

***Self-study lab:  
Developing and managing business  
processes with IBM WebSphere Business  
Integration Server Express on  
IBM eServer i5***

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# Developing and managing business processes with IBM WebSphere Business Integration Server Express on IBM eServer i5

## Abstract

*This lab introduces many of the development and administrative tools provided by IBM® WebSphere® Business Integration Server Express Version 4.4 on IBM System i5™ systems and the i5/OS® Version 5 Release 3 operating system through a predefined, step-by-step example. This example is a typical development scenario that will let you gain hands-on experience with the tools. After completing the lab, you can continue to use the example materials to further your learning experience.*

## Introduction

This self-guided lab provides an introduction to the development and administrative tools provided in WebSphere Business Integration Server Express V4.4 on the i5/OS V5 R3 operating system. During this lab, you will specifically learn about the following:

- Creating a WebSphere InterChange Server Express (ICS Express) instance
- Using System Manager to import and modify a project
- Using Connector Configurator to configure a Java™ Database Connectivity (JDBC™) connector
- Using Map Designer to define mapping between application-specific and generic business objects
- Using Process Designer to view a business process (collaboration)
- Deploying a solution to WebSphere InterChange Server Express
- Testing a simple data flow through the solution using the Visual Test Connector (VTC)

## Prerequisites

To perform this lab, you must be familiar with the WebSphere Business Integration Server Express Plus product, its terminology, and capabilities. Complete the following two self-study courses prior to performing this lab. The first course introduces you to the product, terminology, and business process architecture and introduces the tool set. The second course shows how to install WebSphere Business Integration Server Express Plus and the prerequisite software, as well as how to verify that your WebSphere Business Integration business process environment is functioning properly. Provided on the **Resources** page is a link to these courses:

- WebSphere Business Integration on the IBM eServer™ iSeries™ platform
- Getting Started with IBM WebSphere Business Integration Server Express Plus on the IBM eServer i5 platform

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## Setup

You will need to perform the following setup steps prior to beginning the lab:

1. Download the lab zip file for this course to a folder on your PC.
2. Unzip the file. (**Note:** You will use the file called CommonLabFall05.jar later in the lab.)
3. Install WebSphere Business Integration Server Express Plus V4.4 on an i5/OS V5R3 system using the install information from the "Getting Started..." course listed above. Ensure that the following software prerequisites are installed:
  - WebSphere Business Integration Server Express is installed on an i5/OS V5R3 system.
  - WebSphere Business Integration Toolset Express is installed on your PC.
4. Restore the WBICOMMON.FILE to the WBICOMMON library that contains the SQL and i5/OS command line (CL) program that will be used to create the JDBC application database:
  - a. Create the **WBICOMMON** library:  
CRTLIB WBICOMMON
  - b. Create a **SAVF** file on the i5/OS system named WBICOMMON:  
CRTSAVF FILE(WBICOMMON/WBICOMMON)
  - c. FTP WBICOMMON.FILE in bin mode to the i5/OS system and overwrite the SAVF file created in step a.
  - d. Restore WBICOMMON SAVF using the Restore Library (RSTLIB) command. (The library is WBICOMMON.)  
RSTLIB SAVLIB(WBICOMMON) DEV(\*SAVF) SAVF(WBICOMMON/WBICOMMON)
5. Map a drive to the i5/OS system and copy the **CommonLabFall05.jar** file from your PC to the following IFS directory on your i5/OS system:  
/QIBM/UserData/WBIServer44/bin
6. Create a user profile called **WBIUSER00** using the CRTUSRPRF command with the following authorities:  
USRCLS of \*SECOFR and SPCAUT of \*JOBCTL, \*SECADM, \*ALLOBJ. CRTUSRPRF  
USRPRF(WBIUSER00) PASSWORD() USRCLS(\*SECOFR) SPCAUT(\*JOBCTL \*SECADM \*ALLOBJ)

Additionally, this lab will require several pieces of data that are used throughout the lab, including the following:

- Lab user profile name: WBIUSER00
- InterChange Server name: WBI00
- WebSphere MQ port number: 14100
- HTTP port number: 14200
- RBAC user ID: WBI00
- RBAC password: WBI00
- Application database name: APPDB00

**Note:** When entering values, enter them exactly as shown here. Do not change the case of the letters or omit characters.

## Creating an InterChange Server Express instance on i5/OS

The i5/OS platform supports multiple WebSphere InterChange Server instances on the same machine. You can create these instances from the Qshell environment by running a script. You can also run multiple instances of the server at the same time. You can establish these instances in a scheme where you use some instances for testing and development, whereas others are production servers.

The script that creates a new WebSphere InterChange Server instance is in the following location:  
/QIBM/ProdData/WBIServer44/bin/create\_instance.sh

The script has the following usage:

```
create_instance.sh [-r<repository name>] [-q<queue manager name> [-exists]]  
[-d<db system> -n<db user> -w<db password>] [-u<rbac user> -p<rbac password>]  
<instance name> <mq listener port> <http port>
```

Here is a description of the arguments for this script:

- **instance name**: the name of the new instance (10 characters or less)
- **mq listener port**: the port number for the MQ listener
- **http port**: the port number for the HTTP server
- **repository name**: the name of the ICS repository (10 characters or less)
- **queue manager name**: the name of the queue manager (The **-exists** value specifies that the queue manager already exists.)
- **db system**: the name of the system where the existing database collection resides
- **db user**: a user name to access the database
- **db password**: the password for the database user name
- **rbac user**: a user to create for role-based access control (RBAC)
- **rbac password**: the password for the RBAC user to be created

The only required arguments for the **create\_instance.sh** script are the instance name, MQ listener port, and HTTP port. All other arguments are optional. In cases where **rbac user** and **rbac password** are not provided (via the **-u** and **-p** options respectively), the ICS Express instance is created without RBAC security enabled. The remaining arguments are for more advanced configuration parameters; this lab will not discuss them.

For example, to create a new InterChange Server named **WBI00** (where the queue manager listener port is on port 14100 and the HTTP port is on port 14100), you can run the following command from QSH. (**Note**: RBAC security is not enabled for the following example.)

```
/QIBM/ProdData/WBIServer44/bin/create_instance.sh WBI00 14100 14100
```

Creating a new instance will build an InterChange Server IFS directory in UserData that will contain all the necessary files to support an ICS instance. The instance IFS directory structure will contain all the adapters and object discovery agents (ODA) that are installed on the machine. The create\_instance script will also build a WebSphere MQ Queue Manager named **ICSNAME.QUEUE.MANAGER** and an SQL collection named **ICSNAME**, which will be used as the InterChange Server repository. You can use the advanced arguments for the create\_instance.sh script to override the default queue manager and repository, but this function will not be covered here.

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A log file will document the instance creation process in the following IFS location:  
`/QIBM/UserData/WBIServer44/Logs/<icsname>.create`

The newly created InterChange Server instance directory will be located in:  
`/QIBM/UserData/WBIServer44/<icsname>`

### Creating a new InterChange Server

The following steps will guide you in setting up a new InterChange Server:

1. Start a 5250 session to the iSeries machine, through the icon on the desktop, and log on using the following information:
  - a. Your WBI lab user profile WBIUSER00
  - b. Your password

2. Start a new Qshell session on the iSeries system by entering the following command: `QSH`

3. From Qshell run the following `create_instance.sh` script:

```
/QIBM/ProdData/WBIServer44/bin/create_instance.sh -uWBI00 -pWBI00 WBI01 14100 14200
```

Notice that the following arguments are used:

- WBI01: your ICS name
- 14100: the port number assigned for your MQ listener port
- 14200: the HTTP port number

This can take a few minutes. Wait for the **Instance WBI00 created successfully** message to appear.

**Note:** RBAC has been enabled for this instance and will use WBI00 and WBI00 as the user name and password for RBAC (the ID and the password are the same for this example).

4. After the script has created your instance, use the following Qshell script to set the mode of the server to design mode:

```
/QIBM/ProdData/WBIServer44/bin/set_ics_server_mode.sh WBI00 design
```

You will use this mode while developing new solutions with the product. When you are ready to go into production, simply change the mode to production.

5. Start your ICS instance using the following Qshell script:

```
/QIBM/ProdData/WBIServer44/bin/submit_ics_server.sh WBI00
```

## Using System Manager to import and modify a project

The System Manager tool is one of the main graphical user interface (GUI) tools for developing InterChange Server projects. Follow these steps:

1. Access the System Manager tool by opening the following shortcut on your PC. Click **Start > Programs > IBM WebSphere Business Integration Express > Toolset Express > Administrative > System Manager**

The following screen in Figure 1 will appear:

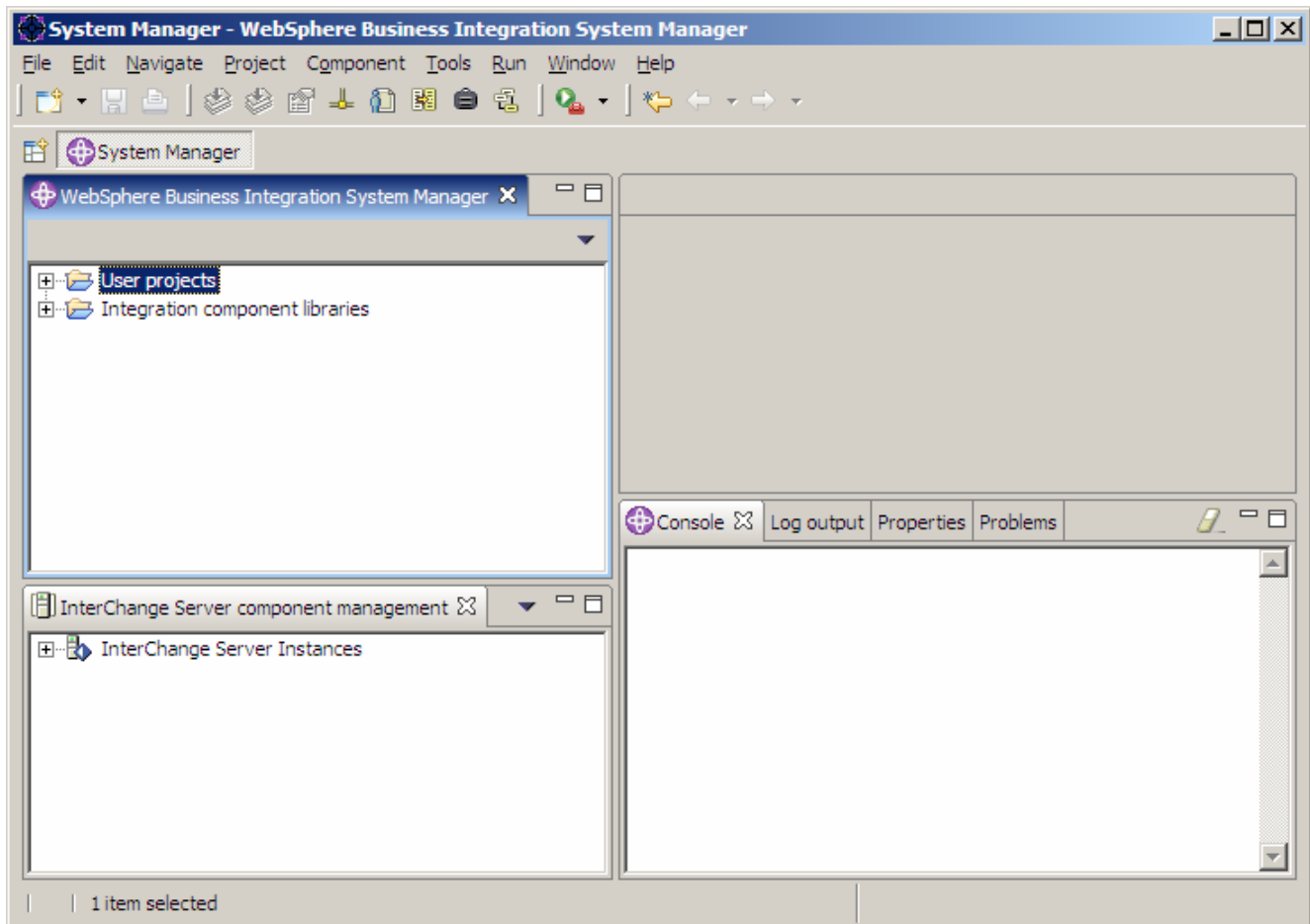


Figure 1: Accessing the WebSphere Business Integration System Manager screen

2. Right-click **Integration Component Libraries** and select **New Integration Component Library**.

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3. Enter **ICL00** for the project name (Figure 2) and click **Finish**.

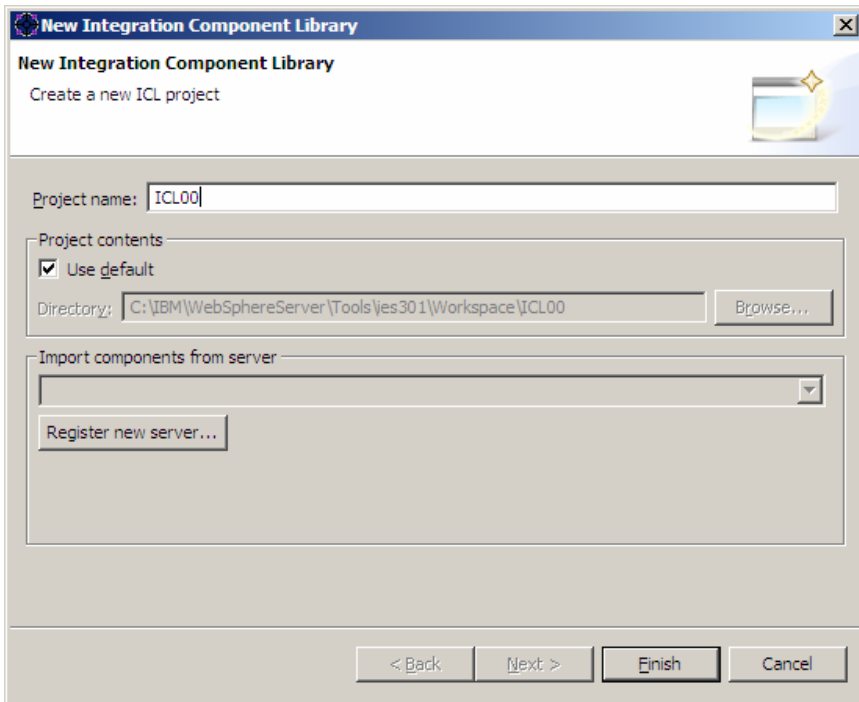


Figure 2: Entering the project name



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4. Map a network drive to the i5/OS platform.
5. Right-click the **My Computer** icon on the desktop and select **Map Network Drive**.
6. Select any drive letter and enter `\\i5OSname\root` as the folder.
7. Now, import a project that has been prepared for this lab exercise.
8. Right-click the **ICL00** library from the System Manager screen (Figure 3) and select **Import From Repository File**.

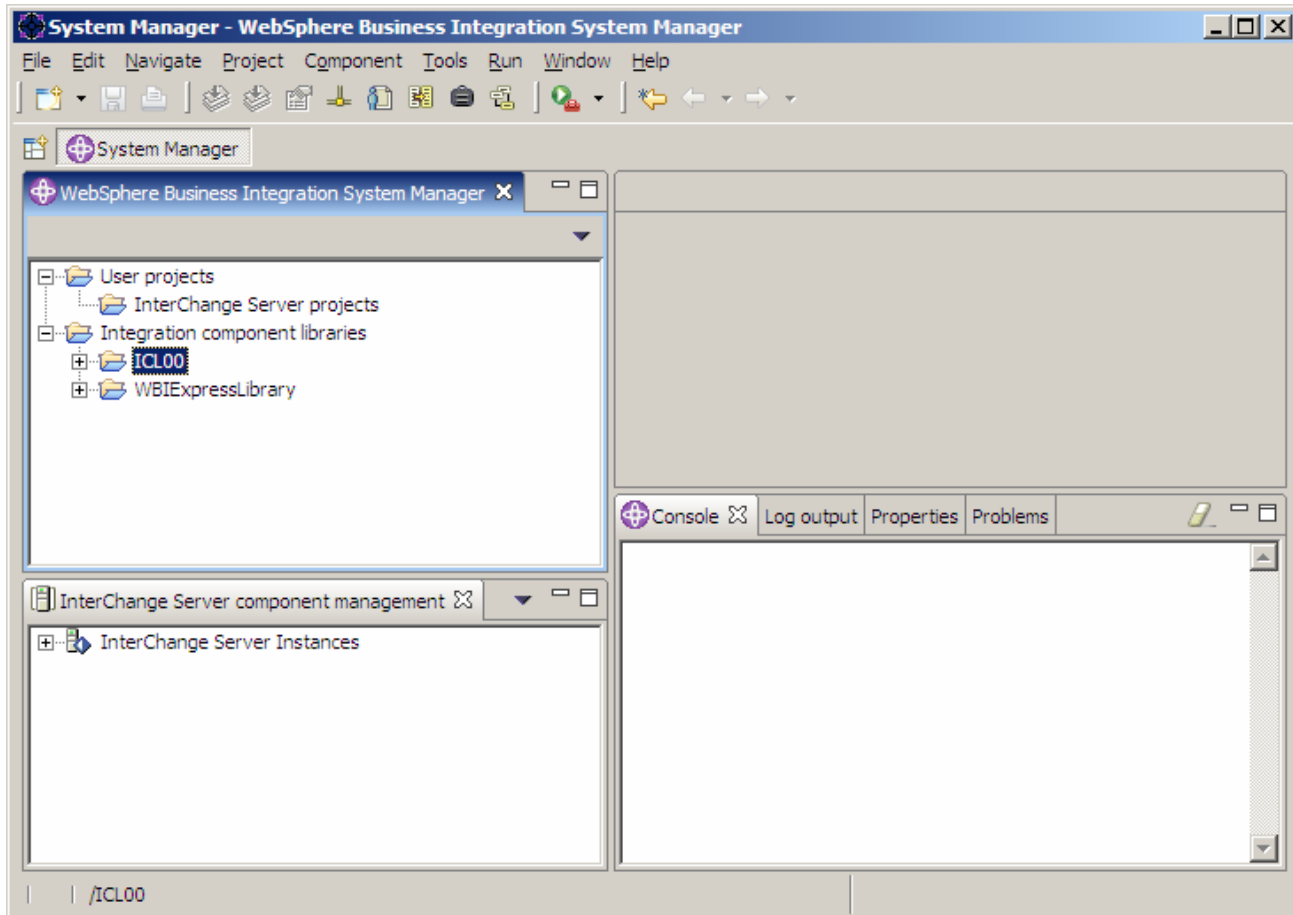


Figure 3: Selecting **Import from Repository File** from the ICL00 library

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9. In the **Import from repository file** window, click **Browse** (Figure 4).
10. Locate the **CommonLabFall05.jar** file on the i5/OS mapped drive in the /QIBM/UserData/WBIServer44/bin folder (Figure 4).

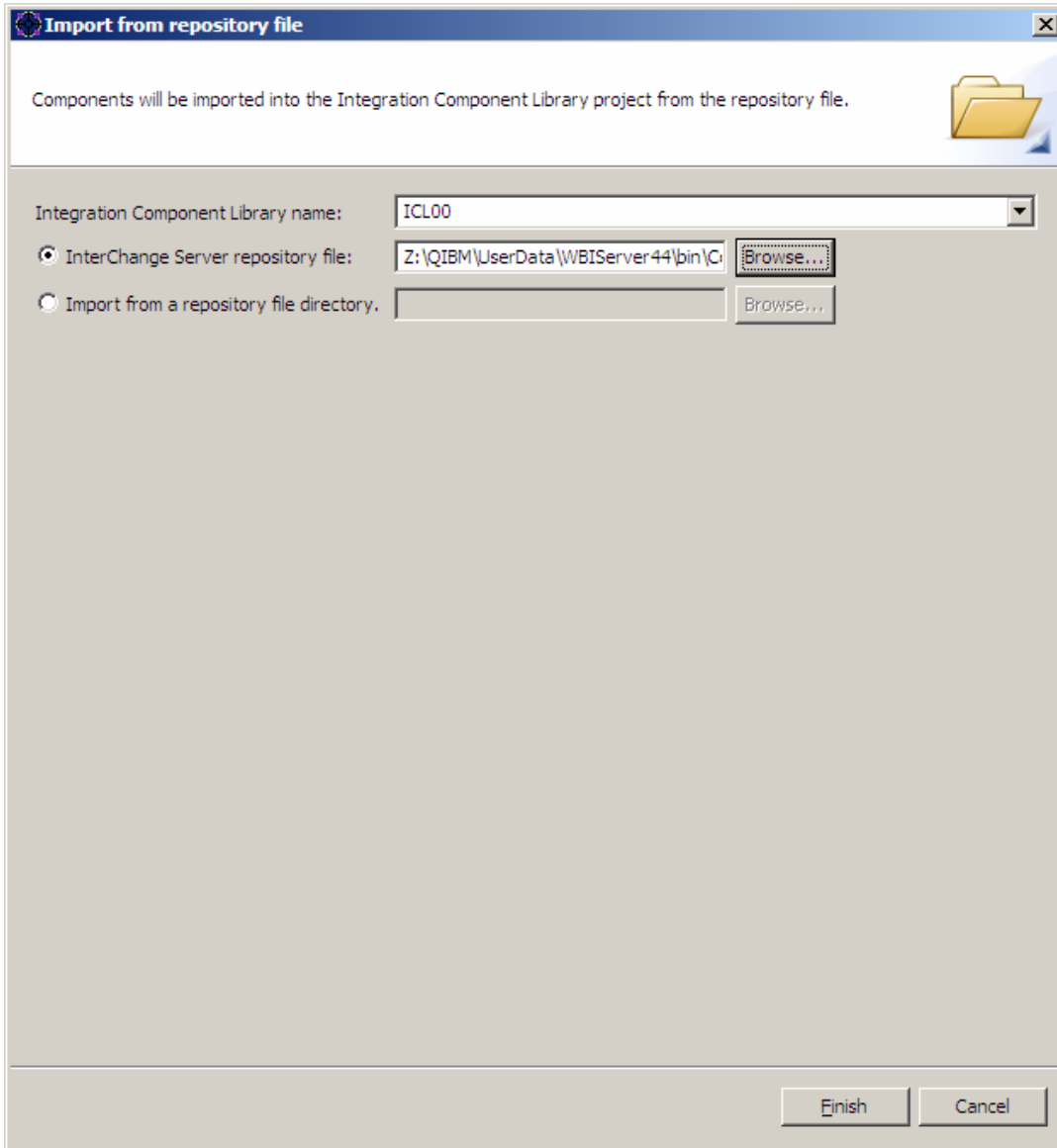


Figure 4: Locating the InterChange Server repository file

11. Click **Finish** (at the bottom of Figure 4) to import the contents of the jar into your integration component library.

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12. Now, connect to the ICS server that is running on the i5/OS platform.
13. Right-click **InterChange Server Instances** from the **InterChange Server Component Management** view in the lower left portion of System Manager screen and select **Register Server** (Figure 5).

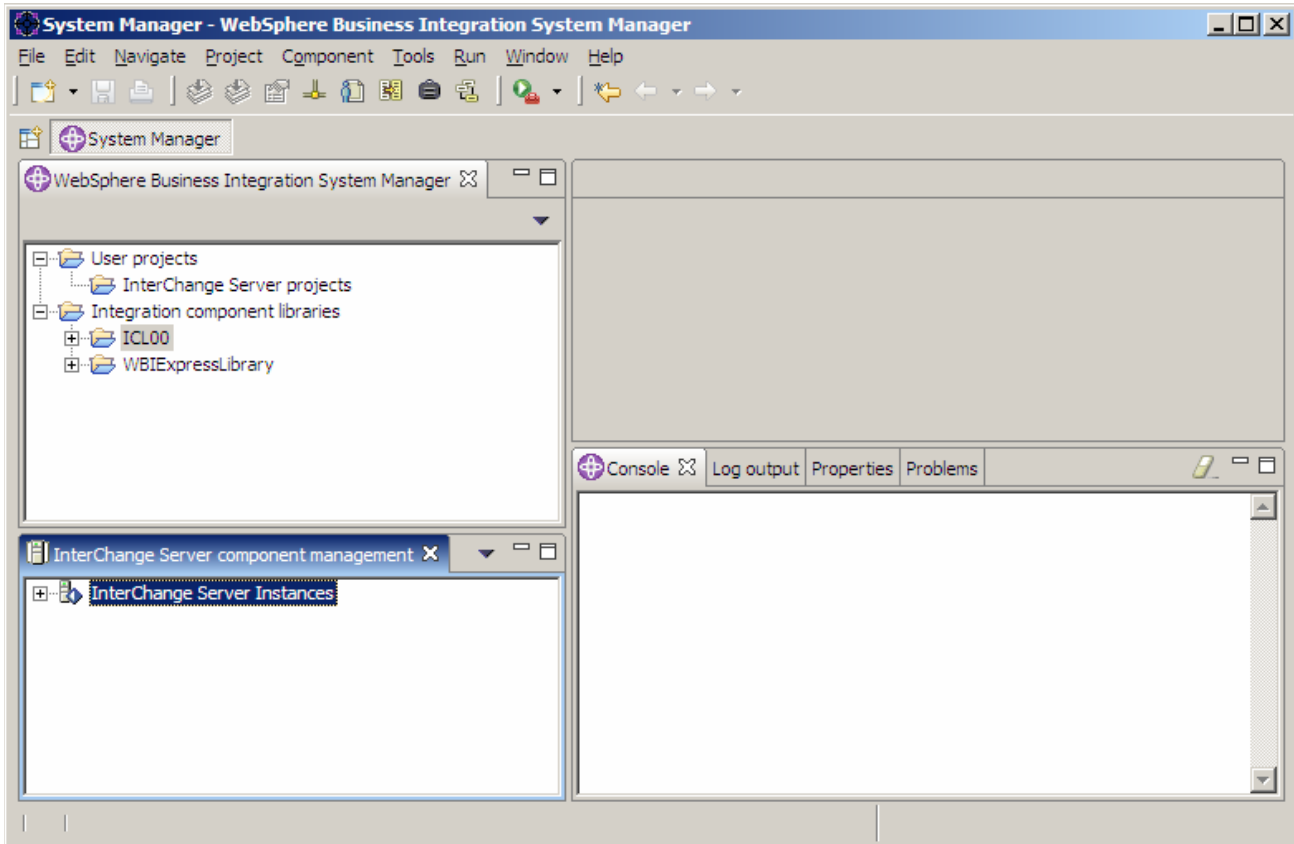


Figure 5: Choosing the InterChange Server instances

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14. From the **Register new server** dialog, click **Browse** (Figure 6).

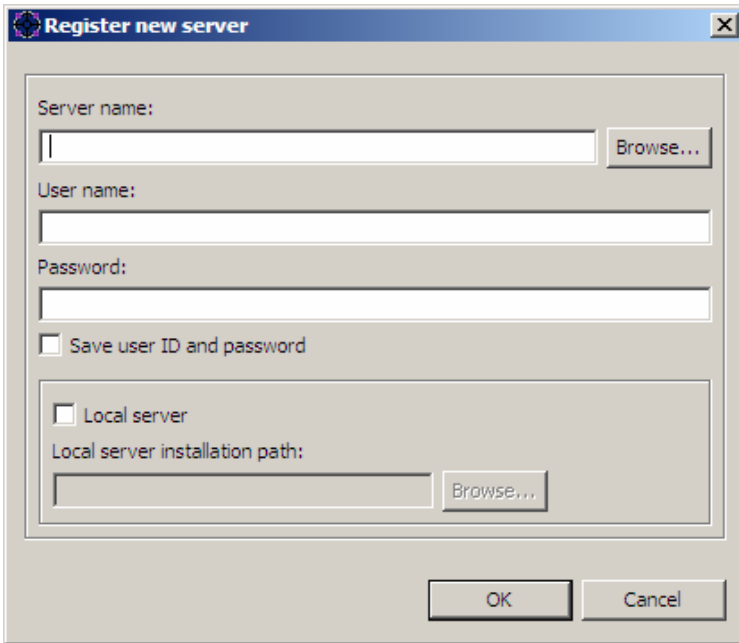


Figure 6: Registering the new server

15. Select the InterChange Server name (WBI00), and click **OK** (Figure 7).

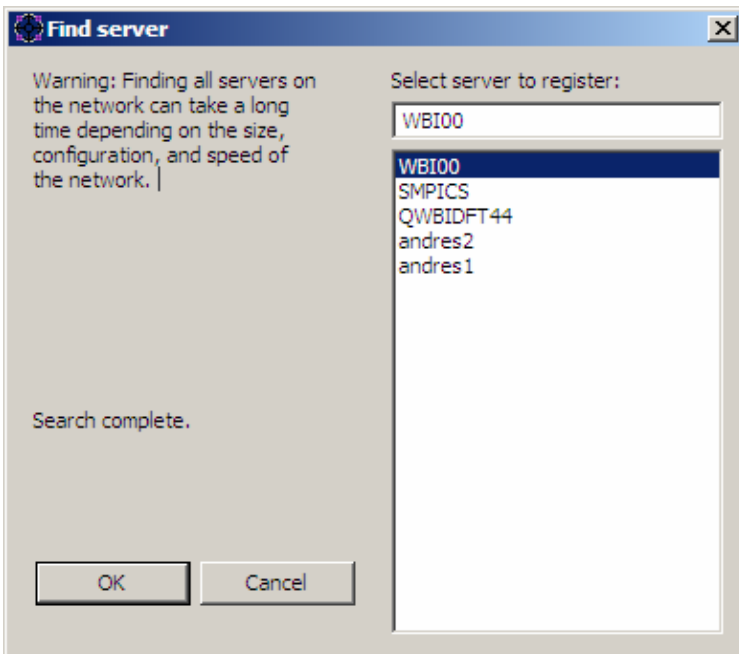


Figure 7: Selecting the InterChange Server name

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16. Enter the following information back at the **Register new server** dialog (Figure 8):  
(**Note:** WBI00 is the RBAC user ID and password you specified when creating the instance.)
  - User name: WBI00
  - Password: WBI00
17. Check the **Save user ID and password** option.
18. Click **OK** to connect to the ICS.

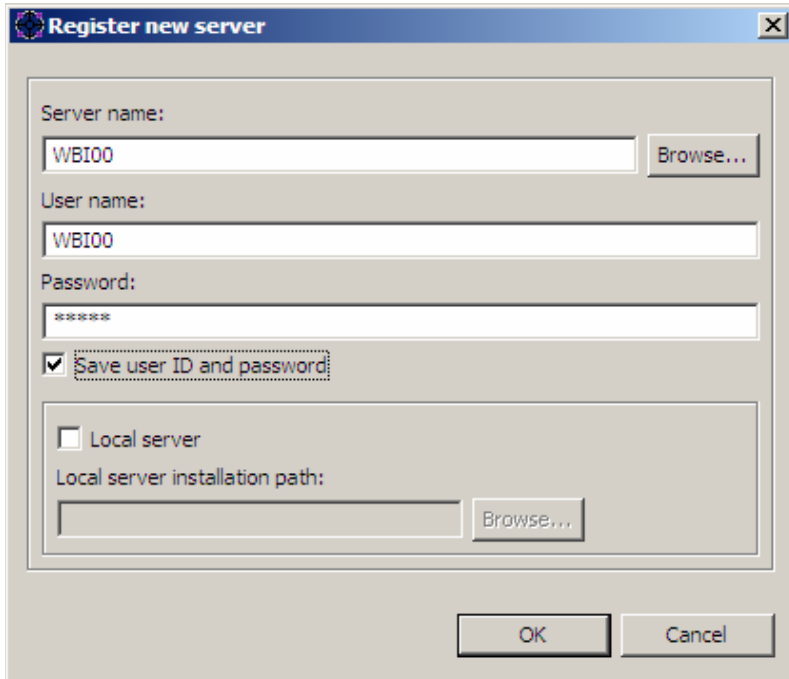


Figure 8: Entering user name and password

## Creating the application database for the JDBC connector

The JDBC adapter monitors a specific application database collection. The adapter agent can poll for events. For example, it can receive events triggered in the collection. The adapter agent can also write events to the collection. (Business objects are normally stored in tables within the collection.) For this exercise, a test application database has been created for you to use. You will need to create your own copy before configuring the adapter.

1. Create a new collection from SQL (the application database), by entering the following commands from an i5/OS command prompt:
  - a. Start an SQL session: STRSQL
  - b. In the SQL session, enter: CREATE COLLECTION APPDB00
  - c. After the message is displayed that the collection was created, hit **F3** to exit the SQL session and hit **1** at the exit/save prompt.

The JDBC adapter ships with a command line (CL) program on the i5/OS platform that will create the necessary event and archive tables as well as the stored procedures for the JDBC adapter to poll.

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2. Create the event and archive tables for the JDBC adapter, as well as a stored procedure, by issuing the following from an iSeries prompt (where APPDB00 is the application database created in the previous step, and WBIUSER00 is the profile name on the i5/OS system):  
CALL QWBISVR44/QWBIJDBCSQ PARM('APPDB00' 'WBIUSER00')

3. Run a CL program (created for this lab) that will create three tables in your application database, as well as a database trigger.

This step will be necessary if you already have a database, because it creates the necessary database tables for the JDBC connector to function:

- One table will store a business object that will be sent as an event in the lab.
- One table will be used by the collaboration in this scenario.
- One table will store application-specific events.

Later in the lab, you will run another CL program that will perform an SQL **insert** in the application event table. A trigger will detect this insert and will copy the new row into the JDBC adapter's event table.

4. Enter the following from an i5/OS prompt (where APPDB00 is the application database created in the previous step, and WBIUSER00 is the profile name on the i5/OS system):  
CALL WBICOMMON/APPDBCRT PARM('APPDB00' 'WBIUSER00')

## Using Connector Configurator and editing connectors

The following steps will help you learn how to use the Connector Configurator to configure the JDBC connectors:

1. From the System Manager screen, expand the **ICL00** integration component library.
2. Expand the **Connectors** folder (Figure 9).

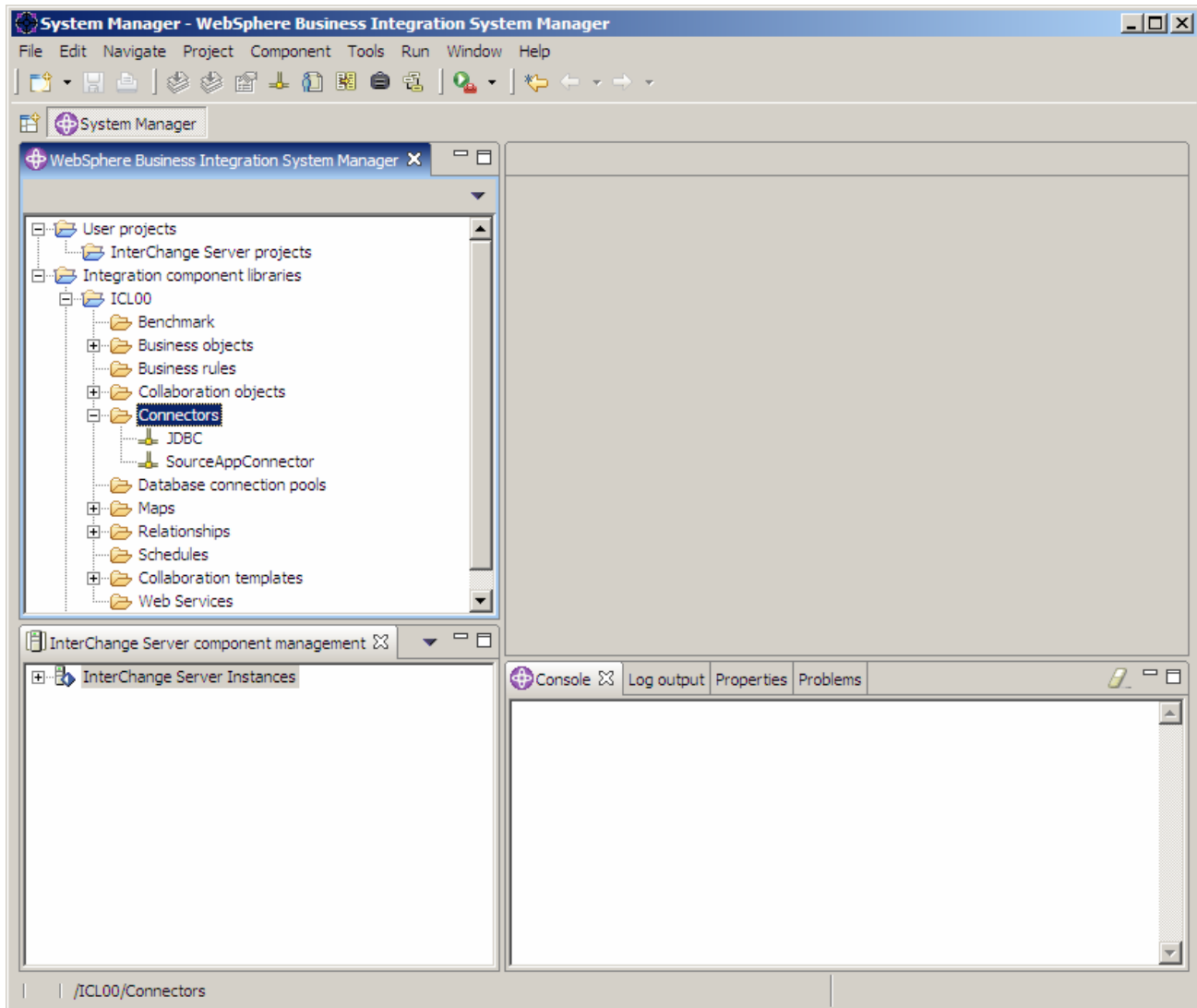


Figure 9: Expanding the Connectors folder

3. Double-click the **JDBC** connector to open the connector definition in Connector Configurator Express.

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- In the **Standard** properties for the connector, ensure that the **MessageFileName** property is set to **JDBCConnector.txt** (Figure 10).

Because this is a JDBC Connector, you want to use the existing message file to ensure that you get proper logging messages for the adapter. Also, notice that the **AgentTraceLevel** is set to **5**. This is the highest level of tracing. When you are ready to go into production, set the trace level to **0**, which is the lowest level of tracing.

The screenshot shows the 'Connector Configurator Express' window with the 'Standard Properties' tab selected. The 'Target System' is set to 'Windows'. A table lists 30 properties for the connector configuration.

Property	Value	Type	Subtype	Description	Update Method
1 AdapterHelpName		String		Used to find a connector-specific proper	component restart
2 AgentConnections	1	Integer		Number of connections opened for requ	component restart
3 AgentTraceLevel	5	Integer		Trace level for the connector agent	dynamic
4 ApplicationName	JDBC	String		The name of the application	component restart
5 BiDiTransformation	false	Boolean		Enable bidi transformation	component restart
6 BrokerType	ICS	String		Broker type	component restart
7 CharacterEncoding	ascii7	String		The connector agent will use the charac	component restart
8 ConcurrentEventTriggeredFlows	1	Integer		The number of connector controller thre	component restart
9 ControllerEventSequencing	true	Boolean		Enable Event Sequencing in connector c	dynamic
10 ControllerStoreAndForwardMode	true	Boolean		Connector Controller will store the mess	dynamic
11 ControllerTraceLevel	5	Integer		Trace level for the connector controller	dynamic
12 DeliveryTransport	IDL	String		The transport for data flowing between	component restart
13 EnableOldForFlowMonitoring	false	Boolean		If true, the ADK will mark the incoming O	component restart
14 JvmMaxHeapSize	128m	Memory		JVM maximum Heapsize for the agent	component restart
15 JvmMaxNativeStackSize	128k	Memory		Maximum native stack size for agent	component restart
16 JvmMinHeapSize	1m	Memory		JVM minimum Heapsize for the agent	component restart
17 Locale	en_US	String		The locale of the connector agent	component restart
18 LogAtInterchangeEnd	false	Boolean		Connector agent will log messages to th	component restart
19 MaxEventCapacity	2147483647	Integer		Maximum number of events in the contro	dynamic
20 MessageFileName	JDBCConnector.txt	String	FileName	Application specific portion of the conne	component restart
21 OADAutoRestartAgent	false	Boolean		If true, enable OAD feature	dynamic
22 OADMaxNumRetry	1000	Integer		Number of max times that OAD will retry	dynamic
23 OADRetryTimeInterval	10	Integer		Number of minutes of retry time interval.	dynamic
24 PollEndTime	HH:MM	Time		Time at which the connector agent pollin	component restart
25 PollFrequency	10000	Integer		Interval at which the agent will poll	dynamic
26 PollStartTime	HH:MM	Time		Time at which the connector agent pollin	component restart
27 RepositoryDirectory	<REMOTE>	String	Directory	Repository location	agent restart
28 RestartRetryCount	7	Integer		Number of times the agent will try to rest	dynamic
29 RestartRetryInterval	1	Integer		The interval at which the agent will try to	dynamic
30 WireFormat	CwBO	String		Message format on the transport	agent restart

Figure 10: Setting the standard properties for the connector



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5. Click the **Connector-Specific Properties** tab.

This is where you will enter the information so that the adapter can find your database. You will also enter a user name and password to access the database.

6. Set the following properties in the **Connector-Specific Properties** tab (Figure 11):

- a. ApplicationPassword: your user profile's password
- b. ApplicationUserName: WBIUSER00
- c. DatabaseURL: jdbc:db2:localhost/APPDB00

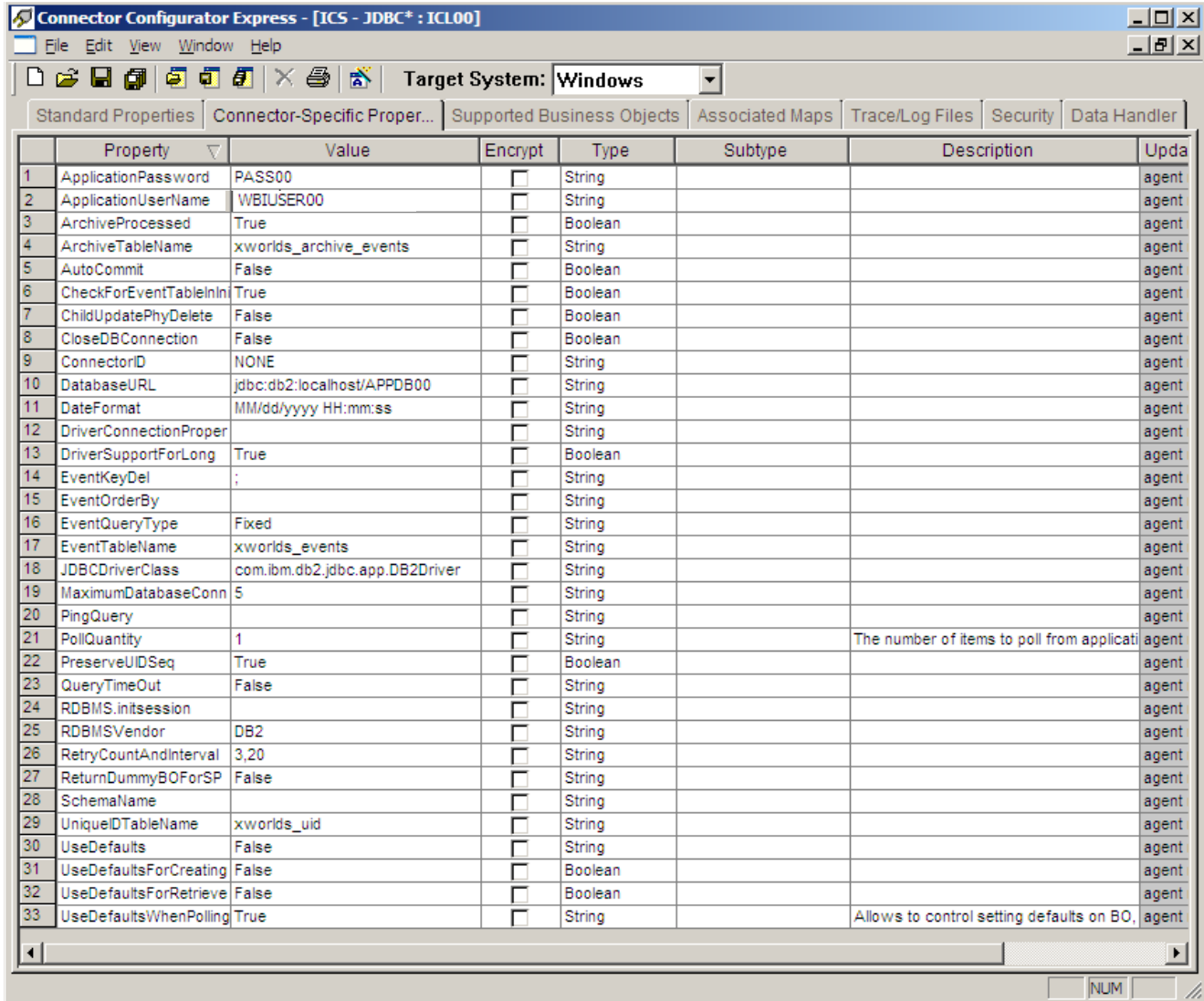


Figure 11: Setting the connector-specific properties

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- Click the **Trace/Log Files** tab (Figure 12).
- Ensure that both the **Logging To Console (STDOUT)** and **Tracing to console (STDOUT)** options are unchecked, and that the **Logging To File** and **Tracing to File** options are checked.

**Note:** If you leave the STDOUT boxes checked, the adapter will create a spool file when it runs. The correct place to log and trace on the i5/OS platform is to an integrated file system [IFS] file.

- Enter a path and file name for logging and tracing for your JDBC adapter:
  - For the logging: /QIBM/UserData/WBIServer44/WBI00/log/myjdbc.log
  - For the tracing: /QIBM/UserData/WBIServer44/WBI00/log/myjdbc.trace

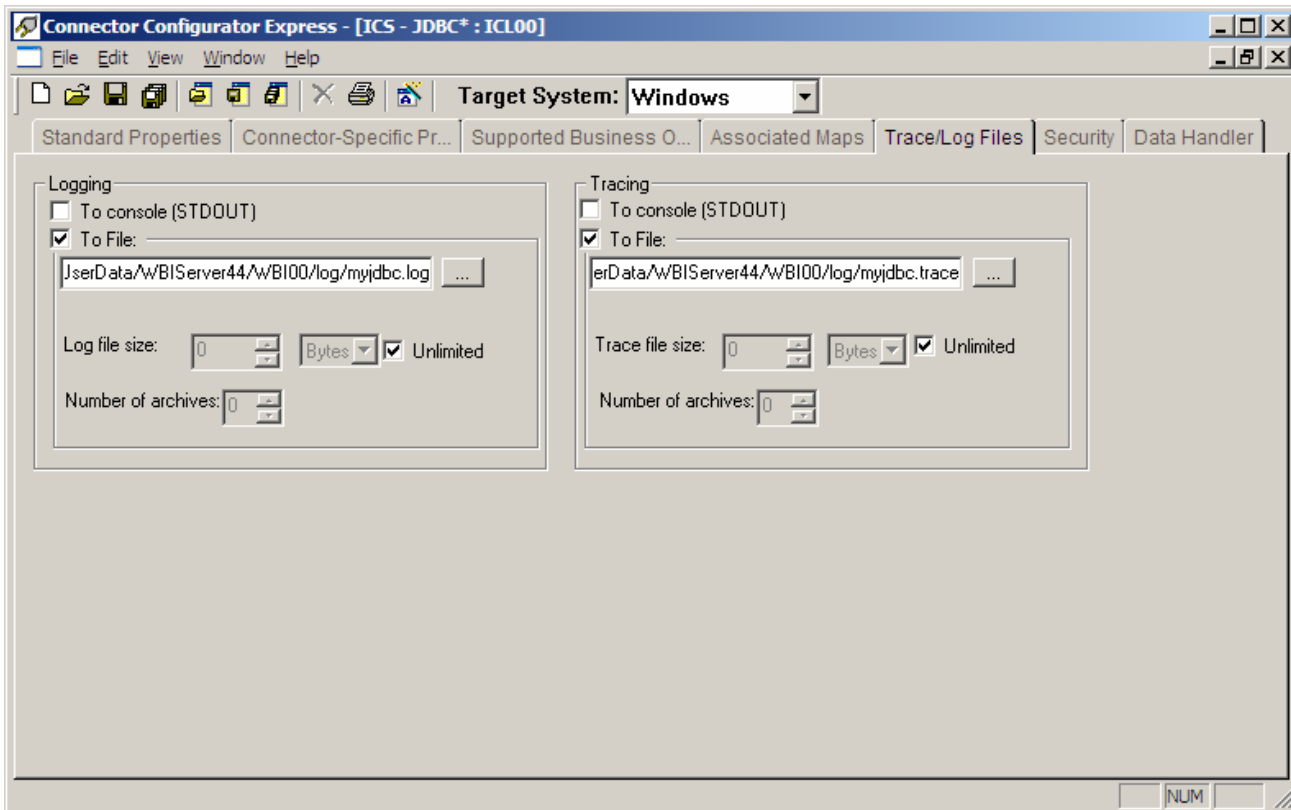


Figure 12: Entering logging and tracing information

- Click **File > Save > To Project** to save the connector definition to the ICL00 library.
- In Connector Configurator, Click **File > Save > To File**.

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13. Browse to the i5/OS drive and then to the following directory:  
/QIBM/UserData/WBIServer44/WBI00/connectors/JDBC

Save the adapter as JDBC.cfg into the **JDBC** directory on the i5/OS drive (Figure 13).

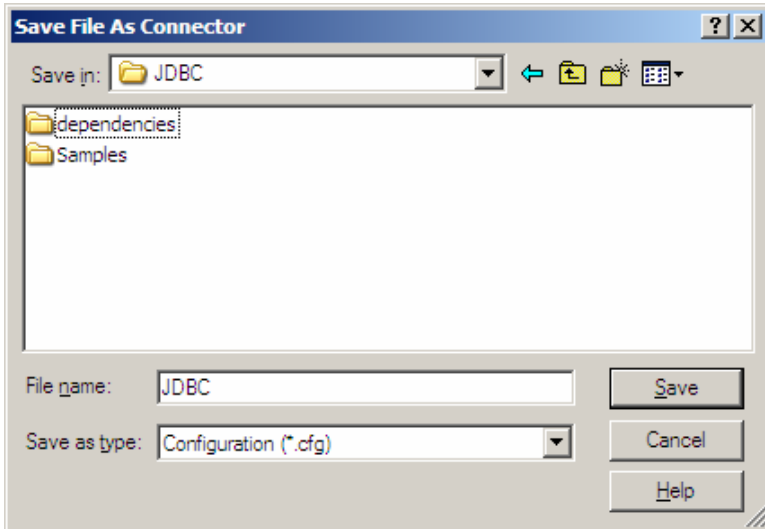


Figure 13: Saving the adapter

14. From the browser, navigate on the i5/OS mapped drive until you find the  
/QIBM/UserData/WBIServer44/WBI00/connectors/JDBC directory.
15. Right-click the **start\_JDBC.sh** file.

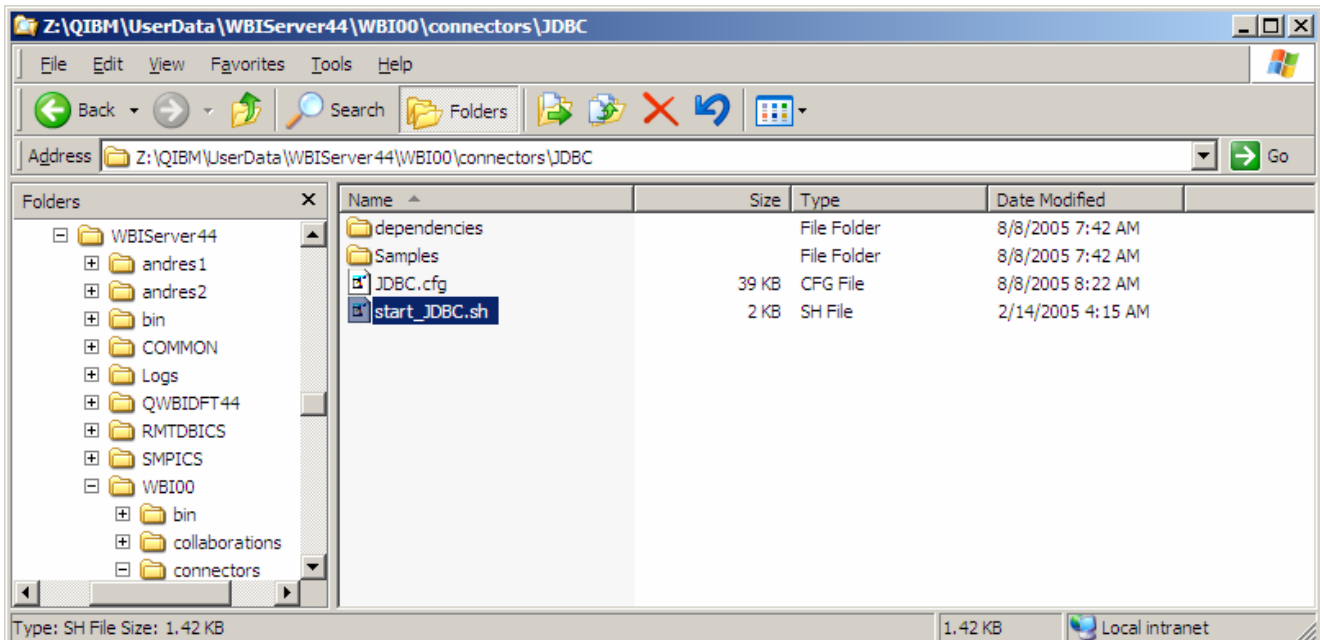


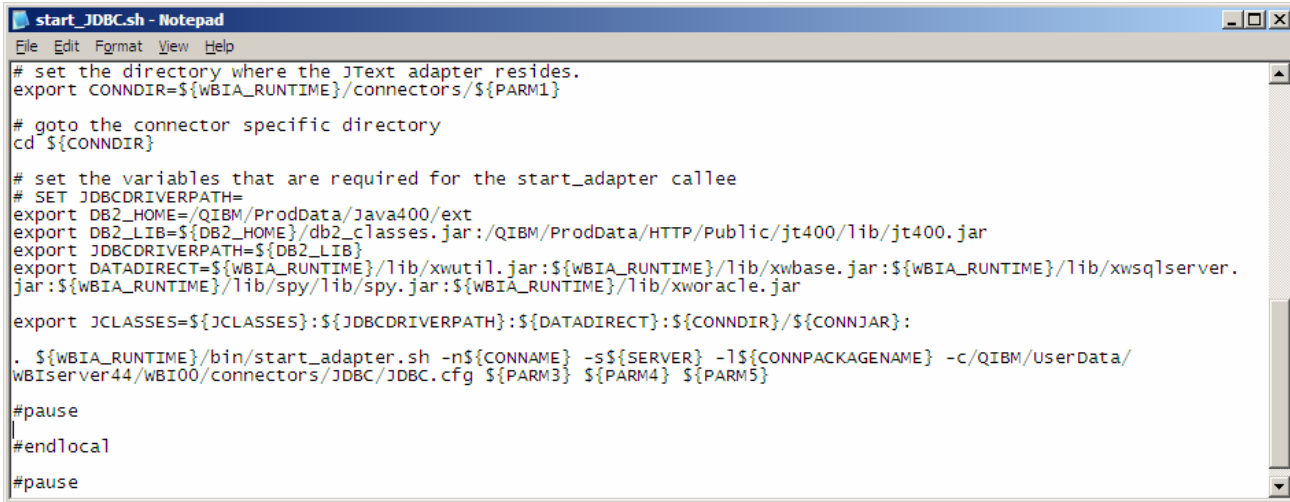
Figure 14: Choosing the start\_JDBC.sh file

16. Select **open with** and choose **Notepad**.

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17. On the last line of the script file, add the following after the `-l{CONNPACKAGENAME}` argument and before the `#{PARM3}` argument (Figure 15).

**Note:** Put a space before `-c` and after `.cfg` and no space between `-c` and `/QIBM/...` as follows:  
`-c/QIBM/UserData/WBIServer44/WBI00/connectors/JDBC/JDBC.cfg`



```
start_JDBC.sh - Notepad
File Edit Format View Help
# set the directory where the JText adapter resides.
export CONNDIR=${WBIA_RUNTIME}/connectors/${PARM1}

# goto the connector specific directory
cd ${CONNDIR}

# set the variables that are required for the start_adapter callee
# SET JDBC_DRIVER_PATH=
export DB2_HOME=/QIBM/ProdData/Java400/ext
export DB2_LIB=${DB2_HOME}/db2_classes.jar:/QIBM/ProdData/HTTP/Public/jt400/lib/jt400.jar
export JDBC_DRIVER_PATH=${DB2_LIB}
export DATADIRECT=${WBIA_RUNTIME}/lib/xwutil.jar:${WBIA_RUNTIME}/lib/xwbase.jar:${WBIA_RUNTIME}/lib/xwsqlserver.jar:${WBIA_RUNTIME}/lib/spy/lib/spy.jar:${WBIA_RUNTIME}/lib/xworacle.jar

export JCLASSES=${JCLASSES}:${JDBC_DRIVER_PATH}:${DATADIRECT}:${CONNDIR}/${CONNJAR}:

. ${WBIA_RUNTIME}/bin/start_adapter.sh -n${CONNNAME} -s${SERVER} -l${CONNPACKAGENAME} -c/QIBM/UserData/WBIServer44/WBI00/connectors/JDBC/JDBC.cfg ${PARM3} ${PARM4} ${PARM5}

#pause
#endlocal
#pause
```

Figure 15: Editing the script file

18. Save and exit from Notepad.

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19. From the System Manager screen, double-click **SourceAppConnector** in your integration component library to open it in the Connector Configurator tool (Figure 16).
20. Click **File > Save > To File** and save it to your desktop. You will be using this connector later in the lab to test the project.

Property	Value	Type	Subtype	Description	Update Method
1 AdapterHelpName		String		Used to find a connector-specific proper	component restart
2 AgentConnections	1	Integer		Number of connections opened for	component restart
3 AgentTraceLevel	0	Integer		Trace level for the connector agent	dynamic
4 ApplicationName	SourceAppConnector	String		The name of the application	component restart
5 BiDi.Transformation	false	Boolean		Enable bidi transformation	component restart
6 BrokerType	ICS	String		Broker type	component restart
7 CharacterEncoding	ascii7	String		The connector agent will use the	component restart
8 ConcurrentEventTriggeredFlows	1	Integer		The number of connector controller	component restart
9 ControllerEventSequencing	true	Boolean		Enable Event Sequencing in connector c	dynamic
10 ControllerStoreAndForwardMode	true	Boolean		Connector Controller will store the	dynamic
11 ControllerTraceLevel	0	Integer		Trace level for the connector controller	dynamic
12 DeliveryTransport	IDL	String		The transport for data flowing between	component restart
13 EnableOidForFlowMonitoring	false	Boolean		If true, the ADK will mark the incoming	component restart
14 JvmMaxHeapSize	128m	Memory		JVM maximum Heapsize for the agent	component restart
15 JvmMaxNativeStackSize	128k	Memory		Maximum native stack size for agent	component restart
16 JvmMinHeapSize	1m	Memory		JVM minimum Heapsize for the agent	component restart
17 Locale	en_US	String		The locale of the connector agent	component restart
18 LogAtInterchangeEnd	false	Boolean		Connector agent will log messages to	component restart
19 MaxEventCapacity	2147483647	Integer		Maximum number of events in the	dynamic
20 MessageFileName	InterchangeSystem.txt	String	FileName	Application specific portion of the	component restart
21 OADAutoRestartAgent	false	Boolean		If true, enable OAD feature	dynamic
22 OADMaxNumRetry	1000	Integer		Number of max times that OAD will retry	dynamic
23 OADRetryTimeInterval	10	Integer		Number of minutes of retry time	dynamic
24 PollEndTime	HH:MM	Time		Time at which the connector agent	component restart
25 PollFrequency	10000	Integer		Interval at which the agent will poll	dynamic
26 PollStartTime	HH:MM	Time		Time at which the connector agent	component restart
27 RepositoryDirectory	<REMOTE>	String	Directory	Location where repository is located	agent restart
28 RestartRetryCount	3	Integer		Number of times the agent will try to rest	dynamic
29 RestartRetryInterval	1	Integer		The interval at which the agent will	dynamic
30 WireFormat	CwBO	String		Message format on the transport	agent restart

Figure 16: Opening the SourceAppConnector

## Creating a new database connection pool

The database connection pool will be used from the logic within the collaboration to access a table in the application database. This table will contain the primary key and time stamp for each event that goes through the collaboration.

1. Right-click the **Database connection pools** folder in your integration component library (Figure 17) and select **Create New Database Connection**.

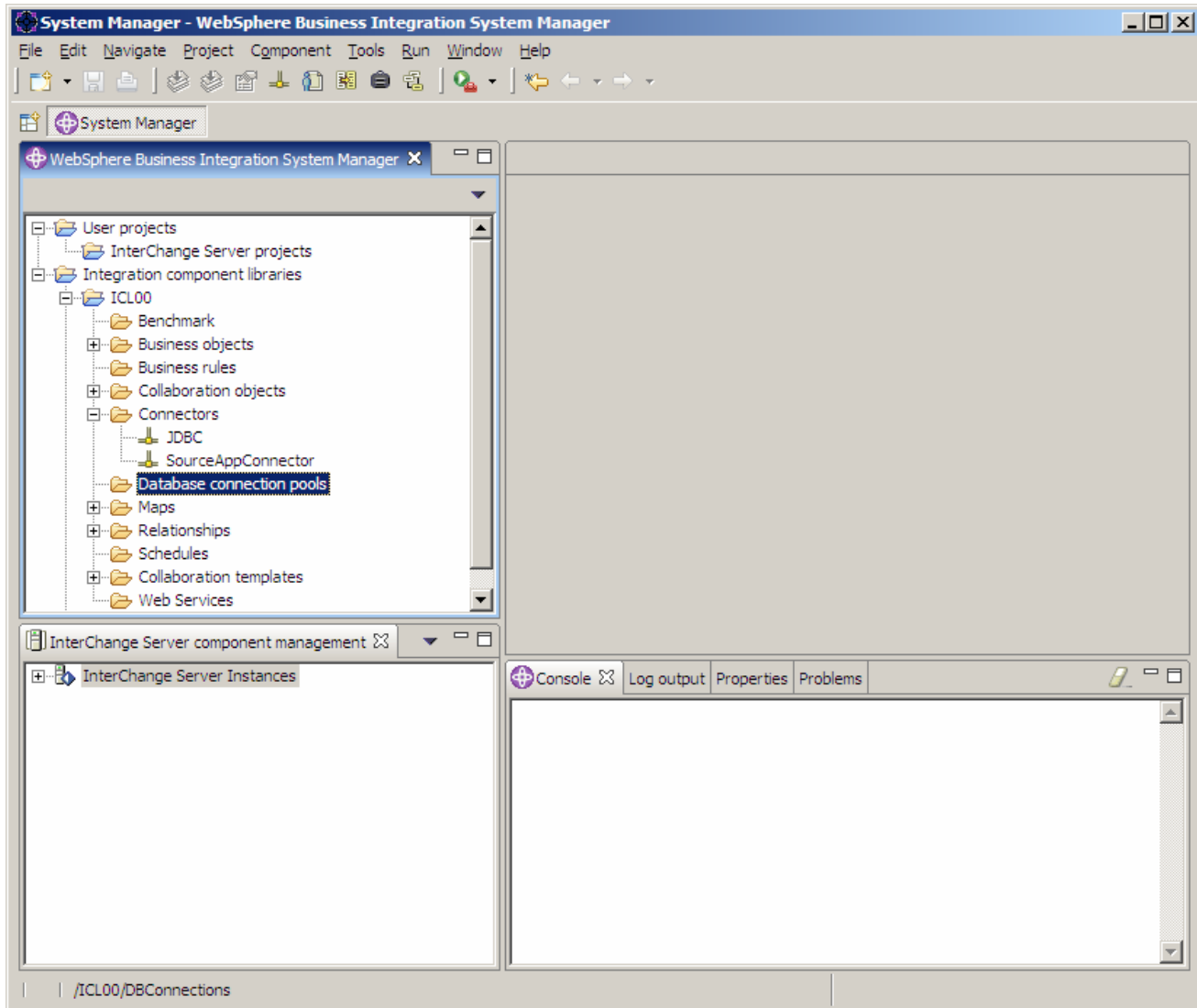


Figure 17: Selecting database connection pools

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2. In the **Create new database connection** wizard, enter the following (Figure 18):
  - a. Database driver: DB2 iSeries (Type 2)
  - b. DBConnection Name: APPDBCon
  - c. Host name: localhost
  - d. Login: WBIUSER00 (your profile name on the i5/OS system)
  - e. Schema: APPDB00 (your application database)
  - f. Password: your i5/OS system password
  - g. Ensure the Unlimited option is checked for Maximum connections
  - h. Connected servers: WB100 (the name of your instance)
  - i. Max connect retries: 10
  - j. Connection retry interval: 60

**Create new database connection**

Database connection  
Create a new database connection.

Database driver: DB2 iSeries (Type 2) | DBConnection name: APPDBCon  
Host name: localhost | Login: WBIUSER00  
Schema: APPDB00 | Password: \*\*\*\*\*  
Port number: | Maximum connections: -1 |  Unlimited  
Connected servers: WB100 | Max connect retries: 10 | Connect retry interval: 60 Second(s)

New connection pool

Name	Minimum

Validate Connection

Finish Cancel

Figure 18: Creating a new database connection (wizard screen)

3. Right-click in the **New Connection Pool** table and select **New Connection Pool**.

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4. Enter the following into the **Connection Pool** dialog (Figure 19).
  - a. Name: APPDBPool1
  - b. Minimum connections: 0

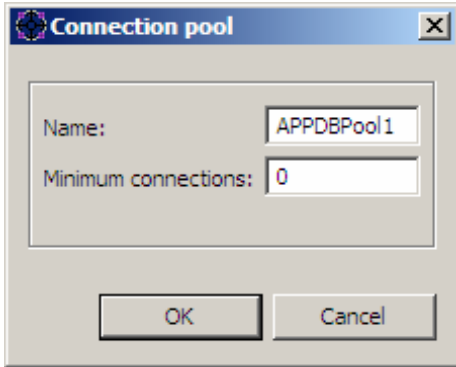


Figure 19: Entering the Connection pool information

5. Click **OK**.
6. Click **Finish** at the bottom of the **Create new database connection** wizard screen (Figure 20).

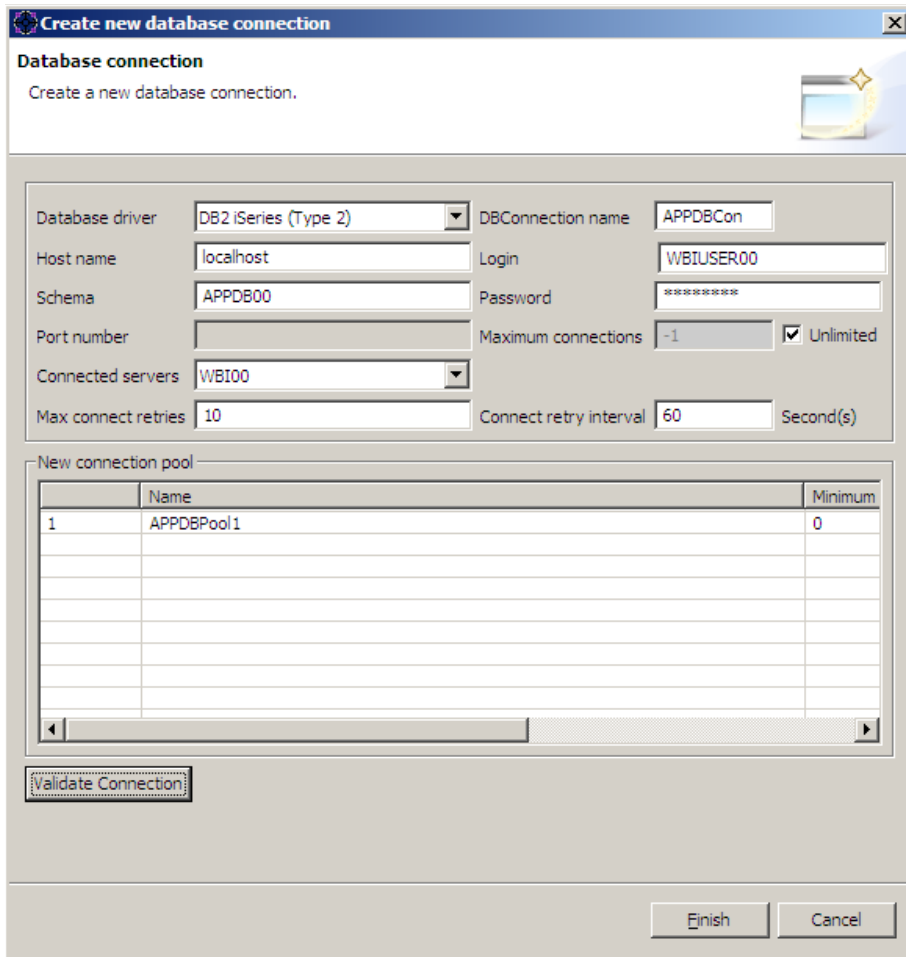


Figure 20: Finishing the connection wizard



## Using the Business Object Designer Express

As the data passes through the adapter and ICS, it will be stored in a business object. You will recall from the WebSphere Business Integration presentation that there are two types of business objects:

- The **application-specific business object** represents how the application sees the data. In this example, this is the database.
- The **generic business object** is the generic representation of the data that the InterChange Server business process uses.

You will not be adding or changing anything in Business Object Designer Express. However, it is beneficial to look at the information because it can help you add or customize.

1. In System Manager, expand the **Business Objects** folder in your integration component library.
2. Double-click the **PersonASBO** folder (Figure 21) to open it in Business Object Designer.

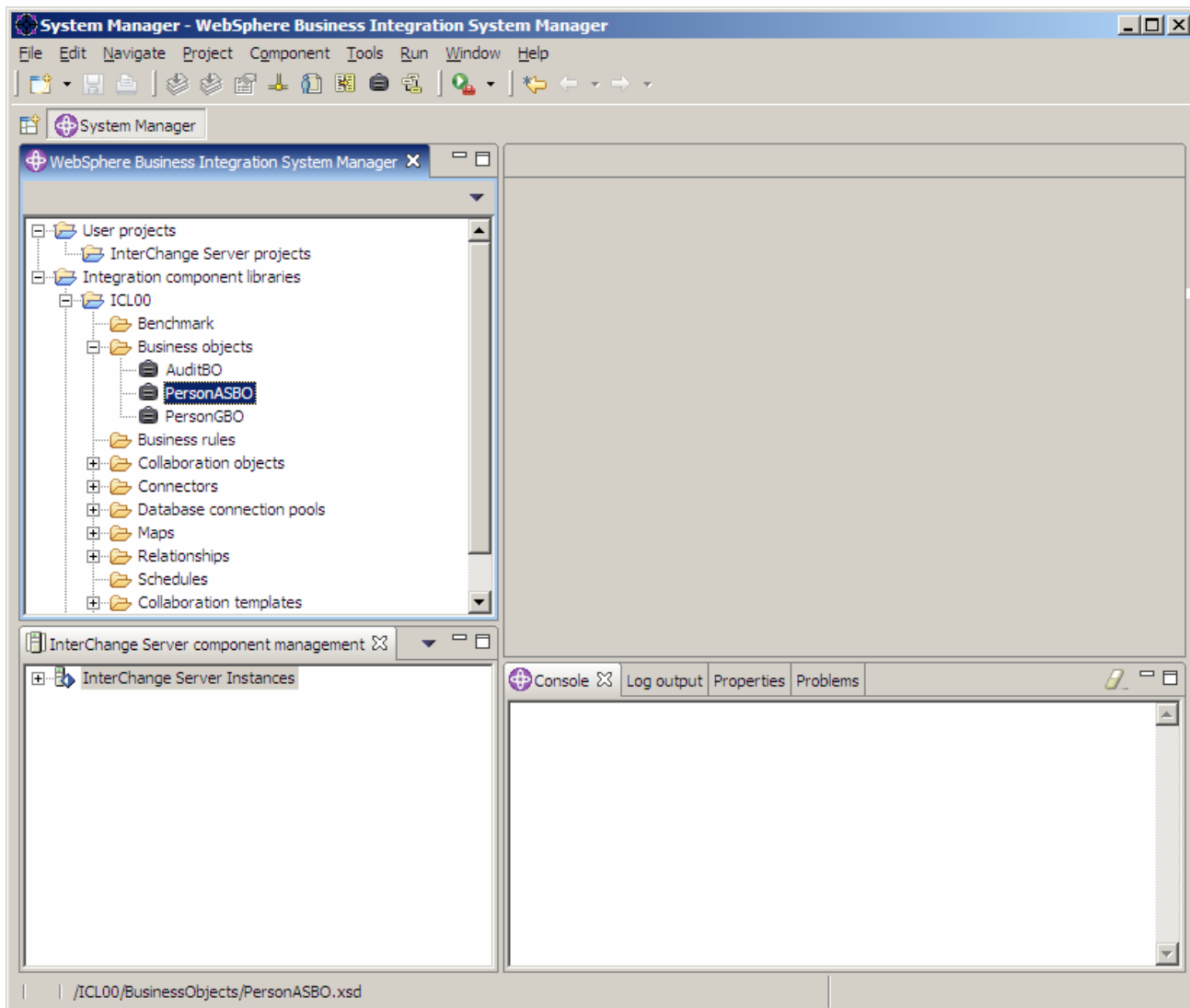


Figure 21: Opening a business objects folder

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3. Click the **General** tab from Business Object Designer and notice the **Business Object Level Application-specific information**, which is **TN=Person** (Figure 22). This information tells the JDBC adapter that the PersonASBO is stored in a table named *Person*. This table must exist in the database that the JDBC adapter agent is monitoring. This was specified in the DataBaseURL property of the JDBCConnector. The actual database name is APPDB00 as specified in the jdbc:db2:localhost/APPDB00 command.

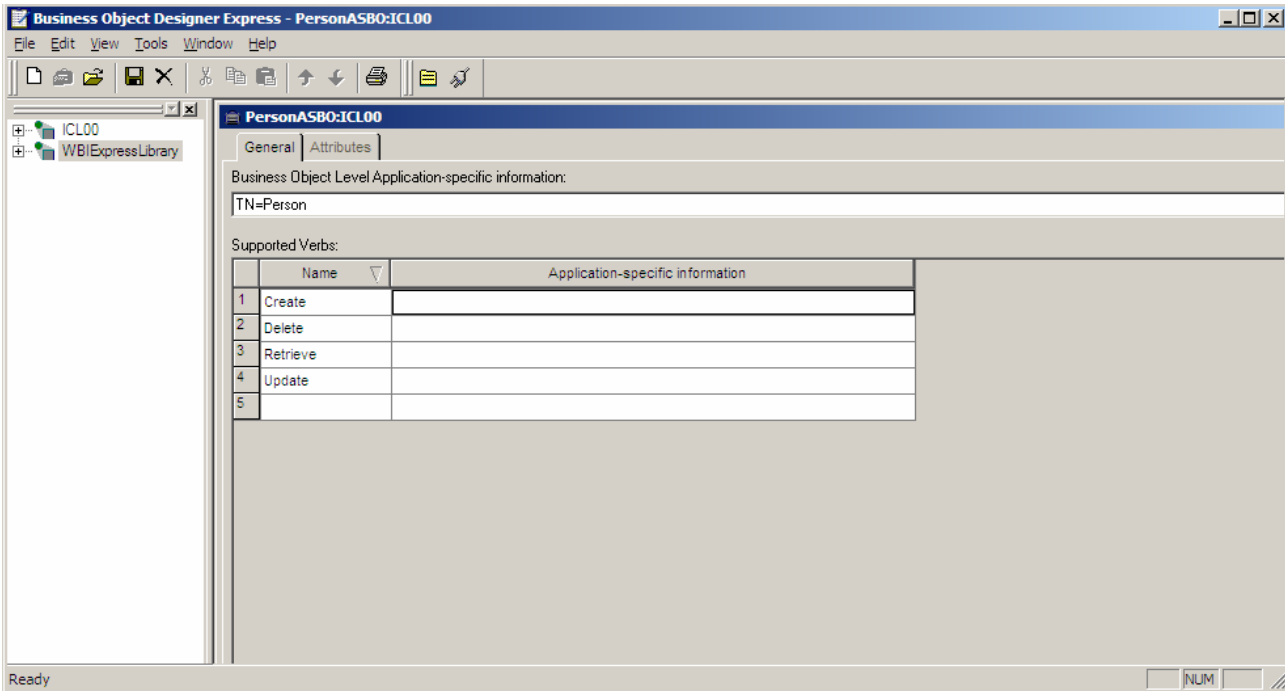


Figure 22: Understanding the Business Object Level Application-specific information

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- Click the **Attributes** tab for the PersonASBO business object (Figure 23). Notice the application-specific information here (CN=CustomerID, CN=FirstName, and so forth). This tells the JDBC adapter agent which column to store the attribute in.

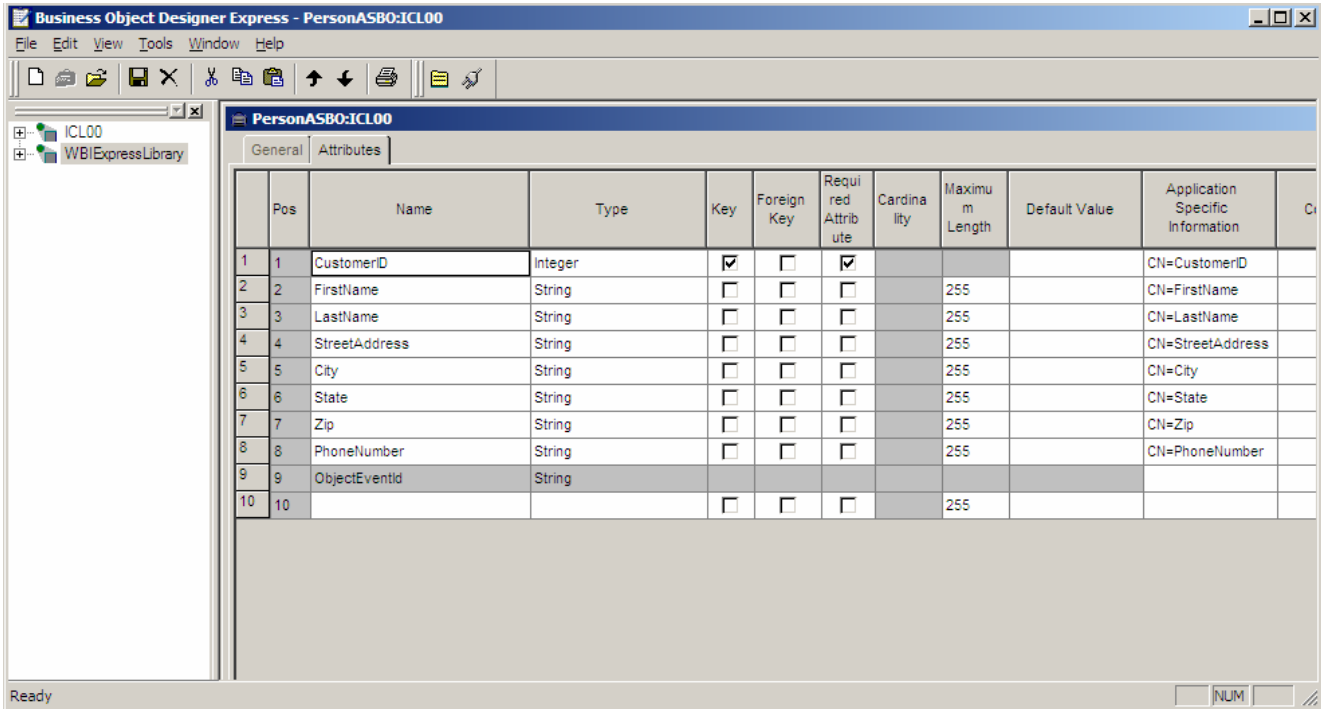


Figure 23: Understanding the PersonASBO business object Attributes

- Exit Business Object Designer.

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- Double-click the **PersonGBO** business object (Figure 24) it from the System Manager screen to open it.

Notice this business object looks almost identical to PersonASBO except that it has no application-specific information, and it also contains a child business object of type AuditBO.

Also notice that PersonGBO only has one attribute for the name (which is *Name*). You will see in the maps that you can join and split attributes to make this implementation easy. This AuditBO stores information that is used in the collaboration to create an entry in a table in the APPDB00. (APPB00 records the time stamp of the event and the Key ID from the business object. As you will see, these values are set in the map.)

	Pos	Name	Type	Key	Foreign Key	Required Attribute	Cardinality	Maximum Length	Default Value	Application Specific Information	Comments
1	1	ID	Integer	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>					
2	2	Name	String	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		255			
3	3	StreetAddress	String	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		255			
4	4	City	String	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		255			
5	5	State	String	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		255			
6	6	Zip	String	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		255			
7	7	PhoneNumber	String	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		255			
8	8	Audit	AuditBO	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	1				
8.1	8.1	BOD	String	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		255			
8.2	8.2	AuditTable	String	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		255			
8.3	8.3	TimeColName	String	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		255	Time		
8.4	8.4	DBPoolName	String	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		255			
8.5	8.5	ObjectEventId	String								
9	9	ObjectEventId	String								
10	10			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		255			

Figure 24: Opening the PersonGBO business object

- When finished, exit Business Object Designer.

## Using Map Designer

The following steps define mapping between application-specific and generic business objects:

1. From the System Manager screen, expand the **Maps** folder in your integration component library.
2. Double-click the **Person\_ASBOToGBO** map to open it in Map Designer (Figure 25). The mapping in this case is very simple; the PersonASBO can be directly moved from the PersonASBO to the PersonGBO. The one exception is that the PersonGBO only has one attribute for the name; thus the mapping uses a **Join** transformation to create the string **FirstName,LastName** in the PersonGBO.
3. Notice that the CustomerID of the PersonASBO (which is the key) is mapped into the **BOID** (business object ID) field of the PersonGBO's AuditBO. This is necessary because the AuditBO contains the key of the events business object. For this simple example, the remaining values of the AuditBO are filled with a **SetValue** transformation.

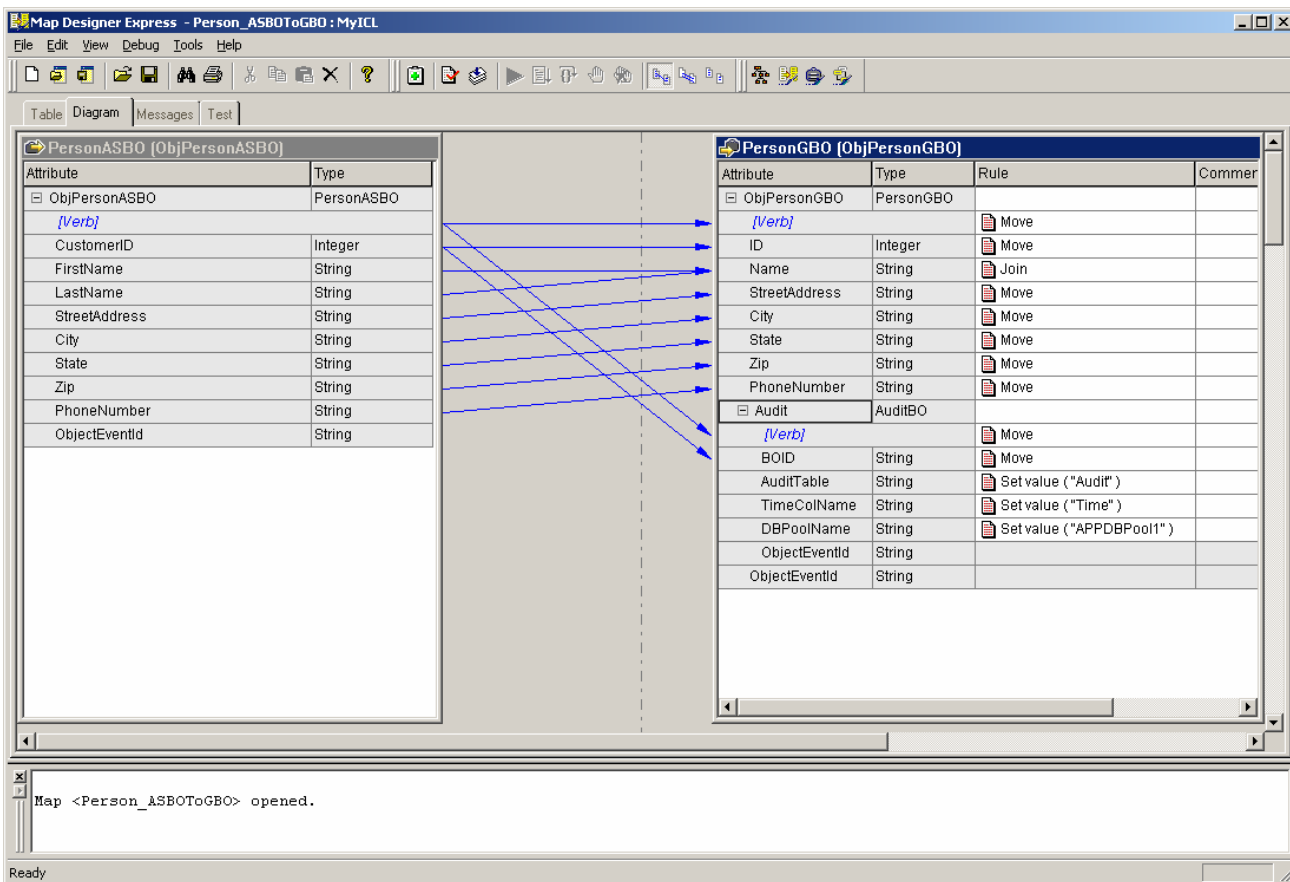


Figure 25: Using Map Designer

**Note:** You can test maps from Map Designer by clicking the **Test** tab and then clicking the **Run** icon. However, you will not do that in this lab.

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4. From the Map Designer screen, right-click the **Join** rule for the **Name** attribute of the PersonGBO and select **Open** to see the **Join** transformation.
5. In Figure 26, there is simply a comma that is put between the first and last name. The comma is also stored in the attribute.
6. Click **Cancel** when you finish viewing the transformation.

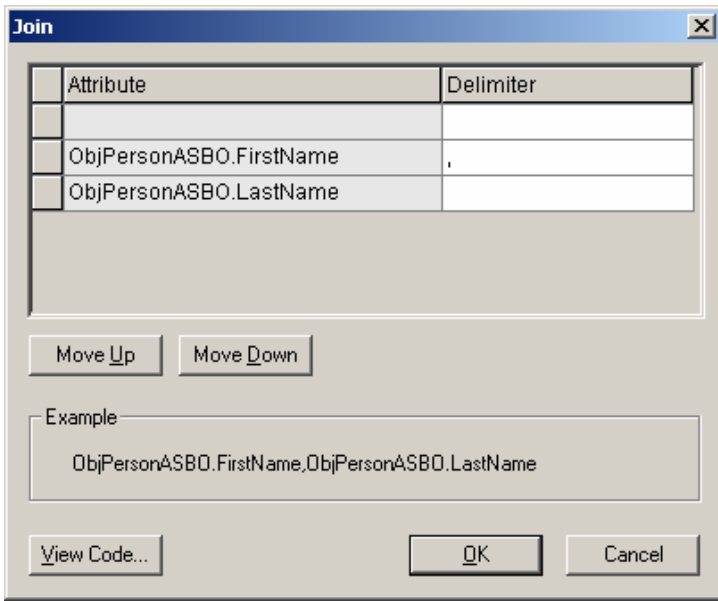


Figure 26: Viewing the Join transformation screen

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7. Open the Person\_GBOTOASBO map in Map Designer by double-clicking it from the System Manager screen.

The only interesting thing about this map is that it must use the split transformation (Figure 27) to separate the first name from the last name in the PersonGBO. Nothing is needed in the ASBO that is related to the AuditBO; therefore, no mappings are necessary.

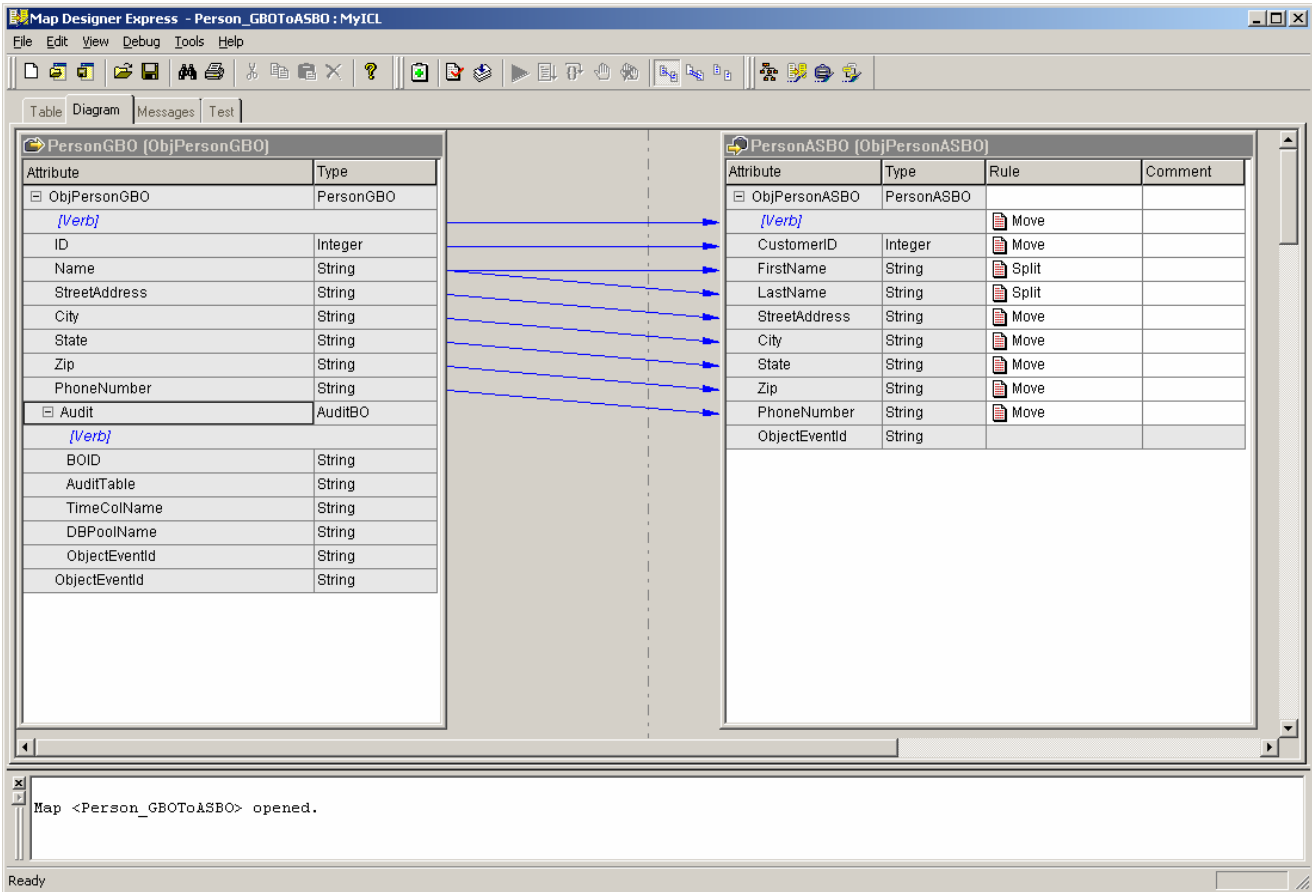


Figure 27: Noticing the split transformation

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8. Right-click each **Split** operation in the PersonASBO to view the mapping.

Notice that FirstName specifies the **Sub-string Index** of **0** (Figure 28), and LastName specifies the **Sub-string Index** of **1** (Figure 29).

9. Click **Cancel** to exit the dialog when you finish viewing it.

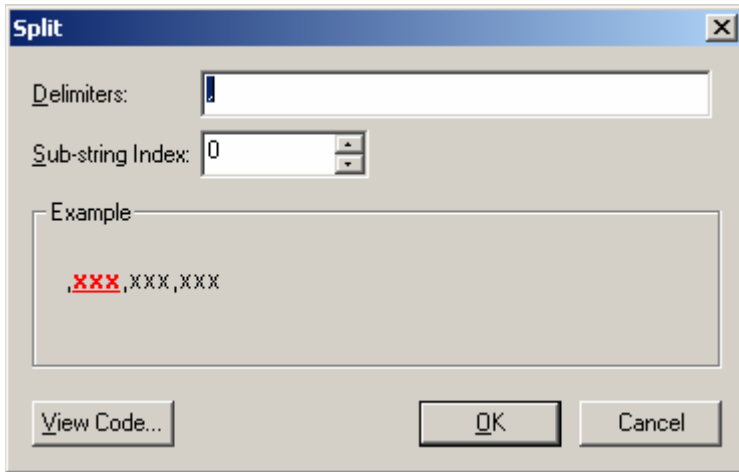


Figure 28: Viewing the FirstName Sub-string Index

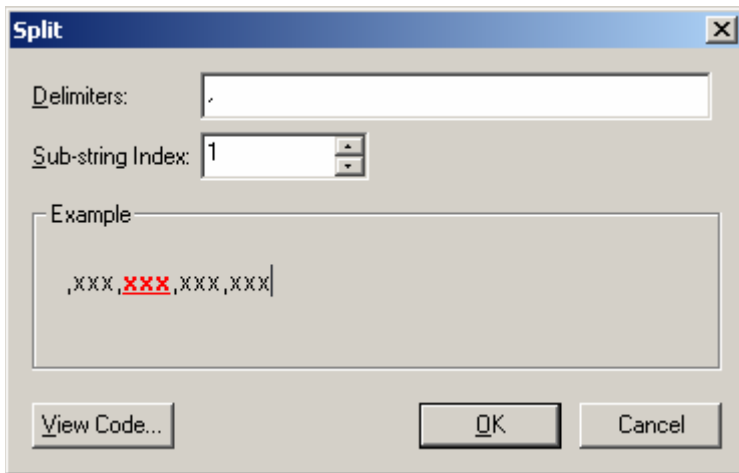


Figure 29: Viewing the LastName Sub-string Index



## Using Process Designer

The steps in this section will show you how to use the Process Designer to view a business process (collaboration):

1. In the System Manager screen, expand the **Collaboration Templates** folder in your integration component library. Then, double-click the **AuditTemplate** collaboration template to open it in the process designer.
2. Double-click the **Definitions** leaf on the left side of the process designer (Figure 30).
3. Select the **Declarations** tab to show the variable definitions that are global to this template.
4. Notice that there is a variable to store the current triggering business object and a database connection object for database operations. There is also a variable to hold the AuditBO, which is a child business object of the PersonGBO.

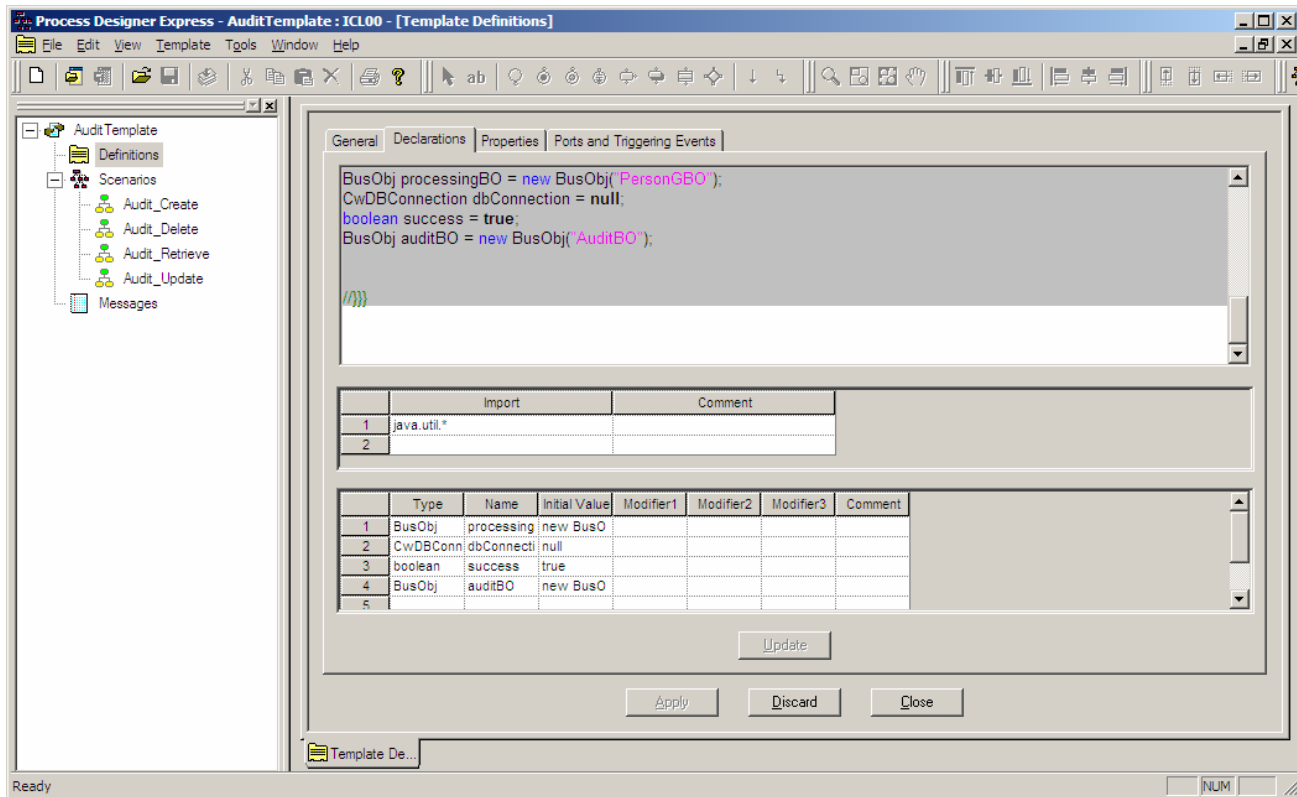


Figure 30: Viewing AuditTemplate definitions

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5. Double-click the **Audit\_Create** scenario (Figure 31) from the left side of the Process Designer screen to open the scenario for the **create** verb.

**Note:** All the scenarios are identical, except that they are triggered by different verbs.

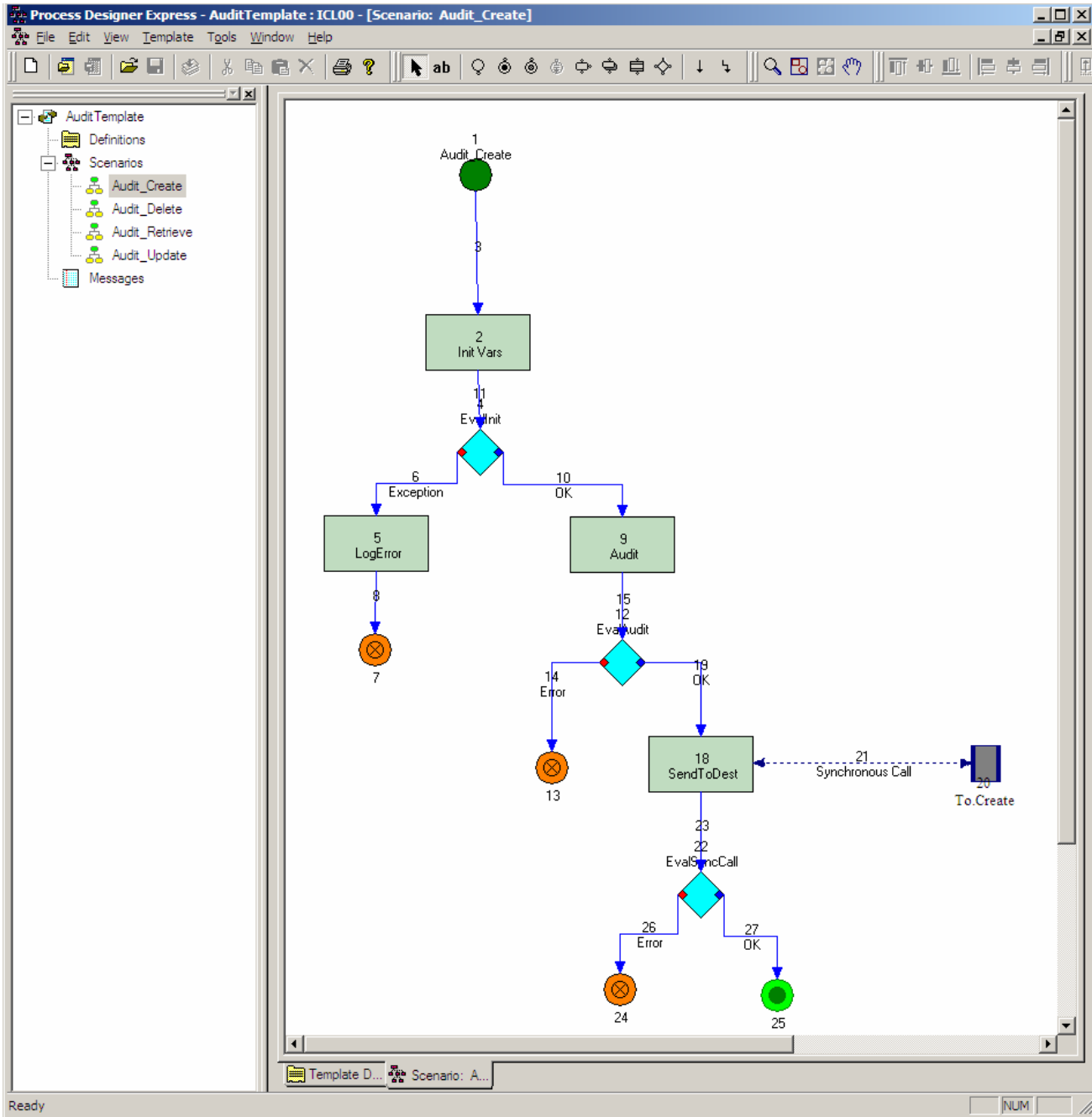


Figure 31: Viewing the Audit\_Create scenario

The logic in this template is quite simple and behaves as follows:

- Attributes are extracted from the triggering business object that contains information necessary to the audit operation. (For example, the AuditBO contains the name of the database connection pool that is needed to obtain the database connection object.)

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- If step 1 is successful, then the actual audit operation is performed, which simply writes the triggering business object's key attribute and the current time stamp into a database table.
- The triggering business object is sent to the destination port.

6. Double-click the **Init Vars** action node in the diagram to view the code (Figure 32).

This code first initializes processingBO as a copy of the triggering business object because it is not good programming practice to operate on the triggering business object. Next, the AuditBO is extracted and saved into the auditBO variable. Finally, the database connection pool name is extracted from the AuditBO, and the database connection object is obtained.

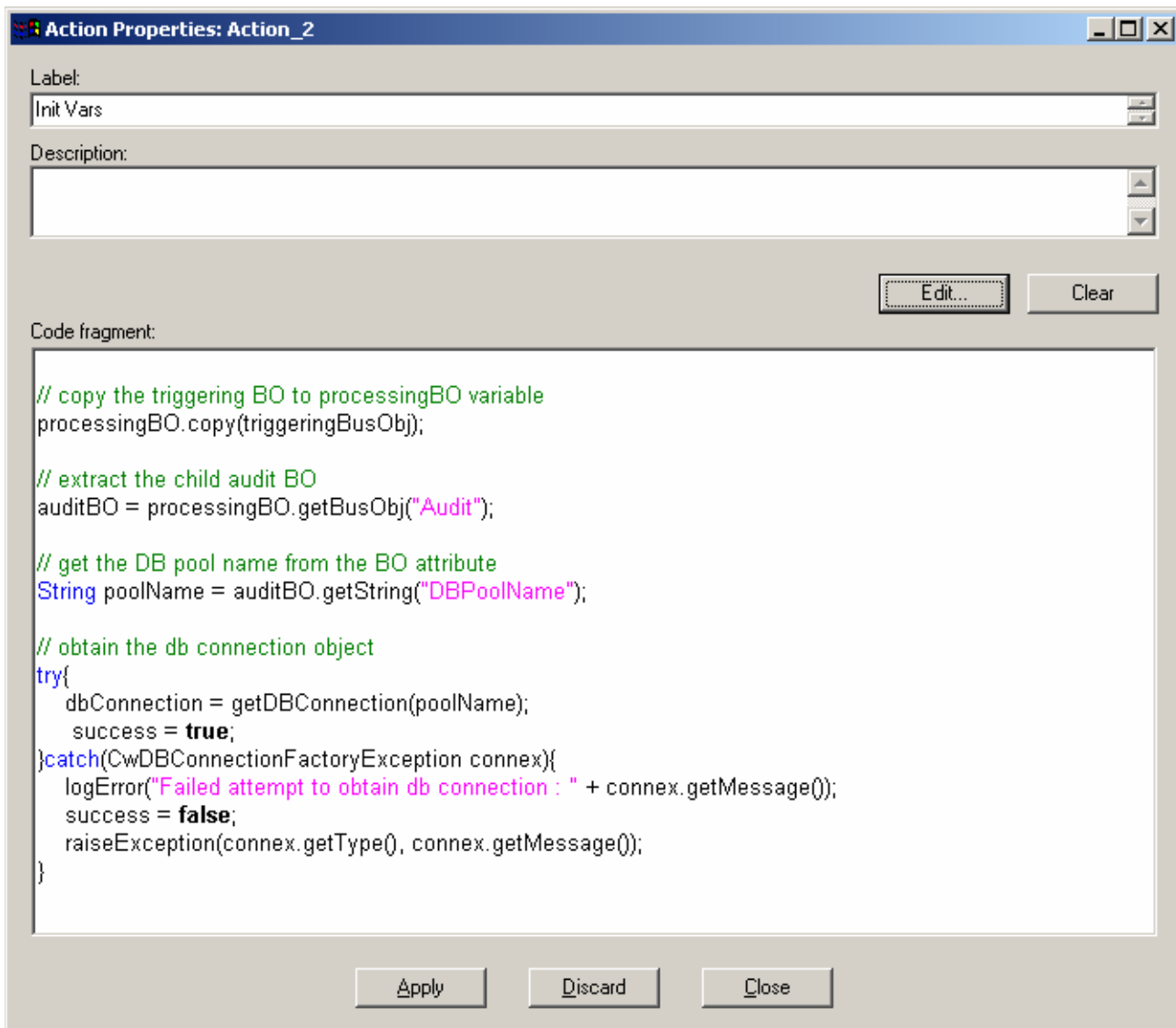


Figure 32: Viewing the code

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7. Double-click the **Audit** action node from the diagram to view its code (Figure 33).

This code first extracts the business object key, the name of the audit table, and the column name to store the time stamp. The code then creates an SQL statement to insert the current time and the key attribute of the triggering business object. This SQL statement is then executed using the database connection object.

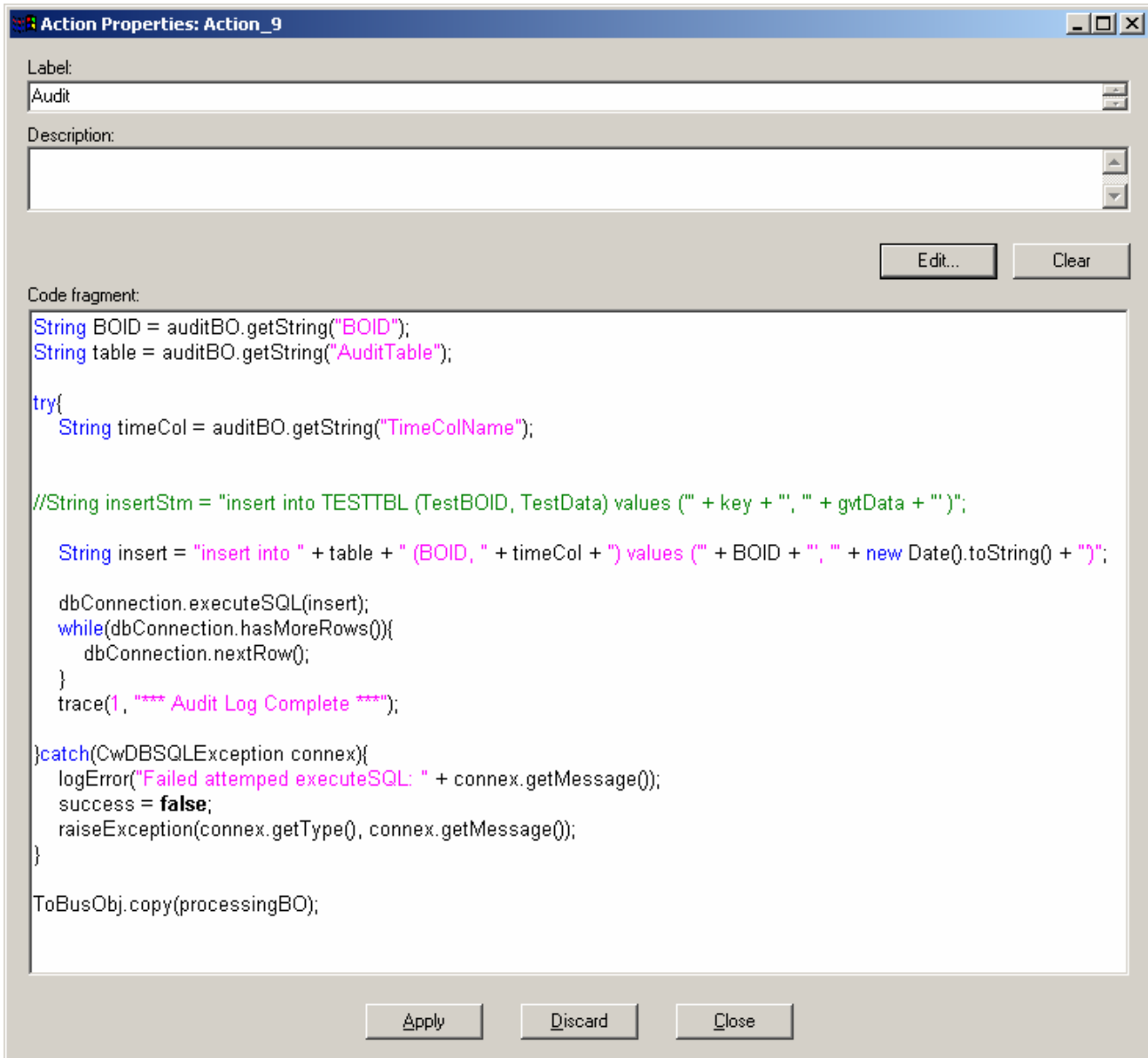


Figure 33: Viewing the Audit action node

## Deploying the project

Before deploying, you first need to create a **User Project** and associate it with your integration component library.

1. From the System Manager screen, expand **User Projects**.
2. Right-click **InterChange Server Projects** and select **New InterChange Server Project**.
3. Enter **ICLProj00** (Figure 34) for the name of the project and select **ICL00** from the available integration component libraries.
4. Click **Finish** to create the project.

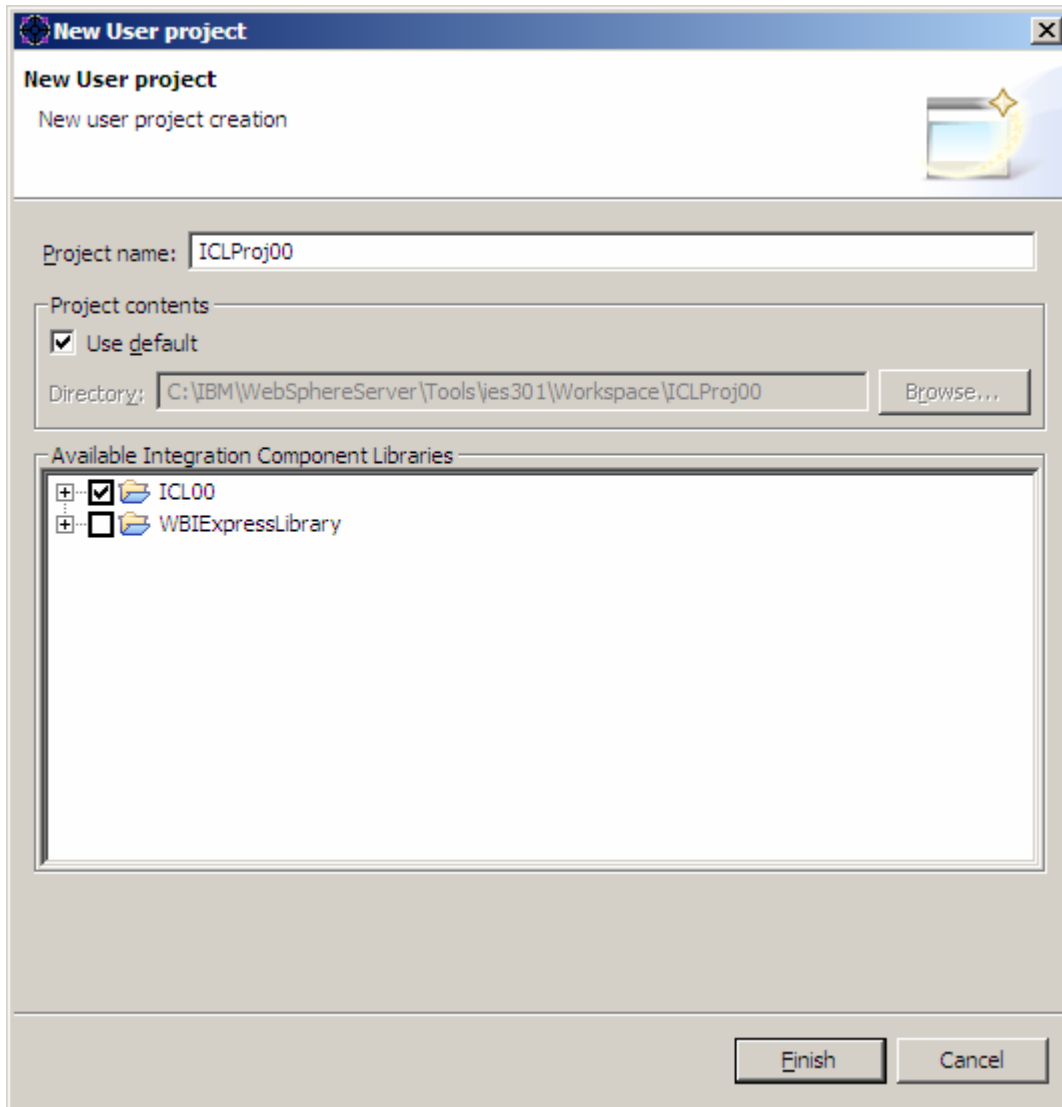


Figure 34: Creating a new user project

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5. Right-click the **ICLProj00** project and select **Deploy user Project**.
6. Select the box next to **ICLProj00** (Figure 35) and check the **Perform Compile (On Server Side)** option.
7. Select the WBI00 server from the drop-down box and click **Finish** to deploy the project to your InterChange Server. This might take a few minutes to complete.

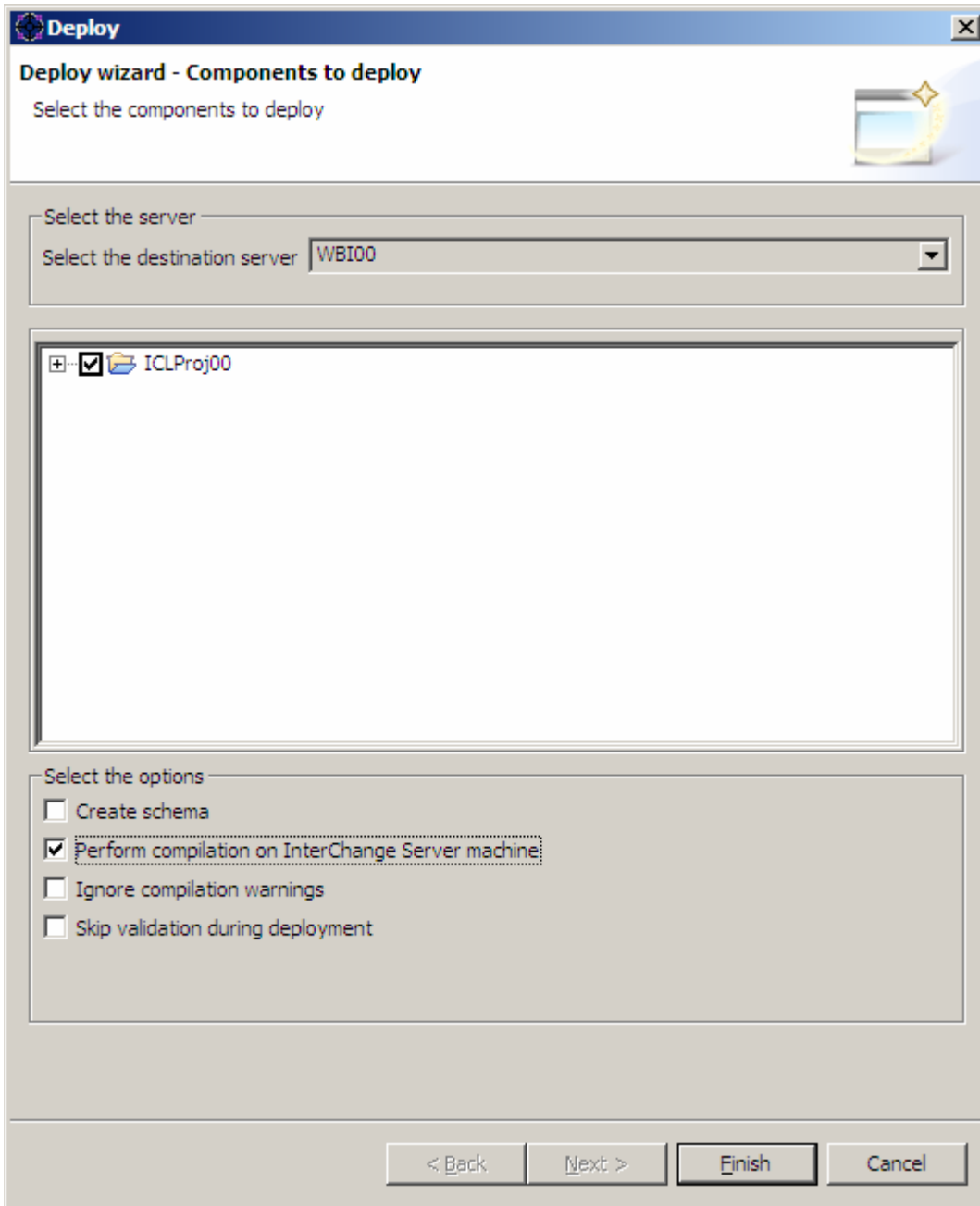


Figure 35: Selecting the components to deploy

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8. After the project deployment is complete, shut down the server gracefully by right-clicking your server instance from the **InterChange Server Component Management** view in the System Manager screen (located in the lower left portion of the System Manager window).
9. Select **Shutdown > Gracefully**.
10. To start the server, open **Start > Programs > IBM WebSphere Business Integration Express > Toolset Express > Administrative > Console**.
11. Enter the following information at the console's server login dialog (Figure 36), then click **OK**:
  - System: your i5/OS system name
  - User ID: WBIUSER00
  - Password: your user profile's password



Figure 36: Entering i5/OS information

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12. From the console, select **Configuration > Rebuild Object Lists**. This will instruct the console to check the iSeries system for any new instances and will add them to the GUI.
13. Select the **InterChange Servers and Connector Agents** tab (Figure 37) from the console to see the WBI00 instance you have created.
14. Select the green icon that corresponds to the WBI00 instance to start the ICS instance.

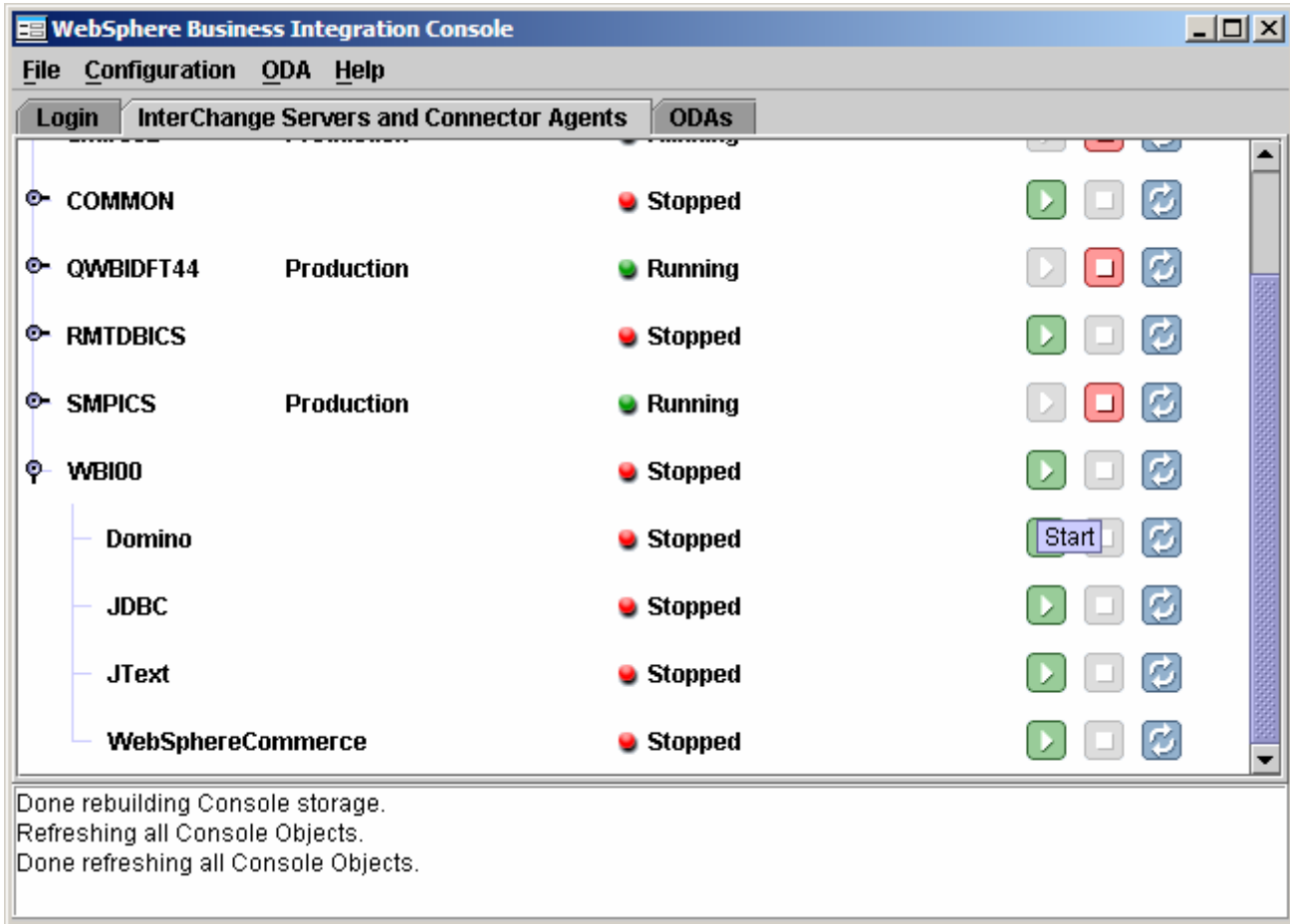


Figure 37: Starting the InterChange Server instance

15. Depending on the content deployed to the InterChange Server instance and the system resources available, it might take a few minutes for the server to come up. Once the instance has started, the WBI00 instance will show up as **Running** from the console.
16. In the System Manager view, right-click your server instance, and select **Connect**. Ensure that both the user ID and password are set to WBI00 (as specified for the RBAC information when creating the instance), and click **OK**.



## Developing and managing business processes with IBM WebSphere Business Integration Server Express on IBM eServer i5

17. After you have connected to your server instance, expand the **Collaboration Objects**, **Connectors**, and **Maps** folders in the **InterChange Server component management** view in the System Manager screen (Figure 38).
18. If any of the elements in the folders are stopped (which is indicated when their icon is red), right-click the stopped element and select **Start**.

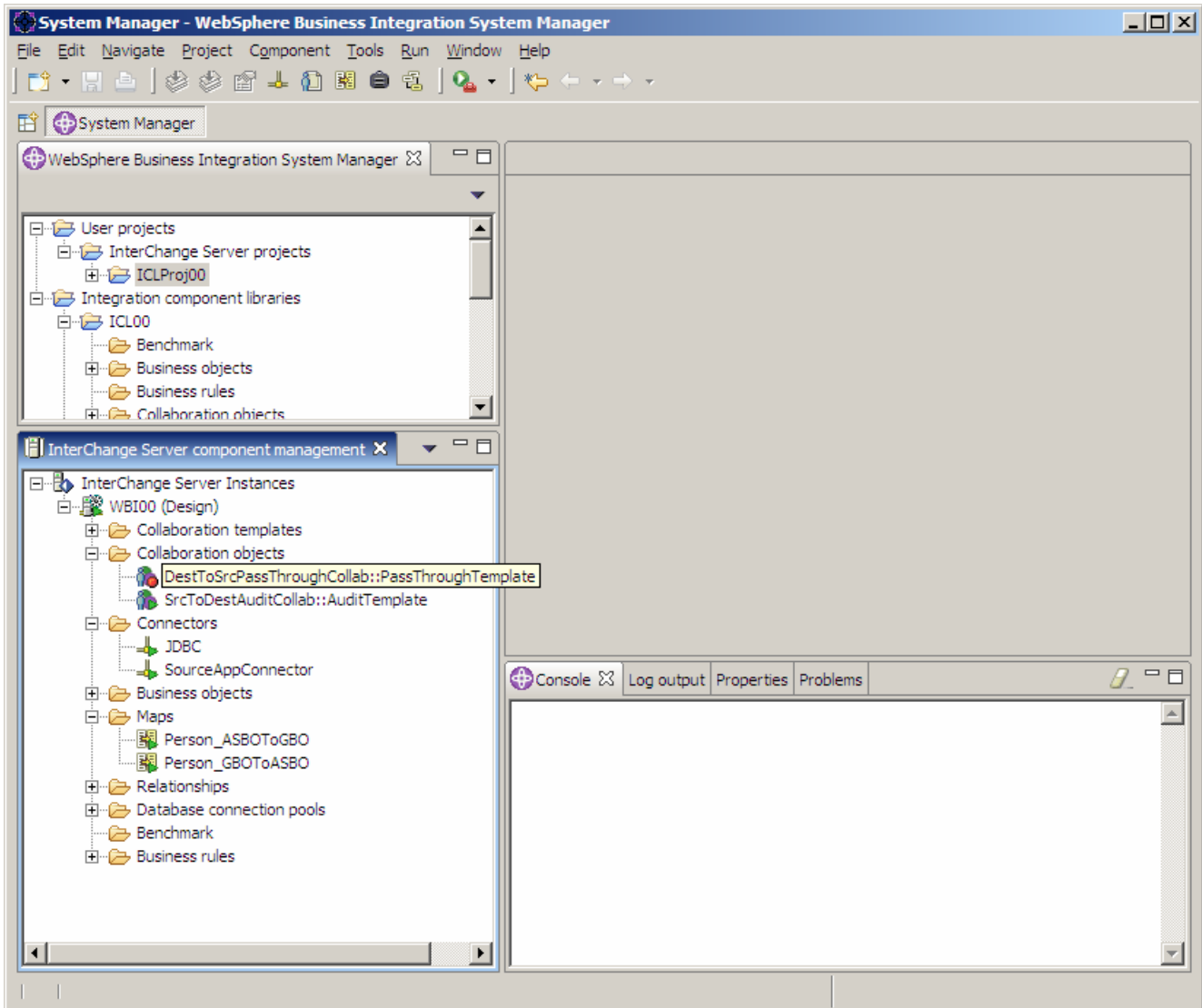


Figure 38: Viewing the InterChange Server component management options

## Testing the solution using Visual Test Connector

Before testing the solution using the Visual Test Connector (VTC), you must first start the JDBC agent on the i5/OS machine.

1. From the console application used to start the server instance, select **JDBC** in the **Adapters** section under the **WB100** instance you created, and click the **Start** icon (Figure 39).

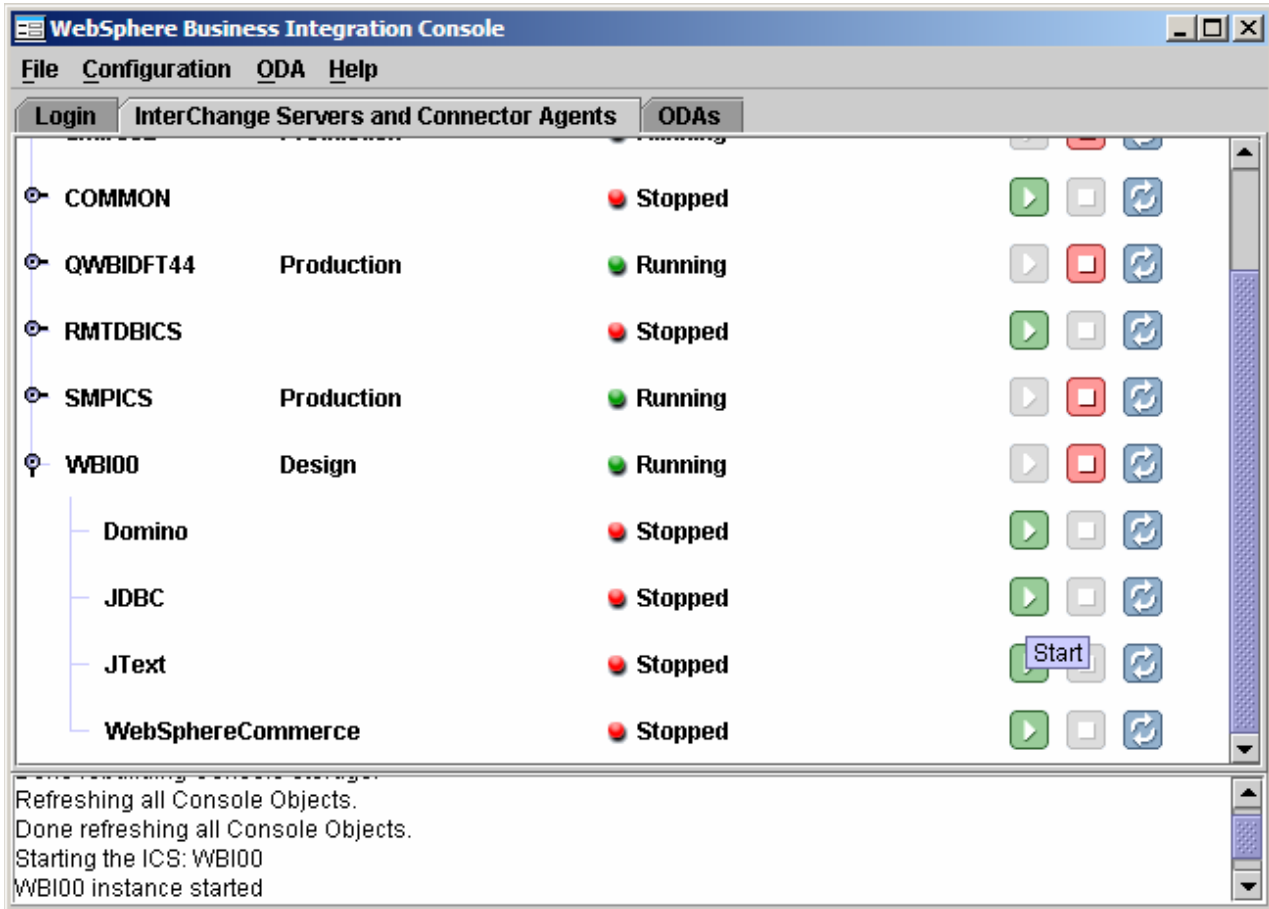


Figure 39: Starting the WB100 instance

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2. To start the VTC tool, open the following program (Figure 30):  
**Start > Programs > IBM WebSphere Business Integration Express > Toolset Express > Development > Test Connector**

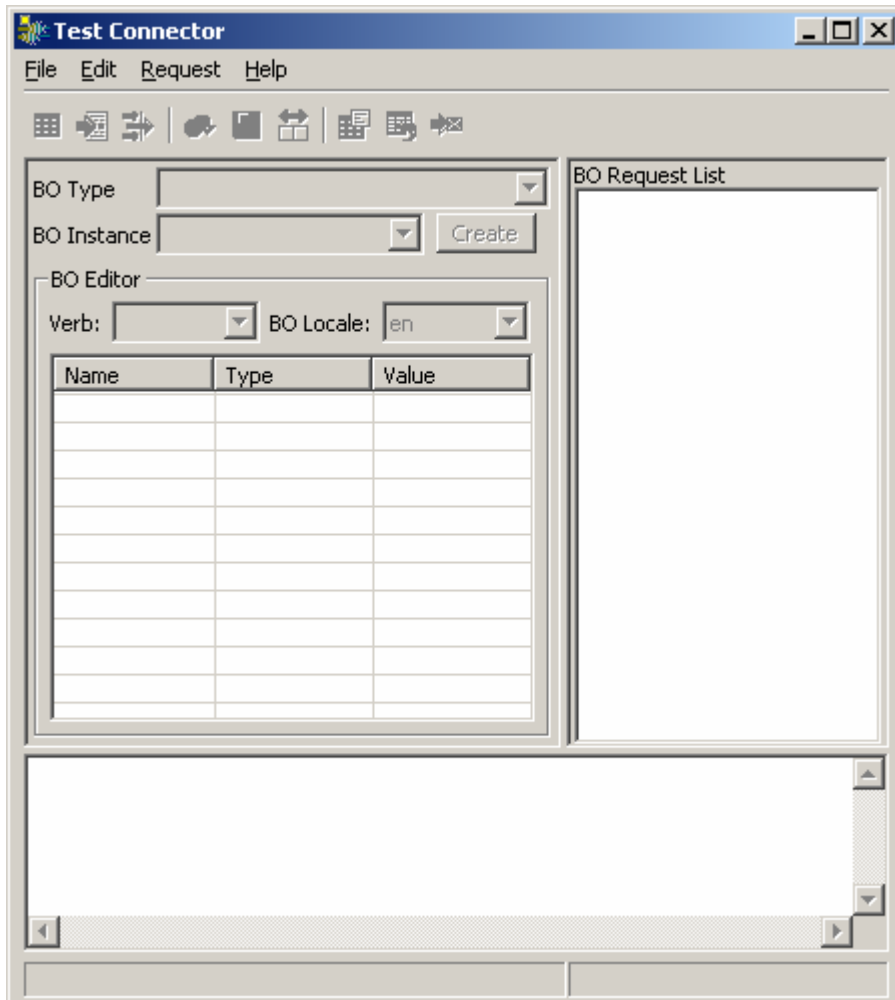


Figure 40: Starting the VTC tool

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3. From the VTC tool, select **File > Create/Select Profile** to open the connector profile dialog.
4. In the Connector Profile dialog, select **File > New Profile** (Figure 41).

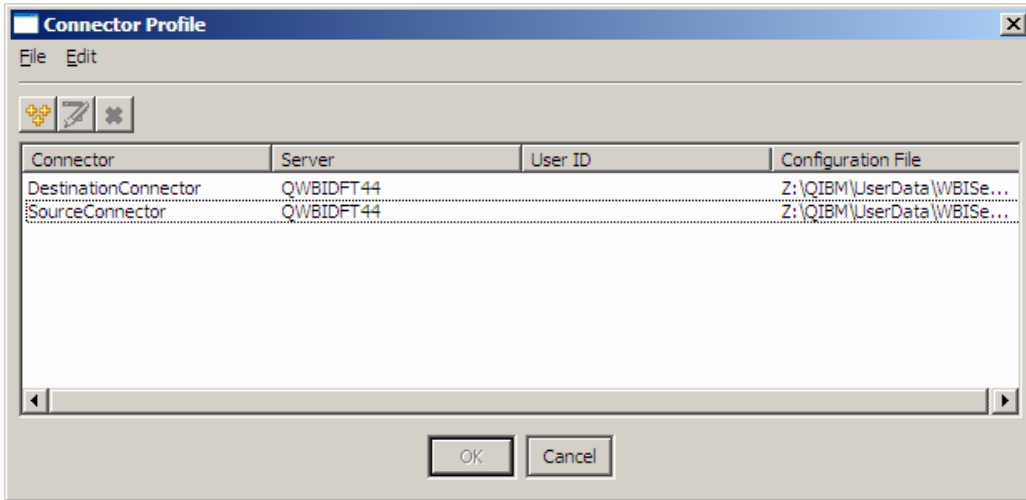


Figure 41: Selecting a profile

5. In the New Profile dialog, click **Browse** to select the connector configuration to use in the profile.
6. Browse to the SourceAppConnector that was saved to your desktop earlier in the lab, and click **Open** (Figure 42).

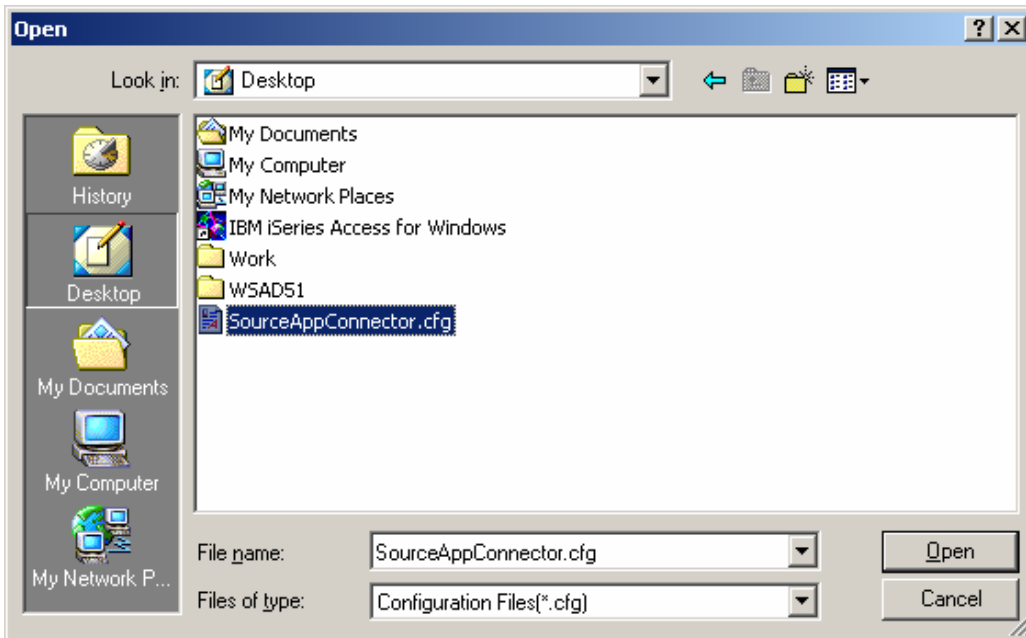


Figure 42: Opening SourceAppConnector.cfg

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7. Complete the remaining fields in the **New Profile** dialog (Figure 43) using the following values:
  - a. Connector Name: SourceAppConnector.
  - b. Broker Type: ICS
  - c. Server: WBI00
  - d. User ID: WBI00 (**Note:** This is the RBAC user ID.)
  - e. Password: WBI00 (**Note:** This is the RBAC password.)

Select the connector configuration file:

C:\Documents and Settings\Administrator\Desktop\jars\COMMC Browse

Connector

Connector Name SourceAppConnector

Broker Type ICS

Server

Server WBI00

User ID WBI00

Password \*\*\*\*\*

OK Cancel

Figure 43: Entering New Profile dialog information

8. Click **OK** to create the connector profile.
9. From the Connector Profile dialog, select the SourceAppConnector profile just created, and click **OK** (Figure 44).

Connector	Server	User ID	Configuration File
DestinationConnector	QWBIDFT44		Z:\QIBM\UserData\WBISe...
SourceConnector	QWBIDFT44		Z:\QIBM\UserData\WBISe...
SourceAppConnector	WBI00	WBI00	C:\Documents and Setting...

OK Cancel

Figure 44: Selecting the SourceAppConnector profile

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10. Select **File > Connect** from the VTC window to connect to the server instance using the profile information just selected.

You will see a message indicating that a connection has been made to the server in the lower portion of the VTC window (Figure 45).

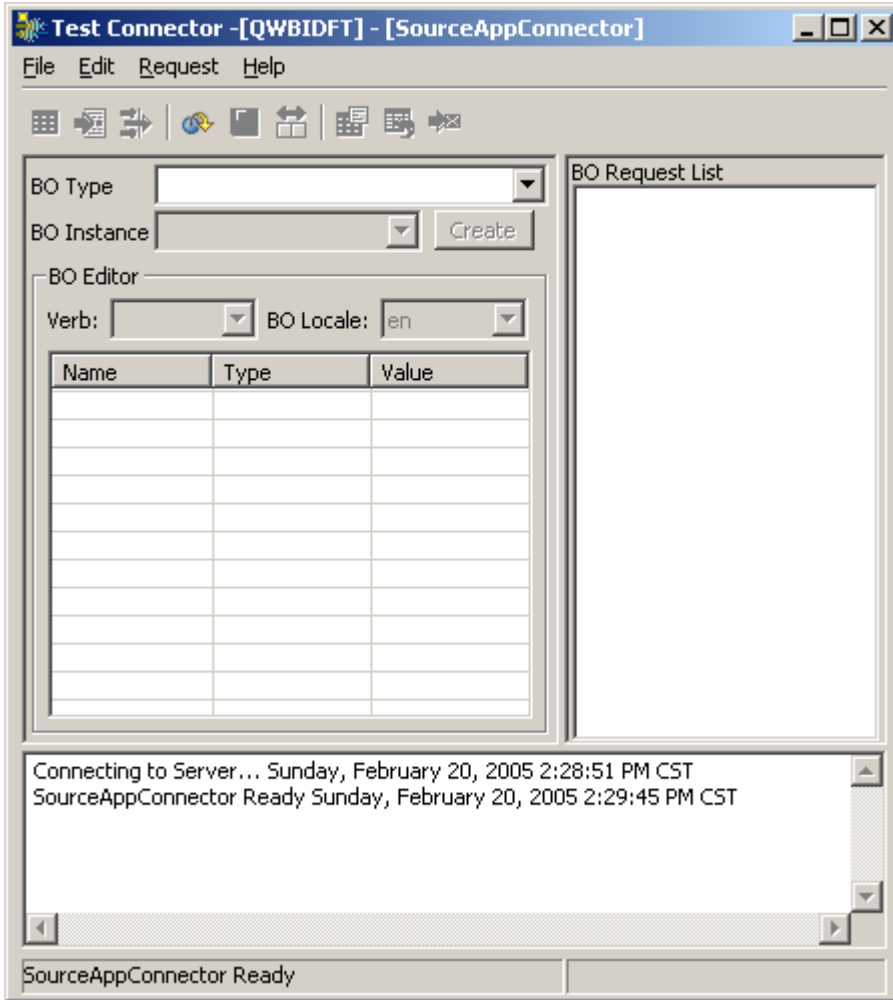


Figure 45: Seeing the server connection message

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11. In the **BO Type** drop-down box, select **PersonASBO**.
12. Click the **Create** button (Figure 46) to create a new instance of the PersonASBO business object.

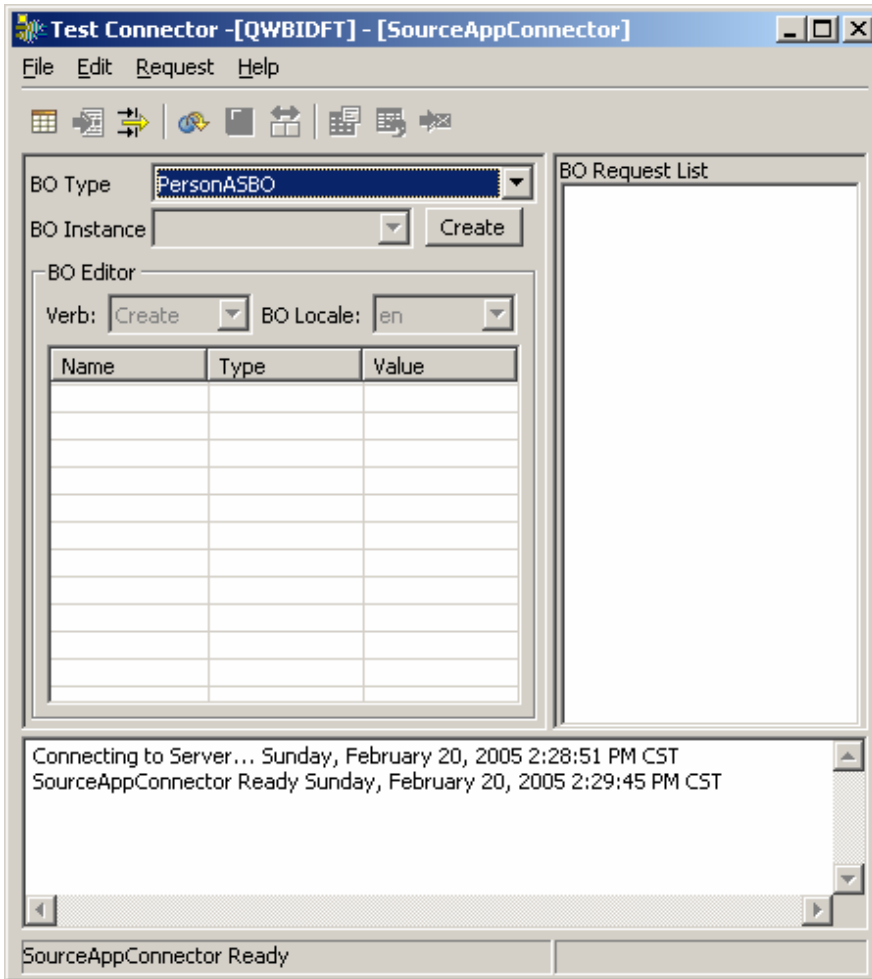


Figure 46: Creating a new PersonASBO business object instance

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13. Enter any name you want for the **New Instance** name (this name is irrelevant), and click **OK** (Figure 47).

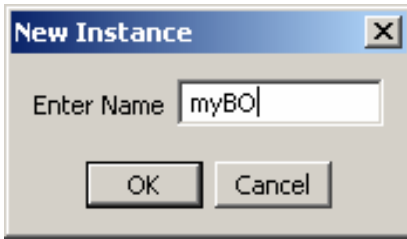


Figure 47: Entering the New Instance name

14. You will now see the attributes of the business object in the **Business Object Editor** portion of the VTC window.
15. Enter some data for each of the business object attributes (the values are arbitrary) (Figure 48).
16. Ensure the **CustomerID** attribute is a valid integer. (In other words, use only numbers.)
17. After entering some data for the business object, select **Request > Send** from the VTC menu to send the business object to the server.

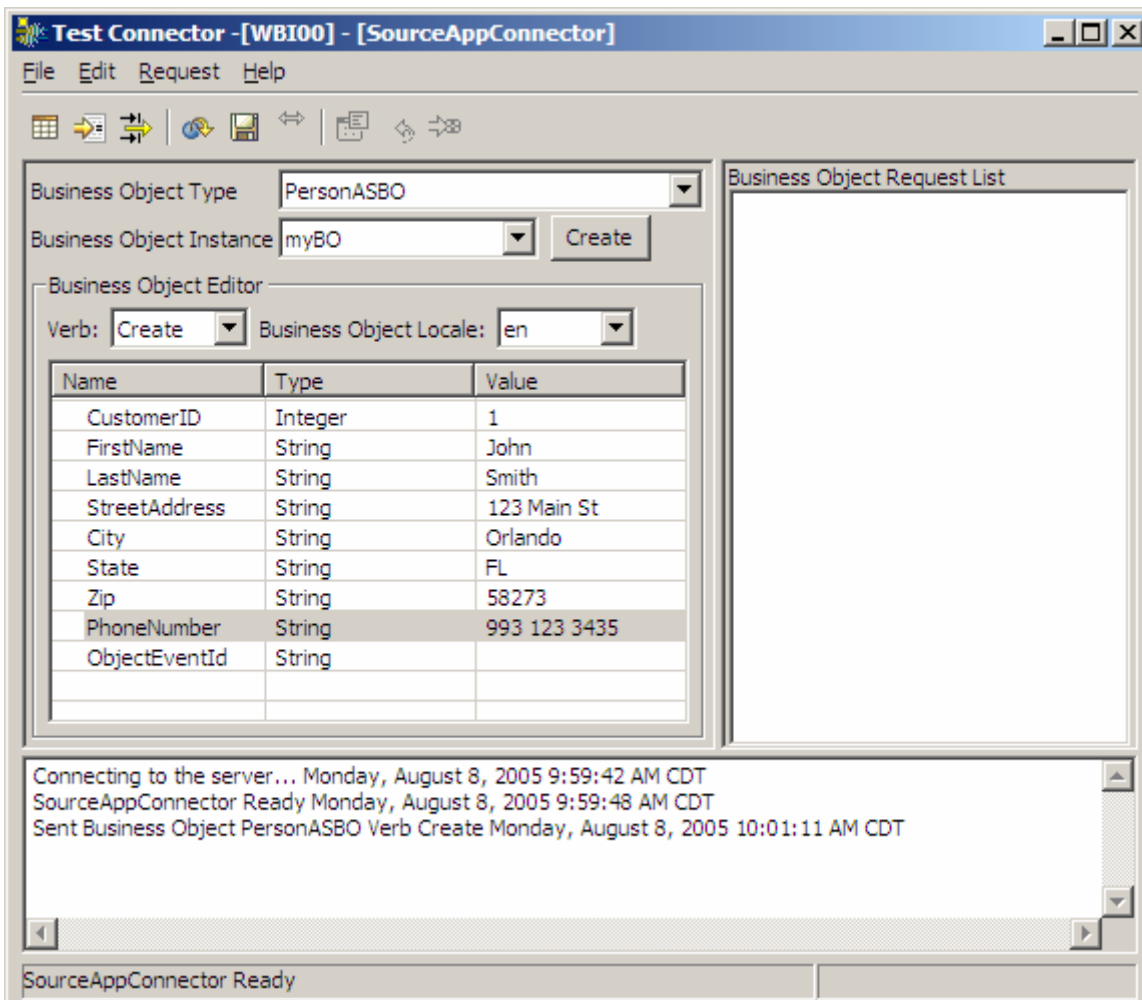


Figure 48: Entering business object attributes



## Developing and managing business processes with IBM WebSphere Business Integration Server Express on IBM eServer i5

- To view the database tables, start an SQL session from the 5250 session by entering **STRSQL**. To view the contents on the audit table, enter: `SELECT * FROM APPDB00/AUDIT`
- Here, you will see your CustomerID attribute for the **BOID** column (Figure 49) that was specified in the Virtual Test Connector a few steps ago. Also, you will find the time stamp for this event in the **TIME** column of the database table.

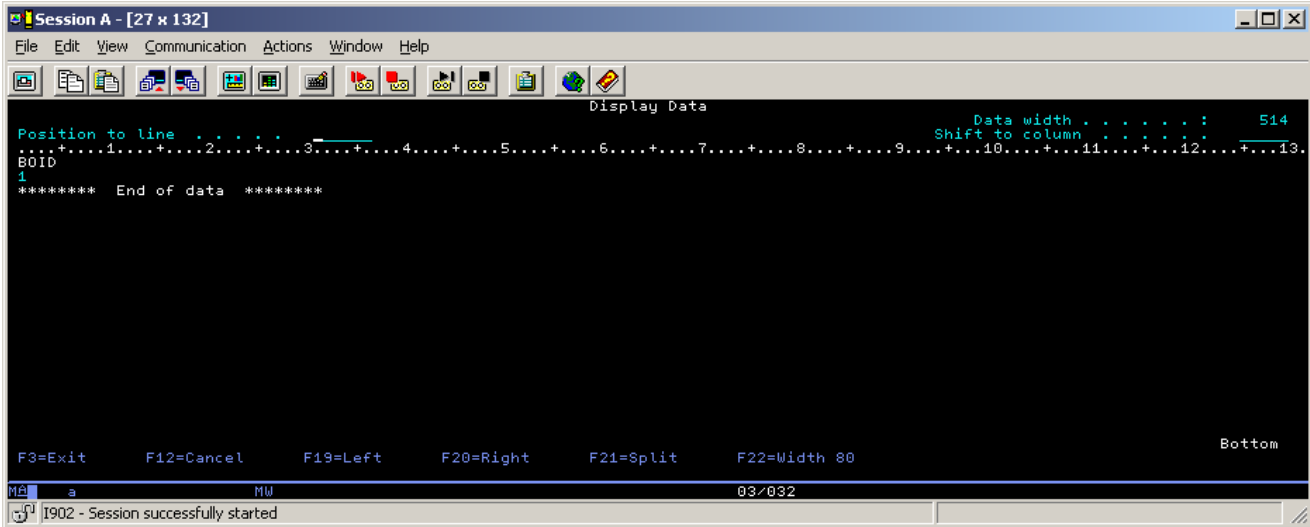


Figure 49: Viewing the CustomerID attribute information for the BOID column

- Similarly, you can verify that the attributes of the business object were saved into the **Person** table (Figure 50) by entering the following SQL statement:  
`SELECT * FROM APPDB00/PERSON`

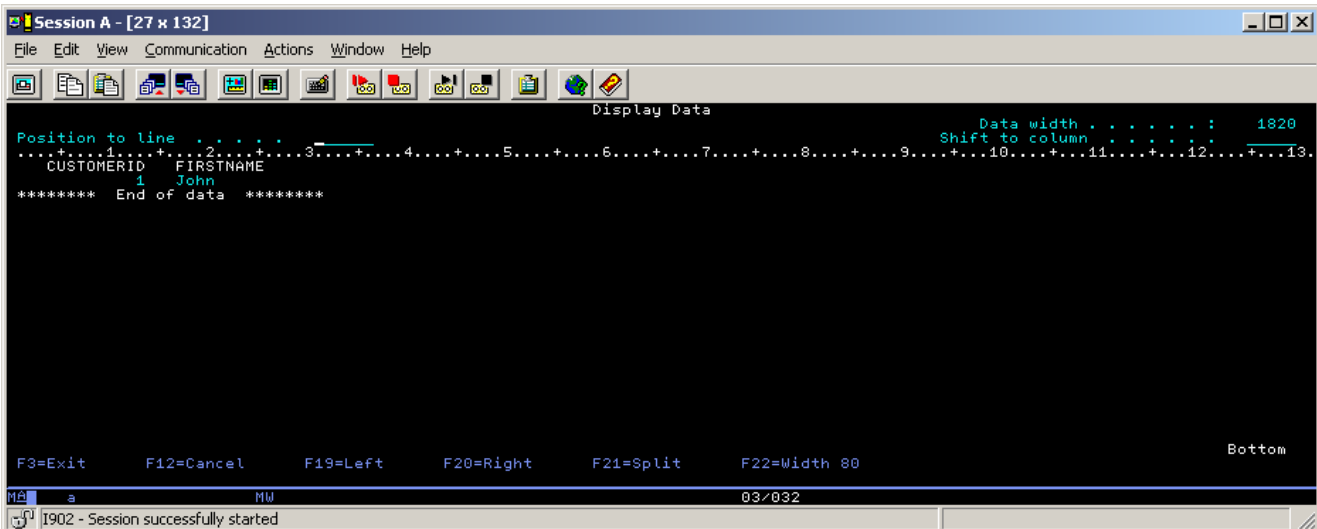


Figure 50: Verifying the Person table information

You have now successfully sent a business object from your Virtual Test Connector to the ICS where it executed the collaboration. You have also sent the business object to the JDBC connector where a record was written to the database.

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To demonstrate the polling feature of the JDBC adapter, you will run a command line script that will execute some SQL to produce an **INSERT** statement. You will also insert some sample data into the Person\_Event table. A database trigger is set up for the Person\_Event table that extracts the newly inserted data and inserts it into the XWORLDS\_EVENTS table. The JDBC agent is set up to inspect this event table, and properties related to this polling mechanism can be set in the adapter agent from the Connector Configurator window.

1. Execute the following CL statement from the iSeries command line:  
CALL WBICOMMON/APPDBINS PARM('APPDB00' 'WBIUSER00')
2. In the Virtual Test Connector window, you will see a PersonASBO with a **Create** verb (Figure 51).

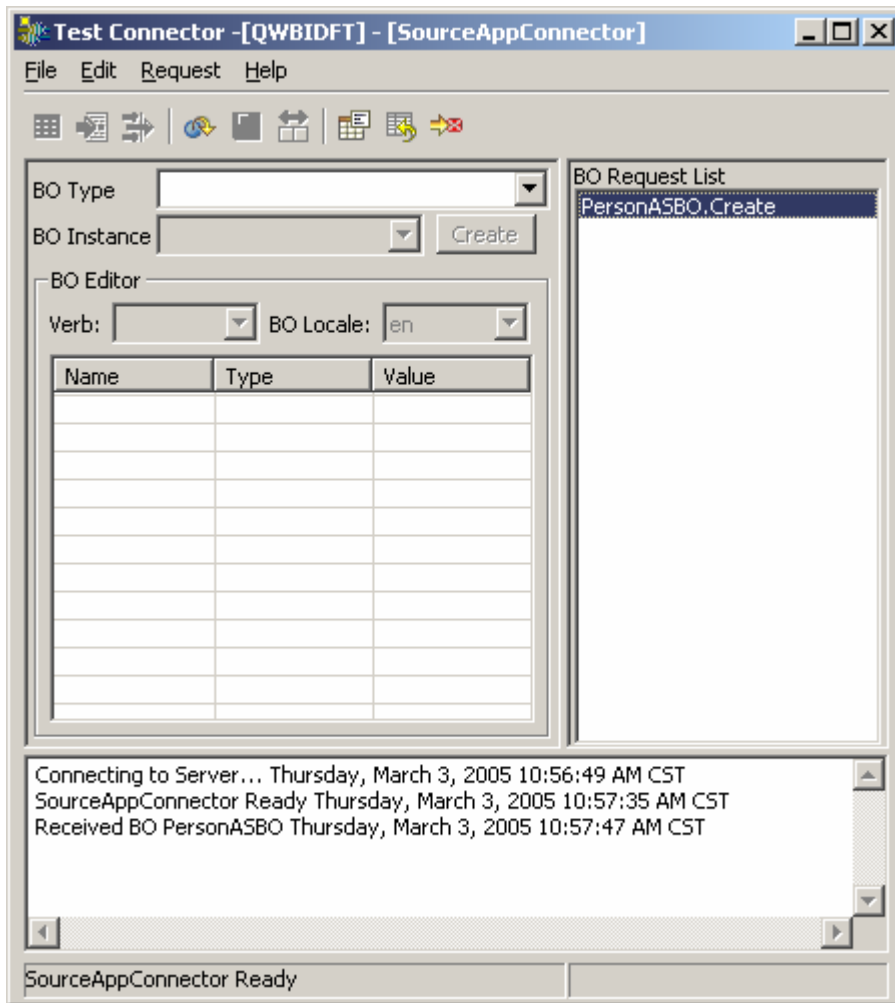


Figure 51: Finding the PersonASBO.Create verb

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3. Double-click the business object to open and view its contents (Figure 52).

Name	Type	Value
CustomerID	Integer	9899845
FirstName	String	Jane
LastName	String	Doe
StreetAddress	String	1234 SomeStreet St
City	String	Rochester
State	String	MN
Zip	String	55901
PhoneNumber	String	123 456 7899
ObjectEventId	String	JDBC_9899845xworlds_events20050810104607....

Figure 52: Viewing the business object contents

4. When you finish inspecting the business object, click **OK**.
5. It is necessary to send a reply to complete the process, select **Request > Reply > Success**.

You have now successfully inserted a record in your application database. The JDBC connector picked it up and sent it through the collaboration to your Virtual Test Connector.

## Conclusion

This concludes the lab exercise. Although the exercise was simple and you did not develop a collaboration business process, this introduction to the product and its tools will hopefully heighten your interest. It will also give you a basis for developing a real solution using this product.

### *Cleaning up your i5/OS system*

To clean up your i5/OS system and your PC, follow these steps:

1. Exit the Virtual Test Connector window.
2. From the System Manager screen, select your JDBC adapter. Right-click it and select **Shutdown JDBC**. This will end your JDBC connection.
3. From the System Manager screen, select your InterChange Server, **WBI00**. Right-click it and select **shutdown gracefully**. This will end your InterChange Server.
4. Right-click your **User Project**, and select it to be deleted.
5. Right-click your integration component library and select it to be deleted.
6. Exit the System Manager screen.
7. Exit the console.

**END OF LAB**

## Resources

These Web sites provide reference materials to supplement the information contained within this lab:

- IBM Publications Center  
[www.elink.ibm.link.ibm.com/public/applications/publications/cgibin/pbi.cgi?CTY=US](http://www.elink.ibm.link.ibm.com/public/applications/publications/cgibin/pbi.cgi?CTY=US)
- WebSphere Business Integration Server Express  
[ibm.com/software/integration/wbiserverexpress](http://ibm.com/software/integration/wbiserverexpress)
- WebSphere Business Integration Toolset  
[ibm.com/software/integration/wbitools](http://ibm.com/software/integration/wbitools)
- Connector Configurator toolset  
[ibm.com/software/integration/wbitools/connconfig](http://ibm.com/software/integration/wbitools/connconfig)
- Map Designer toolset  
[ibm.com/software/integration/wbitools/map](http://ibm.com/software/integration/wbitools/map)
- Process Designer toolset  
[ibm.com/software/integration/wbitools/process](http://ibm.com/software/integration/wbitools/process)
- WebSphere InterChange Server  
[ibm.com/software/integration/wbiserver/ics](http://ibm.com/software/integration/wbiserver/ics)
- WebSphere MQ  
[ibm.com/software/integration/wmq](http://ibm.com/software/integration/wmq)
- IBM developerWorks® WebSphere Business Integration Zone: The Big Picture  
[ibm.com/developerworks/websphere/zones/businessintegration/bigpicture.html](http://ibm.com/developerworks/websphere/zones/businessintegration/bigpicture.html)
- IBM WebSphere Business Integration information center  
[publib.boulder.ibm.com/infocenter/wbihelp/index.jsp](http://publib.boulder.ibm.com/infocenter/wbihelp/index.jsp)
  - click on **Server Express**

### Online prerequisite courses

- WebSphere Business Integration on the IBM eServer iSeries platform  
[ibm.com/servers/enable/site/education/abstracts/436a\\_abs.html](http://ibm.com/servers/enable/site/education/abstracts/436a_abs.html)
- Getting Started with IBM WebSphere Business Integration Server Express Plus on the IBM eServer i5 platform  
[ibm.com/servers/enable/site/education/abstracts/6cc6\\_abs.html](http://ibm.com/servers/enable/site/education/abstracts/6cc6_abs.html)
- IBM Redbooks™ ([ibm.com/redbooks](http://ibm.com/redbooks))

**Developing and managing business processes with  
IBM WebSphere Business Integration Server Express on IBM eServer i5**

**Other online WebSphere Business Integration courses**

- [ibm.com/services/learning/us/catalog/wbi](http://ibm.com/services/learning/us/catalog/wbi)
  - **WebSphere Business Integration Server**
    - BI101: Implementing InterChange Server and Toolset
    - BI103: InterChange Server Deployment Workshop
    - BI104: Introduction to Server and Toolset
  - **WebSphere Business Integration Toolset**
    - BI140: Advanced Mapping
    - BI141: Advanced Cross Referencing
    - BI145: Collaboration Development
  - **WebSphere Business Integration Connect**
    - BI152: WebSphere Business Integration Connect
  - **WebSphere Business Integration Adapters**
    - BI160: Adapter Development
    - BI161: Introduction to WebSphere Business Integration and Adapter Development
    - BI201: Adapter for mySAP.com
  - **WebSphere Business Integration Modeler/Monitor**
    - BI180: WebSphere Business Integration Modeler
    - BI181: WebSphere Business Integration Monitor

**IBM Technotes**

- WebSphere Business Integration Server Role Based Access Control (RBAC)  
(Reference #1219615, updated November 2005)  
[ibm.com/support/docview.wss?uid=swg21219615](http://ibm.com/support/docview.wss?uid=swg21219615)

## **About the author**

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Beth L. Hoffman has worked as a software engineer for IBM in Rochester, Minnesota, for more than 15 years. For much of that time, she led the development of key middleware products for the IBM OS/400® and i5/OS operating environment. Today, she is a technical consultant working with solution providers who are modernizing their applications with new technologies. You can e-mail Beth at [bethvh@us.ibm.com](mailto:bethvh@us.ibm.com).

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