component-managed Authentication Alias	(none)
Container-managed Authentication Alias	WG31/Alias for DB2TEST

Pull-down list will show defined aliases

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Properties File (only for Type 2)



Application Servers > server1 > Process Definition > Servant > Java Virtual Machine > Custom Properties

Configuration	
General Properties	
Name	* db2.jcc.propertiesFile
Value	* /myapp/db2test/db2.jcc.properties
Description	

Property must have this name

/myapp/db2test/db2.jcc.properties



db2.jcc.ssid=dsn8

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Defining Path Variables



Variables are "name/value" pairs created under the "Environment" section of Administrative Console:

p5cell

- [-] Servers
- [-] Applications
- [-] Resources
- [-] Security
- [-] Environment
 - Update Web Server Plugin
 - Virtual Hosts
 - Manage WebSphere Variables
 - Shared Libraries
 - Internal Replication Domains

Total: 25 Page: 1, Total Pages: 2 [Next]

[-] Scope: Cell=p5cell

→ Cell p5cell

Node [] [Browse Nodes]

Server [] [Browse Servers]

[Apply]

[-] Filter

[-] Preferences

[New] [Delete]

<input type="checkbox"/>	Name	Value
<input type="checkbox"/>	DAEMON ras trace BufferCount	4
<input type="checkbox"/>	DAEMON ras trace BufferSize	128K
<input type="checkbox"/>	DAEMON ras trace ctraceParms	00

This section is used to define the "scope" of the variables ...

This section displays the variables created for this "scope"

Scope determines where within the WebSphere configuration a variable applies ...

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PATH Information



WebSphere Application Server Administrative Console Version 5

Home | Save | Preferences | Logout | Help

User ID: bob

jhcell

- [-] Servers
- [-] Applications
- [-] Resources
- [-] Security
- [-] Environment
 - Update Web Server Plugin
 - Virtual Hosts
 - Manage WebSphere Variables
 - Shared Libraries
 - Internal Replication Domains
- [-] Naming
- [-] System Administration
- [-] Troubleshooting

<input type="checkbox"/>	Name	Value
<input type="checkbox"/>	APP_INSTALL_ROOT	\${USER_INSTALL_ROOT}/installedApps
<input type="checkbox"/>	CLOUDSCAPE JDBC DRIVER_PATH	\${WAS_INSTALL_ROOT}/cloudscape50/lib
<input type="checkbox"/>	CONNECT_JDBC JDBC DRIVER_PATH	
<input type="checkbox"/>	CONNECTOR_INSTALL_ROOT	\${USER_INSTALL_ROOT}/installedConnectors
<input type="checkbox"/>	DB2390 JDBC DRIVER_PATH	
<input type="checkbox"/>	DB2AS400 JDBC DRIVER_PATH	
<input type="checkbox"/>	DB2AS400 TOOLBOX JDBC DRIVER_PATH	
<input type="checkbox"/>	DB2UNIVERSAL JDBC DRIVER NATIVEPATH	
<input type="checkbox"/>	DB2UNIVERSAL JDBC DRIVER_PATH	
<input type="checkbox"/>	DB2 JDBC DRIVER_PATH	
<input type="checkbox"/>	DEPLOY_TOOL_ROOT	\${WAS_INSTALL_ROOT}/deploytool/tp

Set to location of JDBC lib directory for type-2 only

Set to location of JDBC classes directory

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Three types of providers

Integral JMS Provider

- Built in to WebSphere
- Created using ISPF Dialogs
- Provides robust JMS support
- Does not allow for connections non-JMS MQ applications

WebSphere MQ Provider

- Full WebSphere MQ product (5.3)

Generic JMS Provider

- any other

WebSphere MQ JMS Provider

A JMS provider enables asynchronous messaging based on the Java Messaging Service (JMS). It provides J2EE connection factories to create connectors for specific JMS queue or topic destinations. WebSphere MQ JMS provider administrative objects are used to manage JMS resources for WebSphere MQ the JMS provider. [1]

Configuration

Scope: Cell=**trcell**, Node=**trnodea**

Cell: trcell

Node: trnodea

Server:

To specify cell scope, clear the node and server fields and click Apply.
To select a node scope, select a server field and click Apply.
To select a server scope, browse for a server, and click Apply.
When new items are created in this view, they will be created within the current scope.

Set the scope for your connection factory

↓

Scroll down to Additional Properties

Additional Properties

WebSphere MQ Queue Connection Factories	Used for point to point
WebSphere MQ Topic Connection Factories	
WebSphere MQ Queue Destinations	
WebSphere MQ Topic Destinations	

Used for publish / subscribe

Connection Factory Properties



General Properties	
Scope	* cells:trcell:nodes:trnodea:servers:trsr02a
Name	* TradeBrokerQCFforTRSR02A
JNDI Name	* jms/TradeBrokerQCFforTRSR02A
Description	
Category	
Component-managed Authentication Alias	
Container-managed Authentication Alias	
Mapping-Configuration Alias	DefaultPrincipalMapping
Queue Manager	MQWV1
Host	

Name the Connection Factory

JNDI name is generated

Subsystem Name of your MQ

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Queue Destinations



General Properties	
Scope	* cells:trcell:nodes:trnodea:servers:trsr02a
Name	* TradeBrokerQforTRSR02A
JNDI Name	* jms/TradeBrokerQforTRSR02A
Description	
Category	
Persistence	NON PERSISTENT
Priority	APPLICATION DEFINED
Specified Priority	0
Expiry	APPLICATION DEFINED
Specified Expiry	0 millisecond
Base Queue Name	* TRADE.BROKER.QUEUE
Base Queue Manager Name	MQWV1

Additional Properties	
WebSphere MQ Queue Connection Factories	
WebSphere MQ Topic Connection Factories	
WebSphere MQ Queue Destinations	
WebSphere MQ Topic Destinations	

Name the Destination

JNDI name is generated

Queue Name defined in your MQ system

Subsystem Name of your MQ

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A few words on security

Authorization



All connectors allow for defining an
'Authentication Alias'

Used for establishing the connection

Passed to back end system for authorization

Some connectors support using the identity
associated with the current thread.

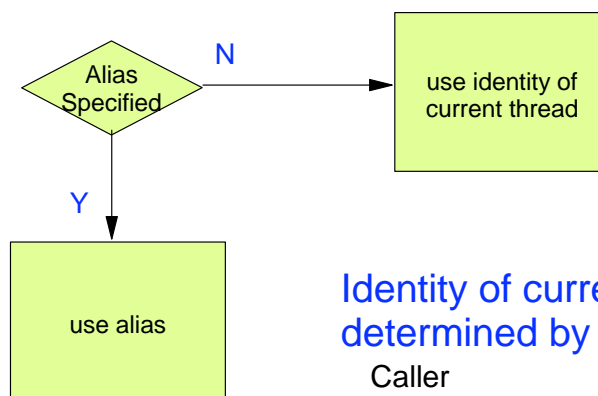
Thread Identity Support



Connector	Thread identity	OS thread identity
IMS Connector - local ConnectionFactory	Allowed	
IMS Connector - remote ConnectionFactory	Not Allowed	
CTG CICSECICConnector - local ConnectionFactory	Allowed	
CTG CICSECICConnector - remote ConnectionFactory	Not Allowed	
IMS JDBC Connector - local ConnectionFactory	Required	Uses
DB2 for z/OS local JDBC provider	Allowed	Uses
DB2 Universal JDBC Driver Provider using Type 2 connectivity	Allowed	Uses
DB2 Universal JDBC Driver Provider using Type 4 connectivity	Not Allowed	

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CICS or IMS Local Connection

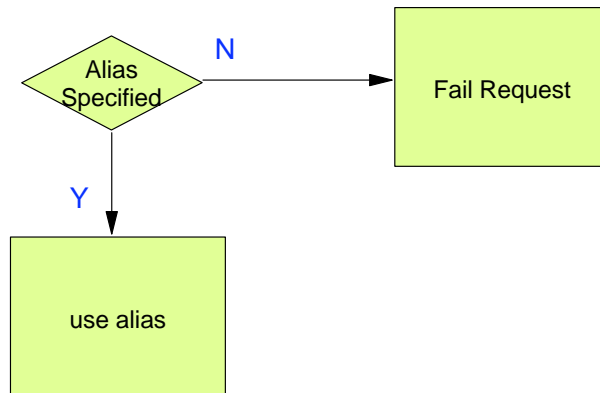


Identity of current thread is determined by RunAs

Caller
Server
Role

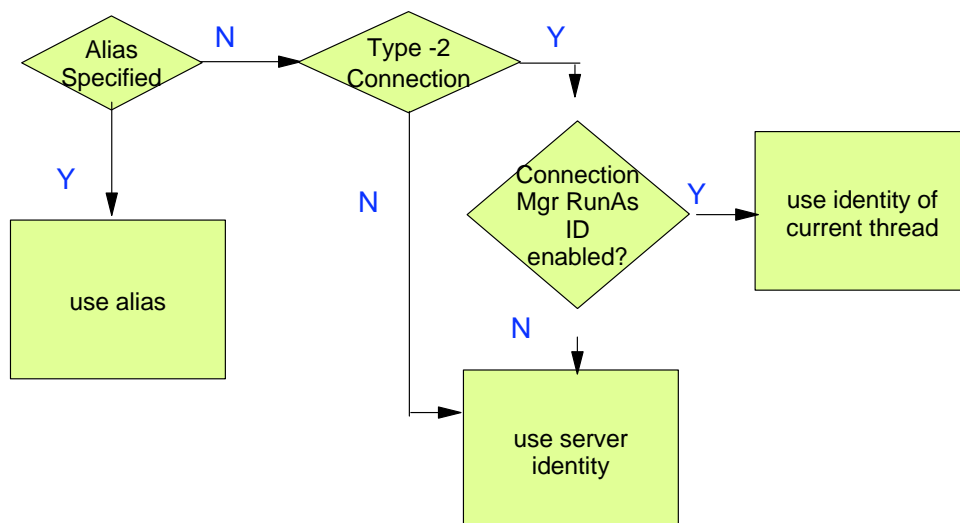
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CICS or IMS Remote Connection



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JDBC Connection



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J2EE Connector Architecture

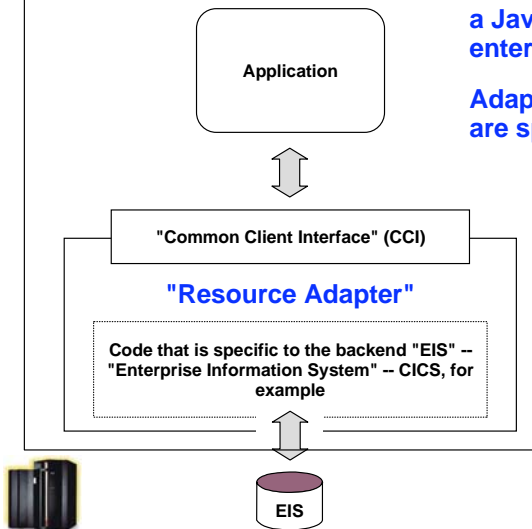


JCA provides "resource adapters" that plug into the J2EE runtime server

A resource adapter is a software driver that a Java application uses to connect to an enterprise information system (EIS).

Adapters are provided by EIS vendors and are specific to that EIS -- CICS, IMS, MQ, etc.

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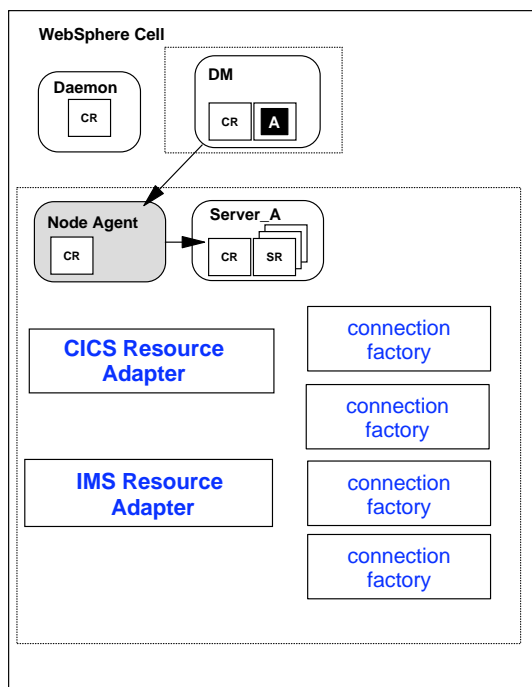
Resource Adapters



Resource adapters plug into the application server and provide connectivity to the EIS through connection factories.

You can have more than one resource adapter installed in a server/node.

Each resource adapter can have multiple connection factories defined.



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