JADE Installation and Administration Course

VERSION 2016

jade

Contents

Overview

This course is designed to give you the information you need to successfully install and administer a JADE application in your organization.

From time to time, upgrades and enhancements will be sent that you will need to apply to your system. Although full instructions will accompany these updates, an understanding of the way a JADE system works and the purpose of operational procedures will give you greater confidence in managing these changes.

The example application used on this course to practice installation, administration, and operational activities is the **Erewhon** e-commerce system. All skills developed using the practice system can be applied to the installation, administration, and operation of your own system.

The course schedule is as follows.

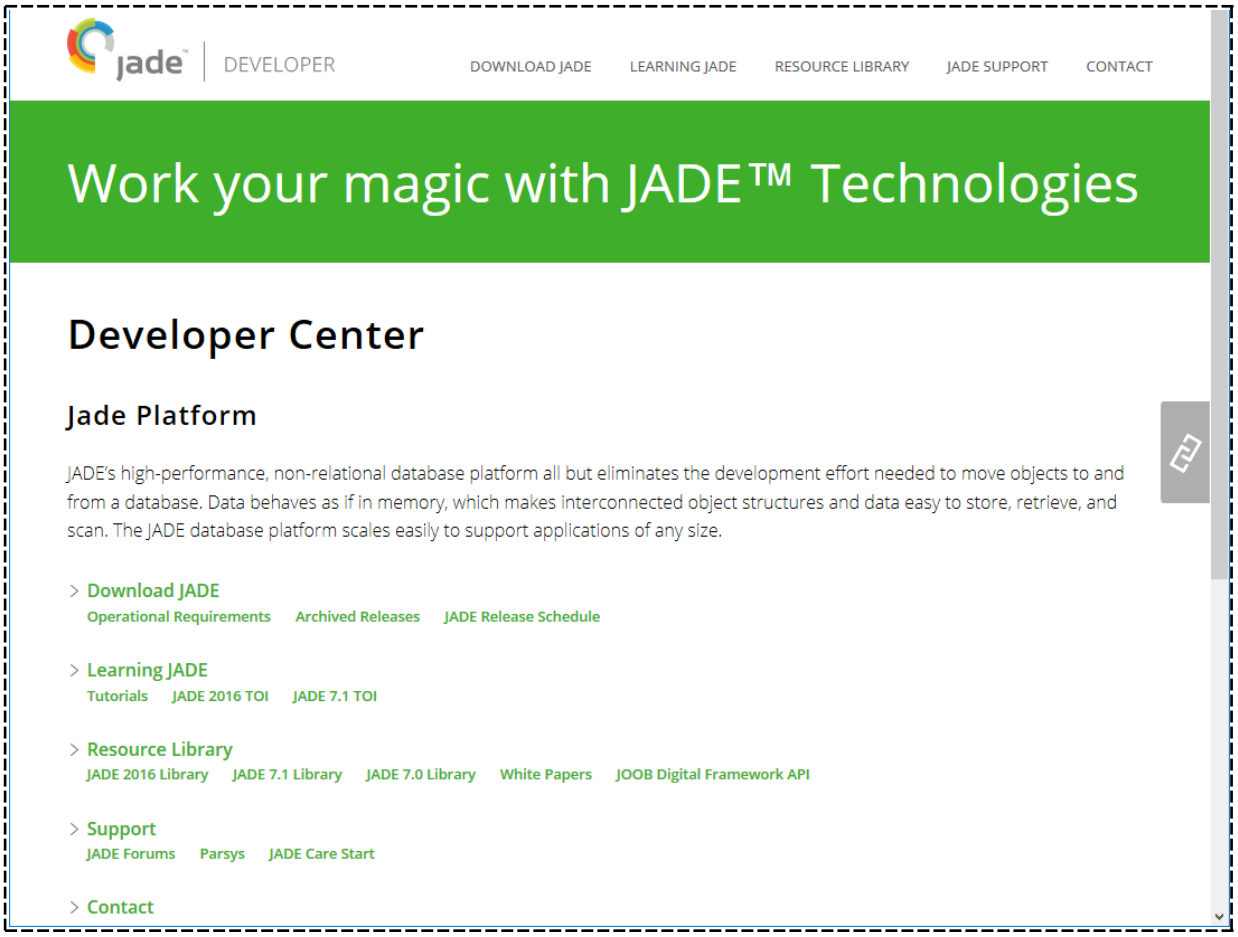
Day 1 – Morning	Day 2 – Morning
Module 1 Documentation Resources	Module 10 JADE Database Utility
Module 2 JADE License	Module 11 JADE Database Administration Utility
Module 3 Servers and Clients	Module 12 JADE Care Start Backup
Module 4 Database Server	Module 13 JADE Initialization File

Afternoon	Afternoon
Module 5 Standard Clients	Module 14 Synchronized Database Service
Module 6 Application Servers and Thin Clients	
Module 7 Shared Memory Transport	Module 15 Relational Population Service
Module 8 Non-GUI Applications and Windows Services	Module 16 Web Applications
Module 9 JADE Schema Load Utility	

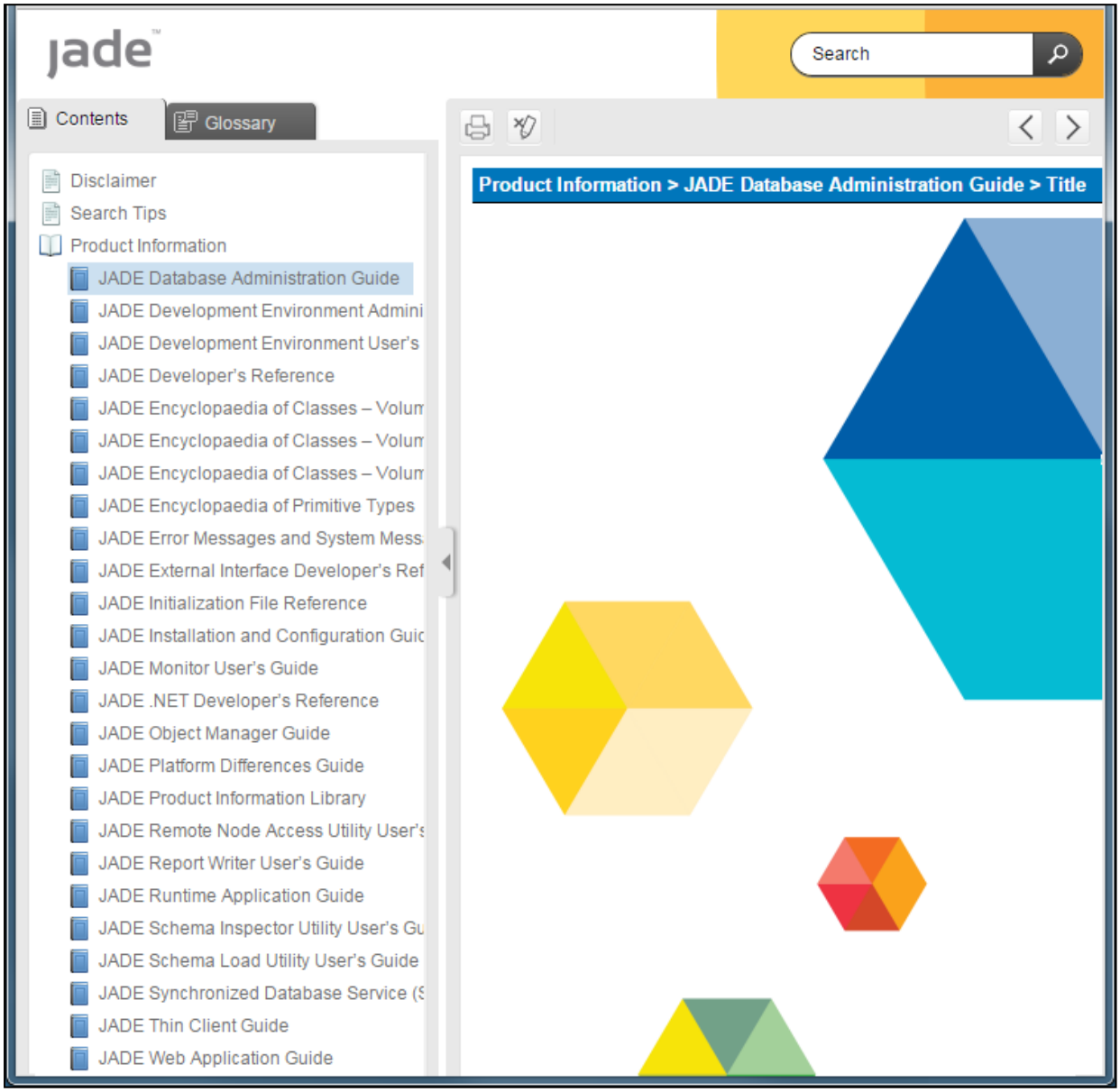
Most modules contain a number of exercises that enable you to practice and build your skills.

Module 1 Documentation Resources

The developer center link https://www.jadeworld.com/developer-center on the JadeWorld web site enables you to access JADE documentation in PDF and HTML formats.



The HTML version of the documentation is shown in the following diagram.



Module 2 JADE License

This module covers the following topics.

Introduction

A production license is required for a customer to run applications commercially. It can include any combination of development and runtime capabilities.

A production license specifies the number of concurrent primary processes that are allowed to run. A process is a thread of execution in a JADE environment that is running user application code, and could be a:

- Person running an application
- Device (for example, a GPS receiver)
- Background task (for example, a program sending e-mail messages or running reports)

A different license is required for processes in a secondary database environment.

Process License

When you install a JADE system, you must enter the **License Name** and **License Key** from the process license in the same case as on the license.

JADE Development Key as requested

jadelicensing@jadeworld.com

Extra line breaks in this message were removed.

Sent: Mon 3/27/2017 9:55 AM

To: JADE Licensing; JADE Administrative Course

```
11    NOTICES

11.1  All notices, which are required to be given hereunder, will be in
writing and will be sent to the recipient by hand or by registered letter
or facsimile and will be deemed to have been served if by hand when
delivered, if by registered letter 48 hours after posting, and if by telex
or facsimile when transmitted.

12    ASSIGNMENT

12.1  The Licensee shall not assign or transfer its rights or obligations
under this License without the prior written consent of the Licensor,
which shall not be unreasonably withheld.

13    GOVERNING LAW

13.1  This Agreement shall be governed by, and construed in accordance
with,
the laws of New Zealand.  The parties submit to the non-exclusive
jurisdiction of the courts of New Zealand in relation to all disputes
arising out of or in connection with this Agreement.

Certificate of Authorisation
Issue Date: Monday, 27 March 2017

Licence Name:     JADE Administrative Course
Licence Key:      82D7A13B - DAD6D7D5 - D2D7D5D6 - 2939D7D7
Certificate Number:     87463

JADE Version 7.0
Product:    JADE 7.0 Free Developer

JADE 7 Free Developers: 2

JADE Processes:   5

JADE Database Size Restriction      1
```

Note The JADE version applies to the version of the JADE license; *not* to the release version of JADE itself.

JADE Processes

The license also shows the number of JADE processes. A process is required for:

- Each user running a JADE application
- Each node; for example, the database server and the application server
- Background tasks

Nodes and processes are explained in later modules.

JADE Registration Program

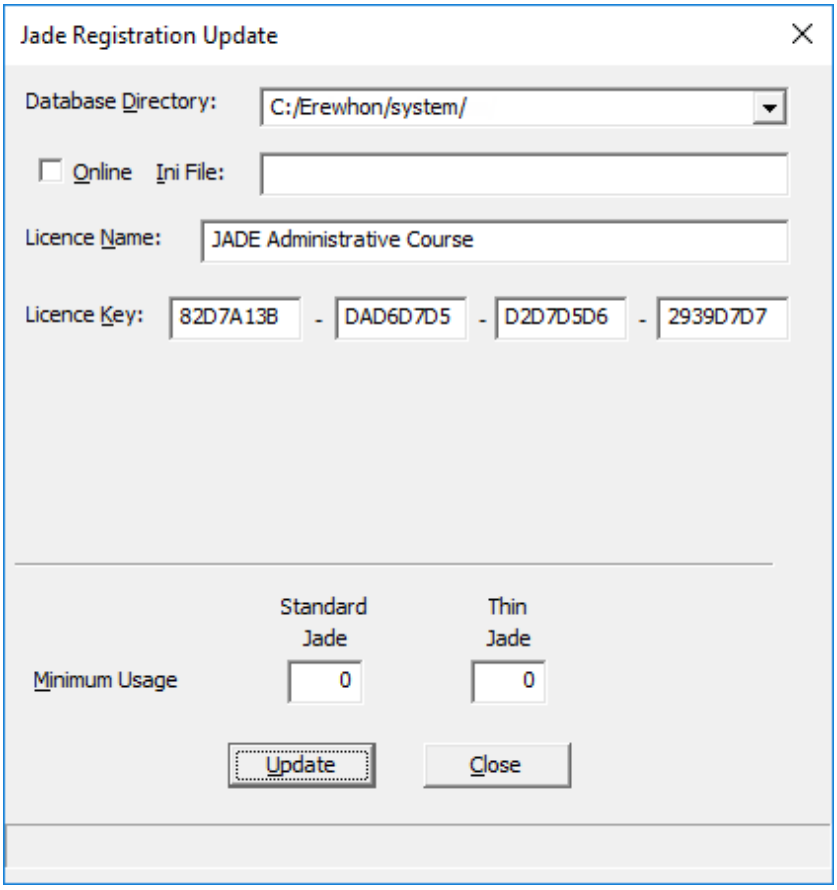
The license information is automatically registered for a JADE system as part of the installation process.

If you require additional processes as the number of application users increases, you can obtain a new license and enter the information by running the **JADE Registration** program.

```
C:\Erewhon\bin\jadreg.exe
```

Note The installation process does not create a program shortcut for this program.

A form is then displayed, to enable you to enter the new license information.



Alternatively, you can enter the license information by using the batch utility, as follows.

```
C:\Erewhon\bin\jadregb.exe path=C:\Erewhon\system
                          [online ini=JADE-initialization-file-name]
                          name="license-name" key=license-key
                          [minStandard=integer-value]
                          [minJade=integer-value]
```

You can reserve a couple of process licenses for a standard client to log on. The remainder of process licenses can be of any client type. The default value for the **Minimum Usage** settings is zero (**0**). When you click the **Update** button, the updated license information is displayed on your screen.

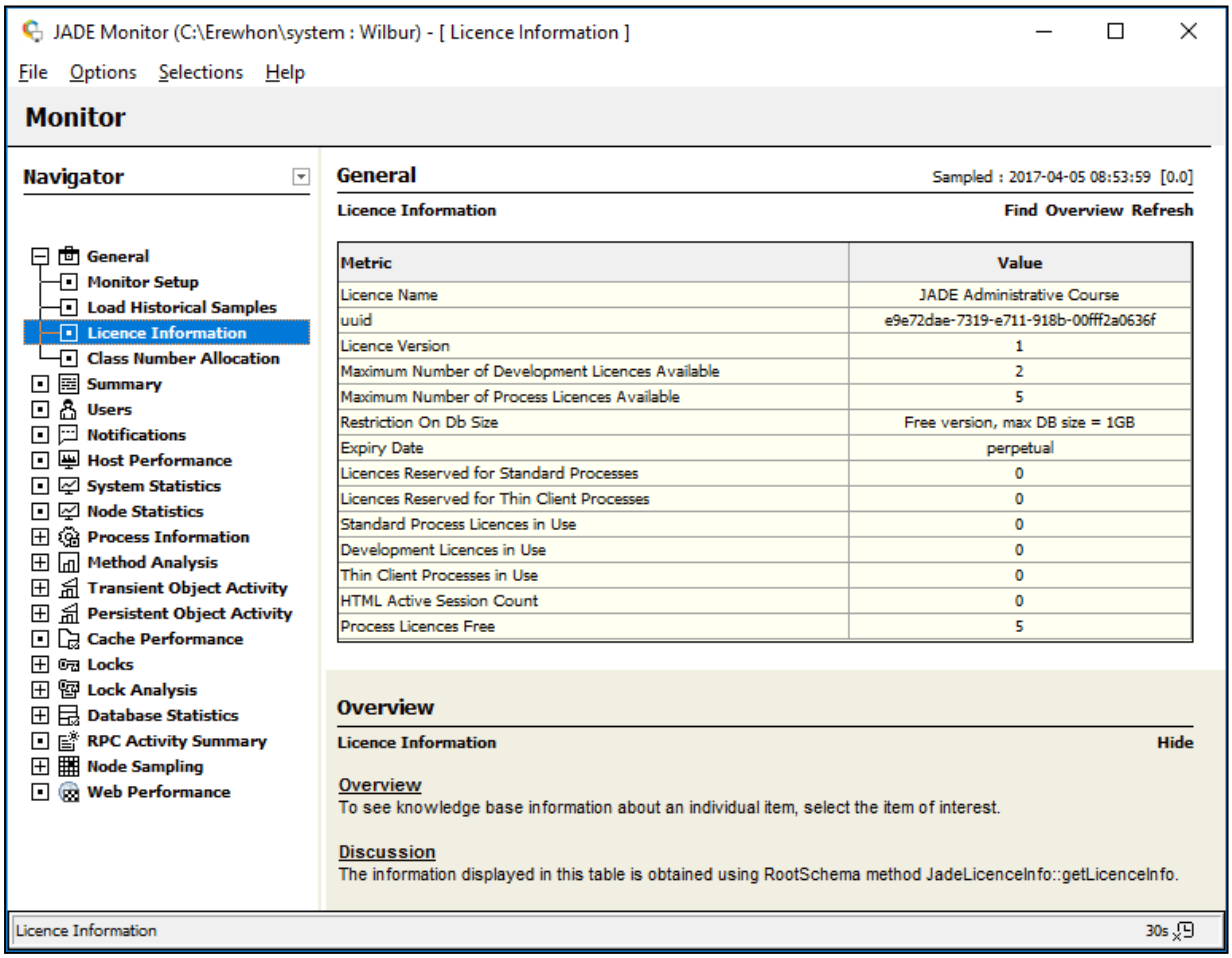
License information and other information about your JADE database is held in the **_control.dat** database control file.

Displaying License Information

You can view license information by running the JADE Monitor program.

```
C:\Erewhon\bin\jade.exe path=C:\Erewhon\system
                        ini=C:\Erewhon\system\jade.ini
                        schema=JadeMonitorSchema
                        app=JadeMonitor
```

Select **License Information** from the **Navigator** pane at the left of the form.



Testing Shortcuts with a Developer License

When you run an application from a shortcut using a developer license, which you are allowed to do for testing purposes, the following screen is displayed.

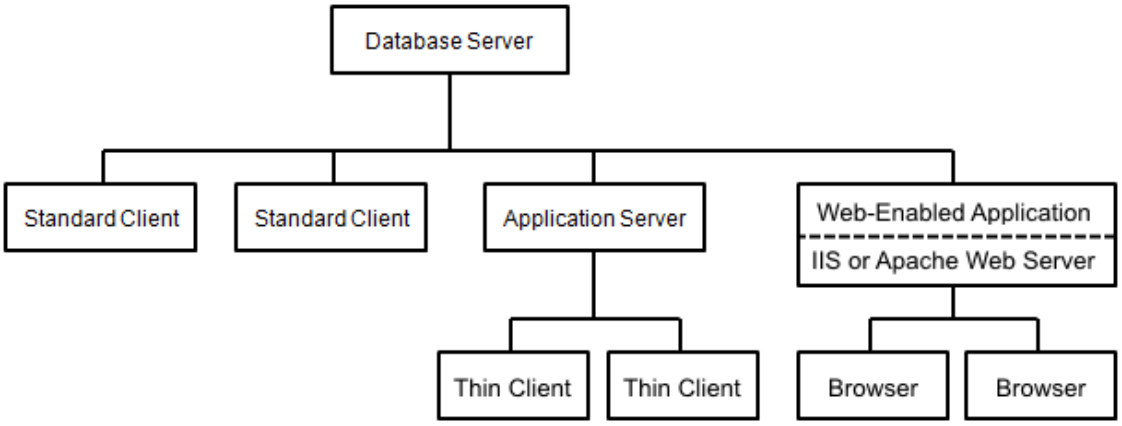
By clicking on the screen, you can proceed to the application. The screen is simply a reminder that a different license is required for use in production.

Module 3 Servers and Clients

This module covers the following topics.

Introduction

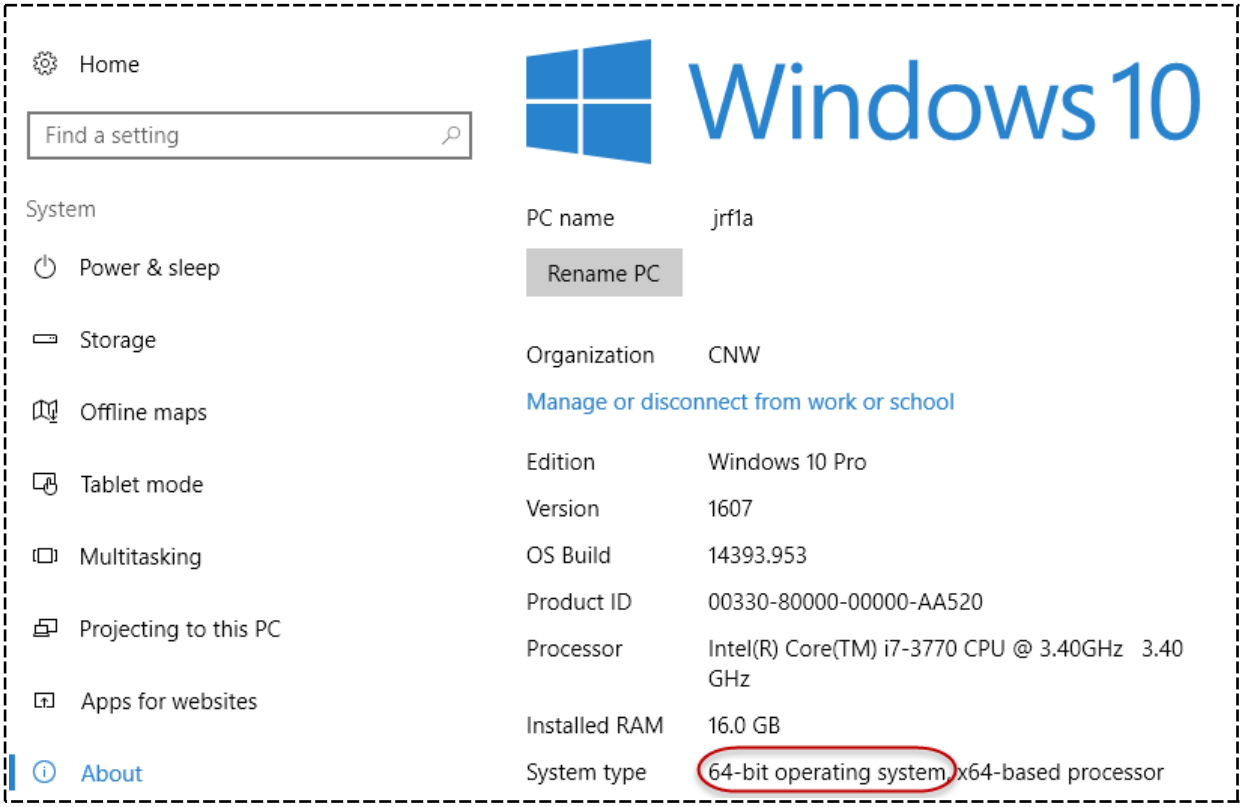
The components making up the architecture of a JADE system are explained in the following sections.



The servers and clients could all be installed on separate computers connected by TCP/IP. However, in this course you will install all of the components on a single laptop or desktop computer.

The database server must be running a 64-bit Windows operating system. The other components can be 32-bit or 64-bit.

You can determine your operating system from the System **About** settings or the Control Panel, depending on your operating system, to check that you are running 64-bit Windows.



Database Server

The database server, which is the center of a JADE system:

- Contains the persistent database
- Accepts connections from standard clients and application servers
- Manages system-wide services such as locking, cache coherency, and notifications
- Can execute application code and process persistent objects (although by default, objects are distributed to standard clients and application servers for processing)
- Cannot display application screens
- Must be running a 64-bit Windows operating system

Standard Client

The standard client (also known as a *fat* client), which was the original type of client in the architecture of a JADE system:

- Connects directly to the database server (it requires a high-bandwidth connection)
- Executes application code and processes persistent objects

- Displays application screens
- Is suitable for a LAN connection

Application Server

The application server is a specialized type of standard client that supports connections from thin clients, which can be remote or local. An application server:

- Connects to the database server (requires a high-bandwidth connection)
- Executes application code and processes persistent objects for connected thin clients
- Cannot display application screens
- Is suitable for a LAN connection
- Can be running a 32-bit or 64-bit Windows operating system

Presentation Client

The presentation client (also known as a *thin* client) was introduced to cater for remote connections. It has also largely replaced the standard client for local connections. A presentation client:

- Connects to an application server (it does not require a high-bandwidth connection)
- Displays application screens
- Cannot execute application code (that is done by the application server)
- Is suitable for a WAN or a LAN connection
- Can be running a 32-bit or 64-bit Windows operating system

HTML Client

A JADE client can run a web-enabled application, which generates or retrieves HTML pages.

These HTML pages are sent to the user's web browser by an Internet server, which acts as an intermediary. An HTML client:

- Runs a JADE application from an Internet browser
- Does no application processing (that is done by the JADE web-enabled client)
- Does not require a high-bandwidth connection
- Can be running a 32-bit or 64-bit Windows operating system

Common Networking Utilities

The networking utilities described in the following sections are executed from a DOS command window.

ipconfig

The following command displays all current TCP/IP network configuration values for the current computer.

```
ipconfig
```

ping

The following command tests whether a server on an Internet Protocol (IP) network can be reached. It also measures the round-trip time for messages sent to the server.

```
ping <server-name>  or  ping <ip-address>
```

netstat

The following command displays connections and ports in use.

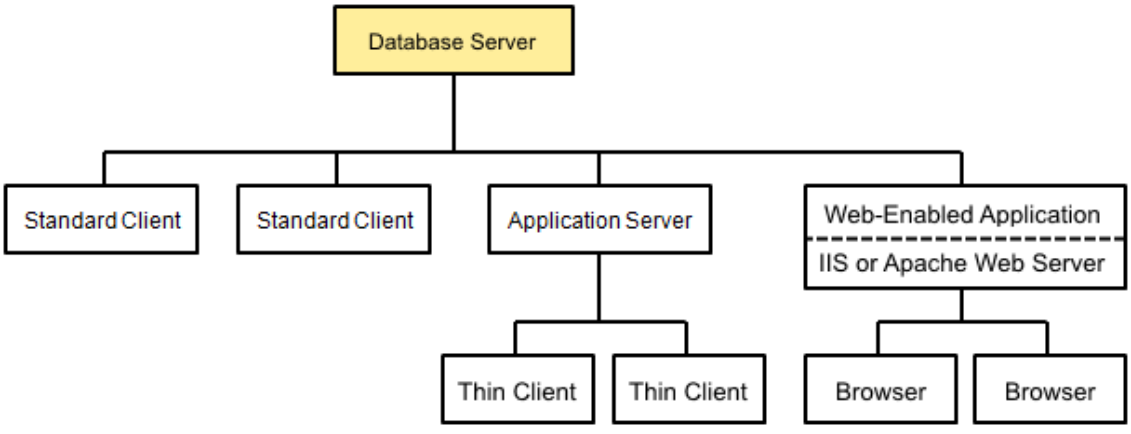
```
netstat -a
```

Module 4 Database Server

This module covers the following topics.

Introduction

In this module, you will install the database server and then load the schema files (programs and database file definitions) for the Erewhon system, which is an online trading system provided by JADE as an example for developers.



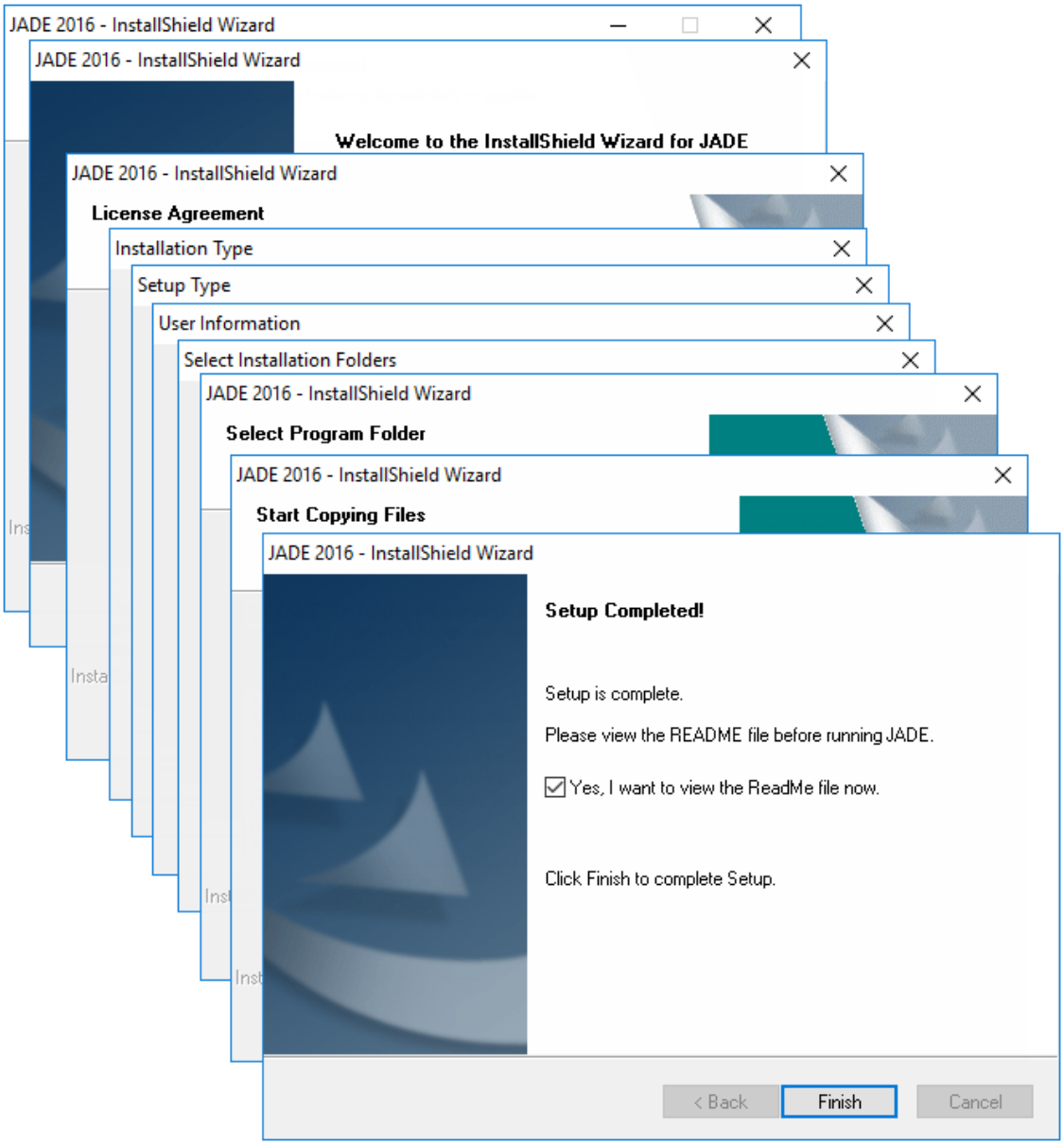
There is a separate installation for the JADE documentation PDF files, some of which describe the installation, operation, and administration of a JADE system.

You can download the JADE software and documentation from the Developer Center on the JadeWorld web site at https://www.jadeworld.com/developer-center. Alternatively, you can download the JADE software from the flash drive provided for this course (that is, **CourseFiles/JADE/JADEwin64Ansi.exe**).

Later sections in this module cover settings in the JADE initialization file that apply to the database server.

Installation

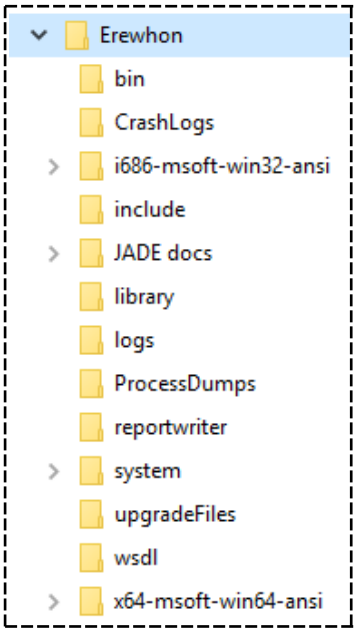
The installation program is an InstallShield wizard that displays a sequence of screens.



There is a separate download for the JADE documentation in PDF (print) format.

Download the **JADE 2016 - Documentation Package** (the **JADEWinDocs.exe** file) from https://www.jadeworld.com/developer-center/resource-library/ and then run the **JADEWinDocs.exe** setup program, specifying **C:\Erewhon\JADE docs** as the **Destination folder**.

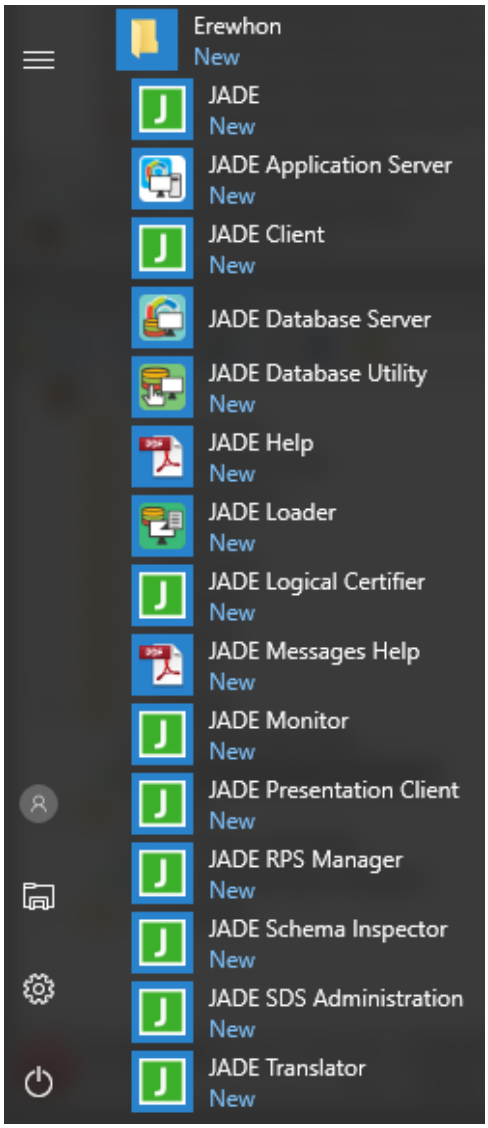
The software is installed in the specified folder, as shown in the following example.



The main subfolders are:

- **bin**, which contains the executable (**.exe**) and library (**.dll**) files
- **JADE docs**, which contains subfolders of the PDF help and white paper files
- **logs**, which contains the JADE message log file (**jommsg.log**) and error log files
- **system**, which contains the database (**.dat**) files, the JADE initialization file (**jade.ini**), and a folder for the database journal files

The installation process created a group of program shortcuts in your **Erewhon** installation folder on the Windows Start menu.



If you are using the Metro interface in a Windows release earlier than Windows 10, in which it is no longer available, select your installation folder name (for example, **Erewhon**) to display the associated shortcuts.

Exercise 4.1 – Installing JADE on a Database Server

In this exercise, you will install the JADE software for the database server, and then in a separate installation, the JADE documentation PDF files.

1. Run the **JADEwin64Ansi.exe** program.
2. Complete the steps of the InstallShield wizard as specified in the following table.

Step	Action
Welcome	Click the **Next** button.

Step	Action
License Agreement	Click the **Yes** button to agree to the terms of the license.
Installation Type	Select the **Fresh Copy** option.
	Click the **Next** button.
Setup Type	Select the **Development** option.
	Click the **Next** button.
User Information	Enter the **License Name** and **License Key** from your license.
	Click the **Next** button.
Select Installation Folders	Enter **C:\Erewhon** in the **Install Directory** text box.
	Click the **Next** button.
Select Program Folder	Enter **Erewhon** in the **Program Folder** text box.
	Click the **Next** button.
Start Copying Files	Click the **Next** button.
Setup Completed!	Click the **Finish** button.

Loading Schemas

A JADE database stores user data and program data. In the Erewhon system, which is an online trading system, user data consists of agents who sell items, clients who purchase items, items for sale, and sales. Program data consists of the screen forms and the report forms, the code that is executed when buttons are clicked, and so on.

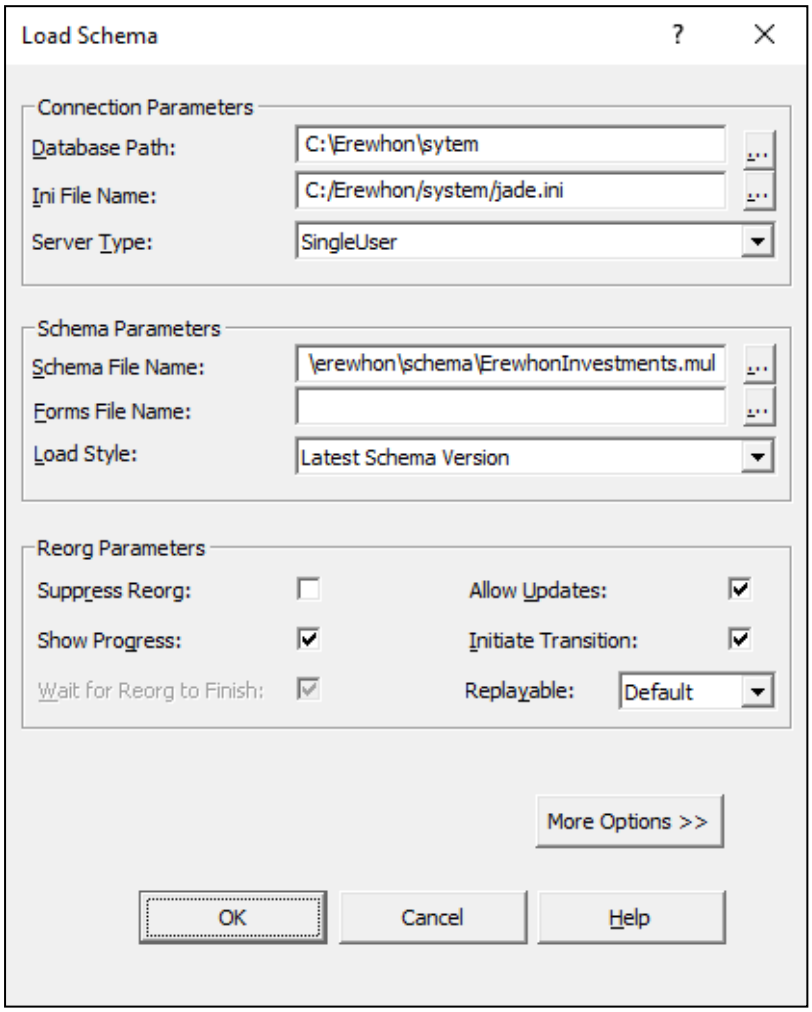
Programs are created by developers working in a JADE system. When they complete a version of the system, they extract it as the following files.

- Schema file with a **.scm** extension
- Forms definition file with a **.ddb** extension

If the system has a number of schemas, a multiple schema load file with a **.mul** extension can be provided. It lists the files in the order that they are to be loaded, as shown in the following example.

```
#MULTIPLE_SCHEMA_EXTRACT
CommonSchema.scm CommonSchema.ddb
SelfDocumentorSchema.scm SelfDocumentorSchema.ddb
ModelSchema.scm ModelSchema.ddb
ViewSchema.scm ViewSchema.ddb
WebServiceConsumer.scm WebServiceConsumer.ddb
```

The JADE Schema Load utility enables schema and forms definition files extracted from the development database to be loaded into a production database.



You can use the:

- Batch version of the JADE Schema Load utility in a batch file to specify the names of the files to be loaded.
- JADE Schema Load utility to load an entire application or an update to an application.

  You can also use it to load fixes that are provided by JADE Support to the underlying JADE software.

Batch JADE Schema Load Utility

As an alternative to the interactive (GUI) version of the JADE Schema Load utility, a batch version **jadloadb.exe** is provided. (The **b** appended to the executable name indicates that it is the batch version.)

You can create a batch file to run the batch JADE Schema Load utility with the following command.

```
C:\Erewhon\bin\jadloadb.exe path=<location-of-database-folder>
                            ini=<name-of-initialization-file>
                            schemaFile=<name-of-schema-file>
                            ddbFile=<name-of-forms-definition-file>
```

Creating Initial Data

A non-GUI application (that is, one that does not require user interaction) is provided for the Erewhon system to create agents, clients, sale items, and sales data.

You can create a batch file to run the data-loading program with the following command.

```
C:\Erewhon\bin\jadclient.exe path=C:\Erewhon\system
                             ini=C:\Erewhon\system\jade.ini
                             schema=ErewhonInvestmentsModelSchema
                             app=DataLoader
                             server=singleuser
                             endjade <Drive>:\erewhon\DataFiles
```

The entire command should be written on a single line, and the ***<Drive>*** variable should be replaced with the drive letter of the location of the course files.

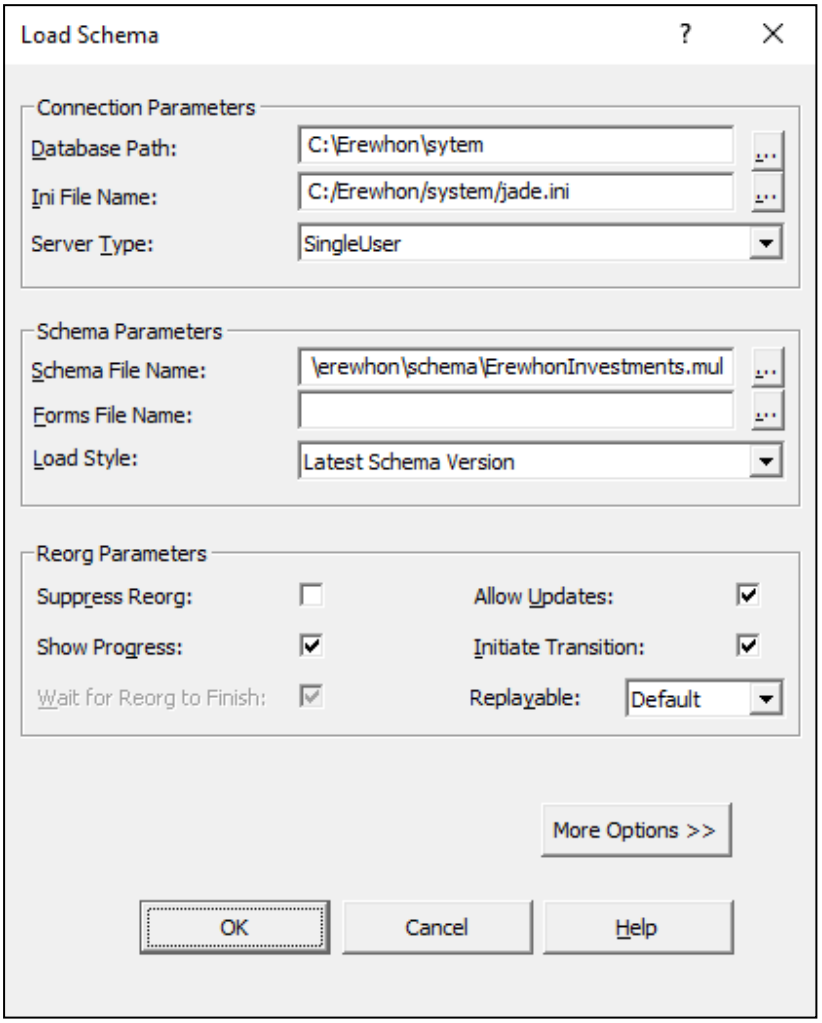
Exercise 4.2 – Loading Schema Files

In this exercise, you will load the program data for the **Erewhon** system using a multiple schema load file.

1. Copy the Erewhon example system to the clipboard by:
   - Copying the **Erewhon** folder and its contents from the **CourseFiles** folder on the flash drive provided for this course.
   - Click the link symbol at the right of the https://www.jadeworld.com/developer-center/jade-support web page to display the **Quick Links** options, download and extract the **JADEExamples.exe** program to a location of your choice on your device, and then copy the **Erewhon** folder and its contents.
2. Paste the **Erewhon** folder and its contents (copied to the clipboard in step 1 of this instruction) into your installation folder; that is, to **C:\Erewhon**.
3. Run the JADE Schema Load utility, as follows.

   ```
   C:\Erewhon\bin\jadload.exe
   ```

The Load Schema dialog, shown in the following diagram, is then displayed.



4. Complete the dialog as shown in the previous diagram, replacing the ***<Drive>***variable in the **Schema File Name** text box with the drive letter of the location of the course files in the folder into which you pasted them in step 2 of this instruction.

   Note When you enter a multiple schema load file name in the **Schema File Name** text box, leave the **Forms File Name** text box blank.

5. Investigate the **Help** and **More Options** buttons.

Exercise 4.3 – Batch-Loading Schema Files

In this exercise, you will create a batch file to load one of the schemas that you loaded in the previous exercise. (No harm is done by loading the same schema files twice.)

1. Open Notepad and then enter the following text, replacing the ***<drive>*** variable with the drive letter of the location of the course files.

```
C:\Erewhon\bin\jadloadb.exe path=C:\Erewhon\system
                            ini=C:\Erewhon\system\jade.ini
                            schemaFile=<drive>:\erewhon\schema\CommonSchema.scm
                            ddbFile=<drive>:\erewhon\schema\CommonSchema.ddb
```

Note The entire command should be written on a single line, and the ***<drive>*** variable should be replaced with the drive letter of the location of the course files.

2. Save the file as **C:\Temp\SchemaLoad.bat**.
3. Execute **SchemaLoad.bat** by double-clicking the file in Windows Explorer.

Exercise 4.4 – Creating Initial Data

In this exercise, you will create a batch file to run a non-GUI program that loads data into the Erewhon database.

1. Open Notepad and then enter the following text, replacing the ***<Drive>*** variable with the drive letter of the location of the course files.

```
C:\Erewhon\bin\jadclient.exe path=C:\Erewhon\system
                             ini=C:\Erewhon\system\jade.ini
                             schema=ErewhonInvestmentsModelSchema
                             app=DataLoader
                             server=singleuser
                             endjade <Drive>:\erewhon\DataFiles
```

Note The entire command should be written on a single line, and the **<Drive>** variable should be replaced with the drive letter of the location of the course files.

2. Save the file as **C:\Temp\DataLoad.bat**.
3. Execute **DataLoad.bat** by double-clicking the file in Windows Explorer.

JADE Initialization File

Most parameters in the JADE initialization file have default values and you do not need to change them. For these parameters, the value in the initialization file is **<default>** or there is no entry for the parameter.

When you upgrade from one release to the next, a parameter set to the value **<default>** automatically picks up the new default value for that release. However, if you set a parameter to a specific value, it is your responsibility to make subsequent changes, if they are necessary.

The two main sections of the JADE initialization file for a database server are:

- [PersistentDb], which contains parameters specific to the operation of the database
- [JadeServer], which contains parameters specific to its role as the database server node

TCP/IP Listening Port

Before the database server program is run, you can change the value of the **NetworkSpecification1** parameter in the [JadeServer] section of the JADE initialization file to the port number on which the server will listen for connections from clients and application servers.

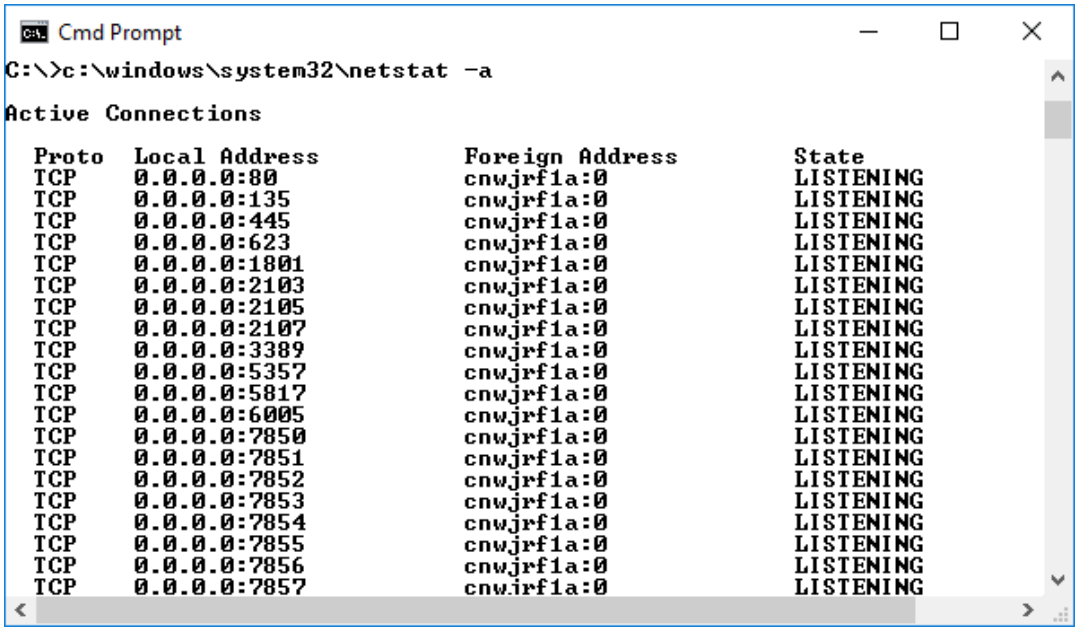
There is no default value for the **NetworkSpecification1** parameter, but the installation process writes the following value into the JADE initialization file.

```
[JadeServer]
NetworkSpecification1=TcpIpV4,Enabled,6005
```

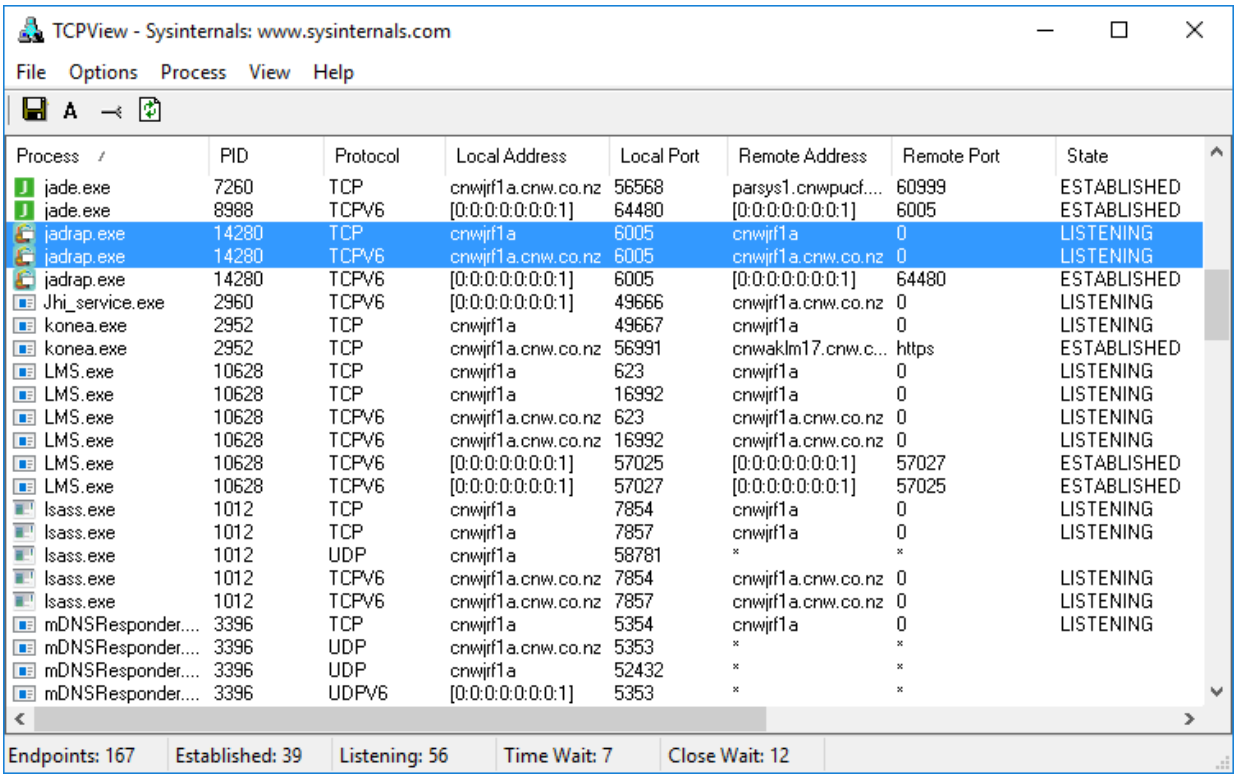
This makes port 6005 effectively a *default* port number. You can change the port number to any integer value in the range 1 through 64K.

To avoid a port conflict, you can use the Network Status Command (**netstat**), executed from a DOS command window, to display connections and ports in use.

```
netstat -a
```



Alternatively, you can download Microsoft's **TCPView**, which is a Windows program that shows details of TCP and UDP connections.



Running the Database Server Program

The JADE database server program must be running *before* standard clients and application servers can run applications and access the database.

The shortcut to run the JADE database server program is as follows.

```
C:\Erewhon\bin\jadrap.exe path=C:\Erewhon\system ini=C:\Erewhon\system\jade.ini
```

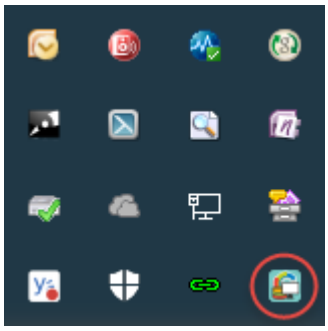
When you install the database server, the JADE initialization file is located in the **system** folder along with the database files and the installed shortcuts that specify this location. For all the other clients and application servers, the JADE initialization file is located in the **bin** folder. (Only the database server has a **system** folder.)

Tips If you move the JADE initialization file to the **bin** folder, you must change the program shortcuts to reference the new location.

In all shortcuts, explicitly specify the location of the JADE initialization file. Some programs (for example the JADE Schema Load utility) assume that the JADE initialization file is in the **bin** folder. Others could assume it is in the **system** folder.

Run the JADE database server program to open the database for access by standard clients and application servers. The following setting in the JADE initialization file indicates that you should look for the JADE database server icon in the Windows system tray.

```
[JadeServer]
UseSystemTrayIcon=true
```



Clicking the icon displays the program, as shown in the following diagram.

Running Utilities on the Database Server

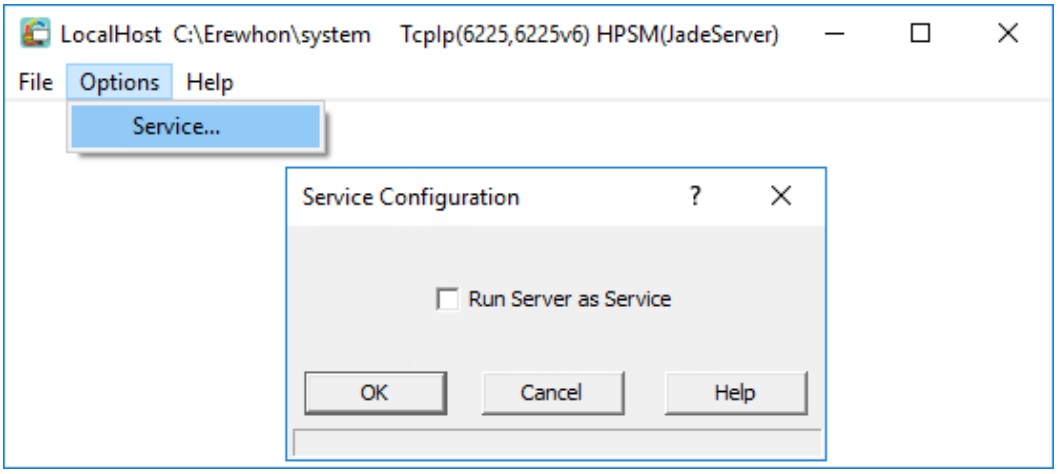
It is common practice to run utilities on the database server (for example, the JADE Database utility), using the same JADE initialization file as that used by the database server program. For that reason, you should keep the TCP/IP settings in the [JadeServer] and [JadeClient] sections of the JADE initialization file consistent.

```
[JadeServer]
NetworkSpecification1=tcpip,enabled,6000

[JadeClient]
ServerNodeSpecifications=tcpip,localhost,6000
```

Running the Database Server as a Service

The JADE database server program can be registered, by using the Options menu, as a Windows service. To enable this option, you must run with administrator privileges.

To run the database server with administrative privileges, right-click on the **JADE Database Server** program shortcut in your Erewhon installation folder on the Windows Start menu, select the **More** command, and then select **the Run as administrator** command from the submenu. Alternatively, to run the database server with administrative privileges for this and every work session, right-click on the **JADE Database Server** item in **C:\ProgramData\Microsoft\Windows\Start Menu\Programs\Erewhon\JADE MultiUser**, and then select the **Run as administrator** command from the popup (context) menu.



You would then check the **Run Server as Service** check box on the Service Configuration dialog and click the **OK** button.

When the PC hosting the JADE database is restarted, the service-equivalent of the JADE database server program, which is called **jadserv.exe**, is automatically started.

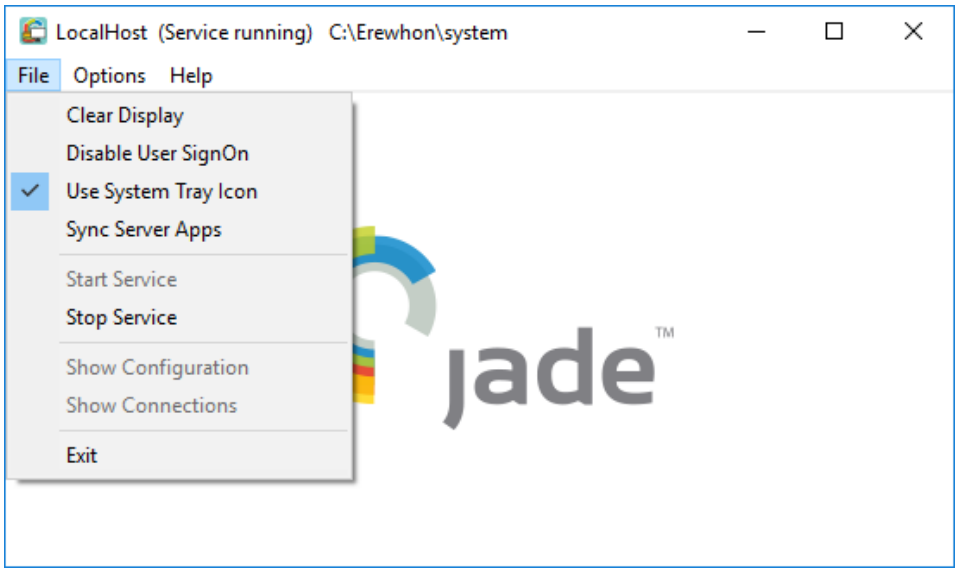
The service name is the same as the node name at the time of registering the service. The node name is set in the JADE initialization file, as follows.

```
[JadeServer]
NodeName=LocalHost
```

You can remove the service by running the following service control DOS utility from the command window with administrator privileges.

```
sc delete <service-name>
```

When the service is running, you can stop it from the Windows services applet or by running the JADE database server program directly.



Exercise 4.5 – Checking Available Port Numbers

In this exercise, you will check that the port numbers to be used in later exercises are available.

1. Open a command window by entering **cmd** in the **Open** text box on the Windows Run dialog.
2. Enter the following command.

```
netstat -a
```

3. Check that the following ports are available.
   - 10000
   - 20000
   - 30000
   - 40000
   - 50000
   - 60000

Exercise 4.6 – Running the Database Server

In this exercise, you will make changes to the JADE initialization file used by the database server, and then create a desktop shortcut to run the database server.

1. Open the **C:\Erewhon\system\jade.ini** file in Notepad.
2. Make the following changes to the JADE initialization file.

```
[JadeServer]
NetworkSpecification1=tcpip,enabled,50000
```

3. Remove the lines for **NetworkSpecification2** and **NetworkSpecification3**.
4. For consistency, make the corresponding change in the [JadeClient] section.

```
[JadeClient]
ServerNodeSpecifications=tcpip,localhost,50000
```

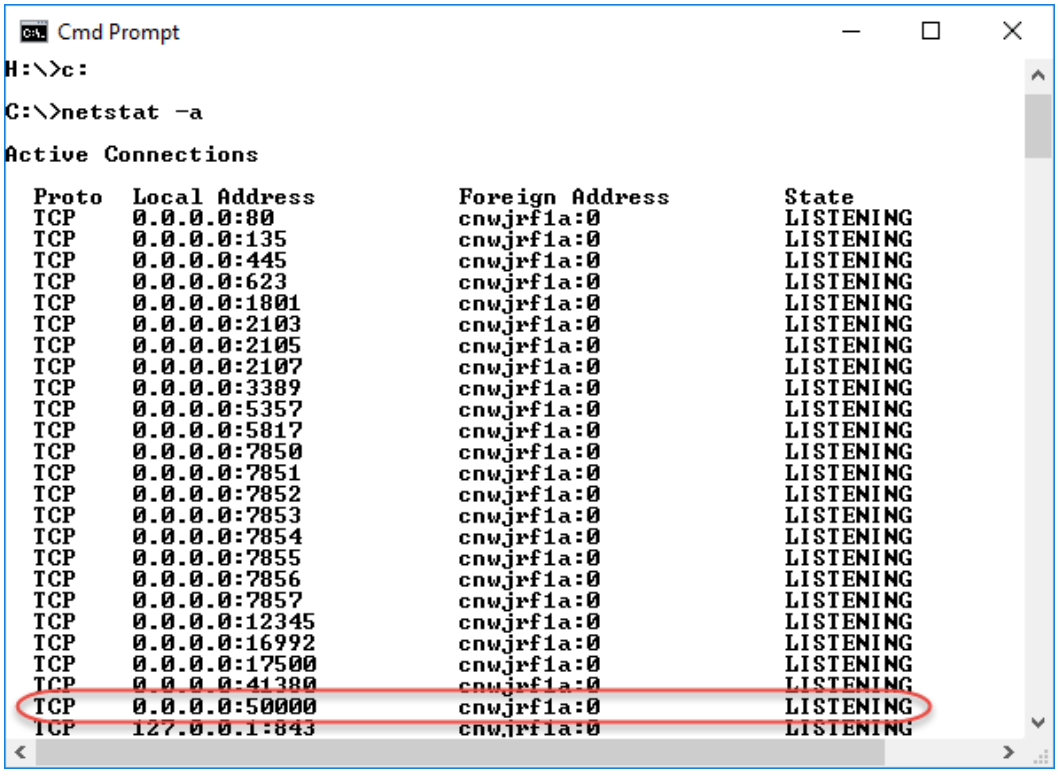
5. Save and close the file.
6. Add the following desktop shortcut.

```
C:\Erewhon\bin\jadrap.exe path=C:\Erewhon\system ini=C:\Erewhon\system\jade.ini
```

7. Start the database server from your shortcut.
8. In a DOS command window, run the Network Status command utility, as follows.

```
netstat -a
```

9. Check that the database server is listening on port 50000.



Relocating Database Journals

When the database server receives transaction information, updates are not immediately stored in database map files.

It is more efficient to store them in cache and perform updates at regular intervals (checkpoints). However, transaction information is always written immediately into a database journal file.

Journals are also used for database recovery and should be stored on a separate disk from the database.

The default location for the journals is a subfolder of the **system** folder. You can specify a different location in the JADE initialization file, as follows.

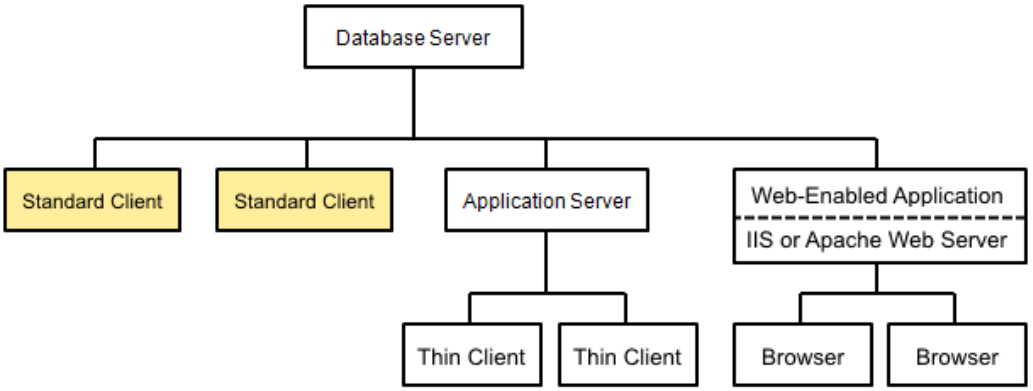
```
[PersistentDb]
JournalArchiveDirectory=<different-disk>:\journals\archive
```

Module 5 Standard Clients

This module covers the following topics.

Introduction

In this module, you will install a standard client that will connect to the database server using TCP/IP and run the **ErewhonShop** application.



The installation creates a **bin** folder on the Windows Start menu, containing the JADE binary files and program shortcuts. Later sections in this module describe how to resolve common connection problems, and the use of the JADE Monitor.

Exercise 5.1 – Installing JADE on a Standard Client

In this exercise, you will install the JADE software for a standard client.

1. Run the **JADEwin64Ansi.exe** program.

   Note A 32-bit client can connect to 64-bit database server. Specific installation programs are available from the JadeWorld web site https://www.jadeworld.com/developer-center/download-jade/.

2. Complete the steps of the InstallShield wizard as specified in the following table.

Step	Action
Welcome	Click the **Next** button.

Step	Action
License Agreement	Click the **Yes** button to agree to the terms of the license.
Installation Type	Select the **Fresh Copy** option.
	Click the **Next** button.
Setup Type	Select the **Jade Client** option.
	Click the **Next** button.
Select Installation Folders	Enter **C:\JadeClient** in the **Install Directory** text box.
	Click the **Next** button.
Select Program Folder	Enter **JadeClient** in the **Program Folder** text box.
	Click the **Next** button.
Client Parameters	Enter **C:\Erewhon\system** in the **Database Path** text box.
	Enter **localhost** in the **Database Host Name** text box.
	Enter **50000** in the **Port Number** text box.
	Click the **Next** button.
Start Copying Files	Click the **Next** button.
Setup Completed!	Click the **Finish** button.

Running an Application

To run an application from a standard client, it is necessary to specify the:

- IP address and port number of the database server
- Application name and schema name

The IP address and port number are usually specified in the JADE initialization file, whereas the application and schema name are specified in the shortcut.

Make the following entries in the JADE initialization file in the **C:\.JadeClient\bin** directory.

```
[Jade]
Server=multiuser
```

Note Alternatively, you can add **server=multiUser** to the command line of the installed shortcut, which overrides the setting in the JADE initialization file.

```
[JadeClient]
ServerNodeSpecifications=tcpip,localhost,50000
```

Note The **ServerNodeSpecifications** parameter is configured by the installation process.

The shortcut to run the application **ErewhonShop** in the schema **ErewhonInvestmentsViewSchema** is as follows.

```
C:\JadeClient\bin\jade.exe path=C:\Erewhon\system
                           ini=C:\JadeClient\bin\jade.ini
                           schema=ErewhonInvestmentsViewSchema
                           app=ErewhonShop
```

Notes The path to the database must be specified from the server perspective.

The **schema** and **app** parameter values are case-sensitive.

Troubleshooting Connections

When a client cannot connect, the most common problems are:

Error -104 Failed to establish network connection

Server is found but is unable to connect to the database.

- Is the JADE server node running?
- Is the TCP/IP transport enabled?
- Do the port numbers on the client and the server match?

Error -111 Host not found

Unable to find the server computer, which is the first step in connecting to the database.

- Is the server in the **ServerNodeSpecifications** parameter in the [JadeClient] section correct?

  Check the HOSTS file or Domain Name Server.
- Is TCP/IP working correctly?

  Try pinging the target machine.

Error -113 Server Network initialization failed

Database server could not be started because the specified TCP/IP listening port number is in use.

Error 1213 Invalid schema

The **schema** parameter has the wrong case or it is spelled incorrectly.

Error 1214 Invalid application

The **app** parameter has the wrong case or it is spelled incorrectly.

Error 3019 Database control file directory not found

The **path** parameter is not locating the folder containing the **_control.dat** database control file.

Error 14544 A concurrent process has already opened the same database

Trying to access the database in single user mode.

- Add **server=multiuser** to the command line shortcut.

Using the Wrong JADE Initialization File

- Is the client using the correct JADE initialization file?
- Is the database server using the correct JADE initialization file?
- Check that the **ini=** parameter is specified in all command line shortcuts.

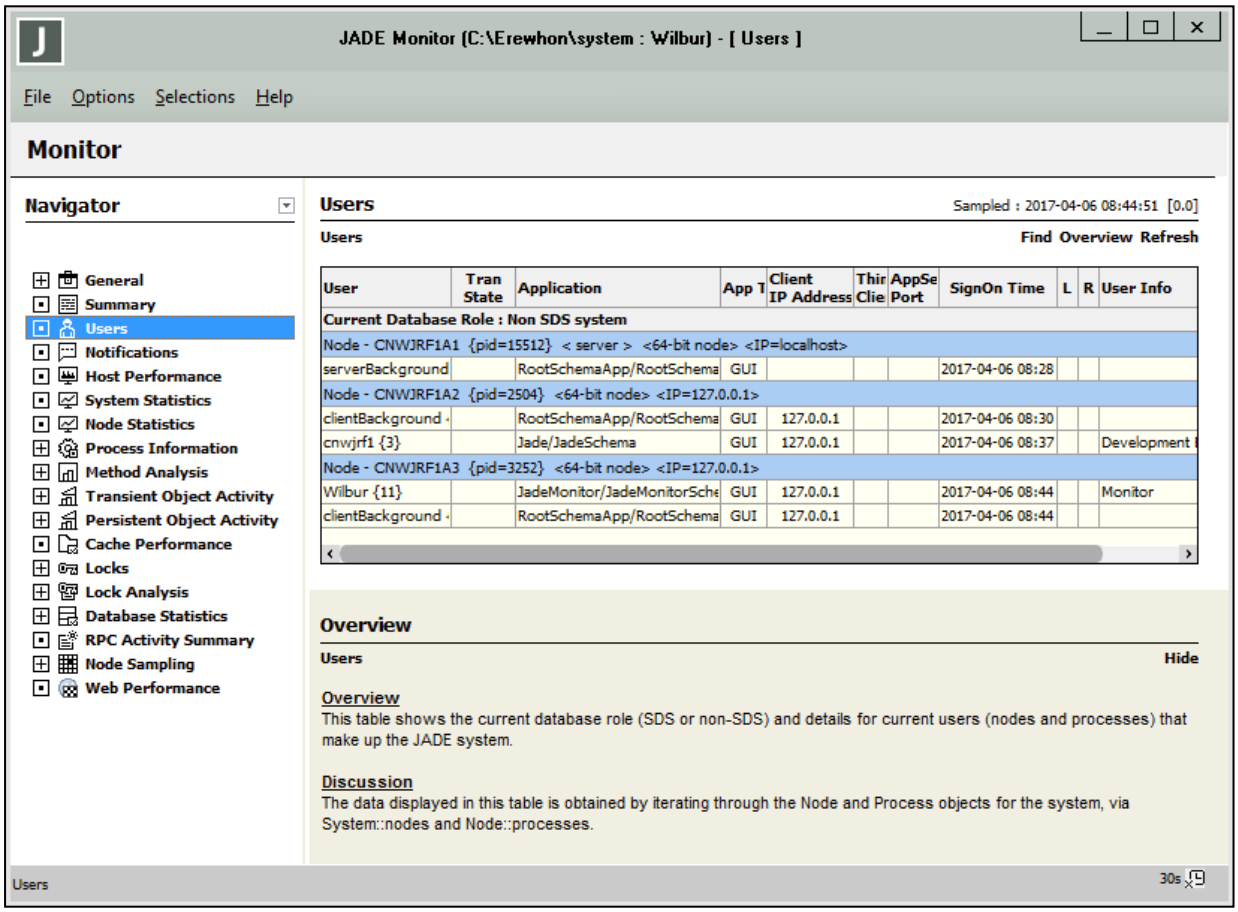
Running the JADE Monitor Utility

The shortcut to run the JADE Monitor application is as follows.

```
C:\JadeClient\bin\jade.exe path=C:\Erewhon\system
                           ini=C:\JadeClient\bin\jade.ini
                           schema=JadeMonitorSchema
                           app=JadeMonitor
```

The JADE Monitor displays useful information about the system.

You can use the JADE Monitor to view users logged on to the system, and to possibly sign a user off.



Exercise 5.2 – Running a Standard Client

In this exercise, you will make changes to the JADE initialization file used by the JADE client, and then create a desktop shortcut to run the **ErewhonShop** application in the schema **ErewhonInvestmentsViewSchema**.

1. Open the **C:\JadeClient\bin\jade.ini** file in Notepad.
2. Make the following changes to the file.

```
[Jade]
Server=multiuser
```

```
[JadeClient]
ServerNodeSpecifications=tcpip,localhost,50000
```

3. Save and then close the file.
4. Add the following desktop shortcut.

```
C:\JadeClient\bin\jade.exe path=C:\Erewhon\system
                           ini=C:\JadeClient\bin\jade.ini
                           schema=ErewhonInvestmentsViewSchema
                           app=ErewhonShop
```

5. Start the application from your shortcut.

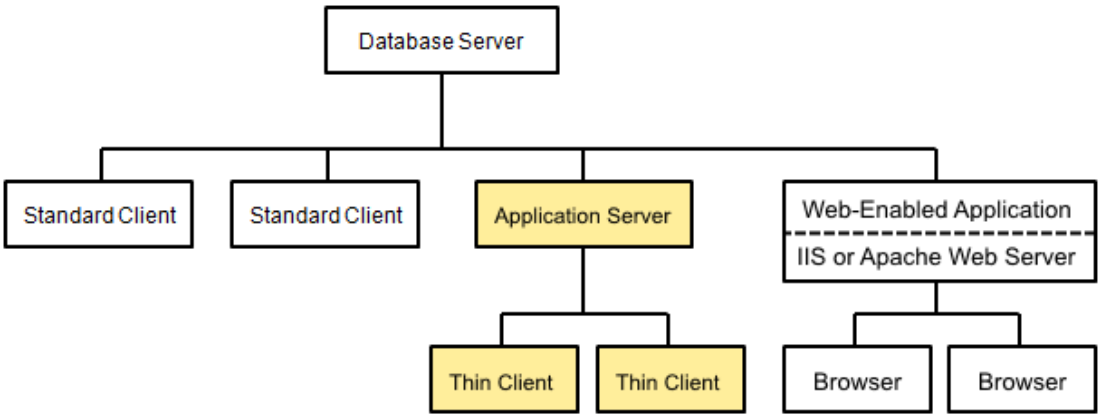
Module 6 Application Servers and Thin Clients

This module covers the following topics.

Introduction

In this module, you will install an application server that will connect directly to the database server, as a standard client does. This results in the creation of a **bin** folder containing the JADE binary files and a program shortcut on the Windows Start menu.

A second installation will install a presentation client that will connect to the application server. A small **bin** folder contains the JADE binary files and a program shortcut on the Windows Start menu.



Later sections of this module cover the operation of the thin client and the JADE initialization file settings that automate the automatic downloading of JADE software updates from the application server to the thin client.

Exercise 6.1 – Installing JADE on an Application Server

In this exercise, you will install the JADE software for an application server. The information you supply is the same as that for a standard JADE client installation.

1. Run the **JADEwin64Ansi.exe** program.

   Note A 32-bit application server can connect to 64-bit database server. Specific installation programs are available from the JadeWorld web site at https://www.jadeworld.com/developer-center/download-jade/.

2. Complete the steps of the InstallShield Wizard as specified in the following table.

Step	Action
Welcome	Click the **Next** button.
License Agreement	Click the **Yes** button to agree to the terms of the license.
Installation Type	Select the **Fresh Copy** option.
	Click the **Next** button.
Setup Type	Select the **Application Runtime** option.
	Click the **Next** button.
Select Installation Folders	Enter **C:\AppServer** in the **Install Directory** text box.
	Click the **Next** button.
Select Program Folder	Enter **AppServer** in the **Program Folder** text box.
	Click the **Next** button.
Client Parameters	Enter **C:\Erewhon\system** in the **Database Path** text box.
	Enter **localhost** in the **Database Host Name** text box.
	Enter **50000** in the **Port Number** text box.
	Click the **Next** button.
Start Copying Files	Click the **Next** button.
Setup Completed!	Click the **Finish** button.

TCP/IP Listening Port

Before the application server program is run, you can change the application server port on which the application server listens for connections from thin clients. You can specify this in the **AppServerPort** parameter in the [JadeAppServer] section of the JADE initialization file or as a command line parameter.

There is no default value for the application server port but the installation process writes the following value into the command line of the installed shortcut.

```
appserverport=4505
```

This makes port 4505 effectively a *default* port number. You can change the port number to any integer value in the range 1 through 64K.

Tip Use the Network Status Command (**netstat**), which is executed from a DOS command window, to display connections and ports in use.

```
netstat -a
```

Running an Application Server

To run an application server, as with a standard client, specify the:

- IP address and port number of the database server
- Application server port number

The IP address and port number are usually specified in the JADE initialization file, whereas the application server port number is usually specified as part of the shortcut.

The following entries should be made in the JADE initialization file.

```
[Jade]
Server=multiuser
```

Note The installation process adds **server=multiuser** to the command line of the installed shortcut, which overrides the setting in the JADE initialization file.

```
[JadeClient]
ServerNodeSpecifications=tcpip,localhost,50000
```

Note The **ServerNodeSpecifications** parameter is configured by the installation process.

The shortcut to run the application server is as follows.

```
C:\AppServer\bin\jadapp.exe path=C:\Erewhon\system
                            ini=C:\AppServer\bin\jade.ini
                            appserverport=60000
```

Note The path to the database must be specified from the server perspective.

Exercise 6.2 – Running the Application Server

In this exercise, you will make changes to the JADE initialization file used by the application server.

1. Open the **C:\AppServer\bin\jade.ini** file in Notepad.
2. Make the following changes to the file.

```
[Jade]
Server=multiuser

[JadeClient]
ServerNodeSpecifications=tcpip,localhost,50000
```

3. Save and then close the file.
4. Add the following desktop shortcut.

```
C:\AppServer\bin\jadapp.exe path=C:\Erewhon\system
                            ini=C:\AppServer\bin\jade.ini
                            appServer=localhost
                            appServerPort=60000
```

5. Start the application server from your shortcut.

Installing a Presentation (Thin) Client

The next task is to install the JADE thin client software on the computer that will connect to an application server. The installation creates a small **bin** folder (approximately 22M bytes).

In this three-tier client server arrangement, the application processing for the thin clients is carried out by the application server. Only GUI information is sent to the thin clients, and this information is cached on the hard drive of the thin client so that it has to be sent once only.

The application server can be run on the same computer as the database server PC, to minimize network traffic.

Running an Application

To run an application from a thin client, specify the:

- IP address and port number of the application server
- Schema name and application name

The shortcut to run the application **ErewhonShop** in the schema **ErewhonInvestmentsViewSchema** is as follows.

```
C:\ThinClient\bin\jade.exe ini=C:\ThinClient\bin\jade.ini
                           appServer=localhost
                           appServerPort=60000
                           schema=ErewhonInvestmentsViewSchema
                           app=ErewhonShop
```

Exercise 6.3 – Installing JADE on a Thin Client

In this exercise, you will install the JADE software for a presentation client (also known as a thin client).

1. Run the **JADEwin64Ansi.exe** program.
2. Complete the steps of the InstallShield Wizard as specified in the following table.

Step	Action
Welcome	Click the **Next** button.
License Agreement	Click the **Yes** button to agree to the terms of the license.
Installation Type	Select the **Fresh Copy** option.
	Click the **Next** button.
Setup Type	Select the **Presentation Client** option.
	Click the **Next** button.
Select Installation Folders	Enter **C:\ThinClient** in the **Install Directory** text box.
	Click the **Next** button.
Select Program Folder	Enter **ThinClient** in the **Program Folder** text box.
	Click the **Next** button.

Step	Action
Presentation Client Parameters	Enter **localhost** in the **Name** text box.
	Enter **60000** in the **Port** text box.
	Enter **ErewhonShop** in the **Application Name** text box.
	Enter **ErewhonInvestmentsViewSchema** in the **Schema Name** text box.
	Click the **Next** button.
Start Copying Files	Click the **Next** button.
Setup Completed!	Click the **Finish** button.

Exercise 6.4 – Running a Thin Client

In this exercise, you will create a desktop shortcut to run the **ErewhonShop** application in the schema **ErewhonInvestmentsViewSchema**.

1. Add the following desktop shortcut.

```
C:\ThinClient\bin\jade.exe ini=C:\ThinClient\bin\jade.ini
                           appServer=localhost
                           appServerPort=60000
                           schema=ErewhonInvestmentsViewSchema
                           app=ErewhonShop
```

2. Start the application from your thin client shortcut.

Cache Files

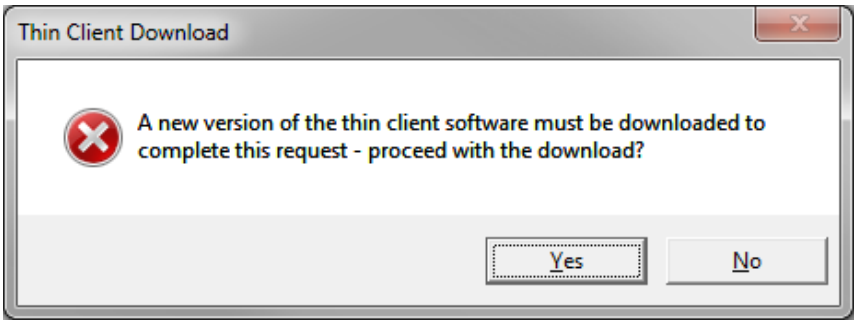
A file is created to minimize retransmitting GUI information.

- **jade60000.jfm** – cached forms and pictures in the thin client **temp** folder
- **jade60000.jpf** – cached pictures in the application server **bin** folder

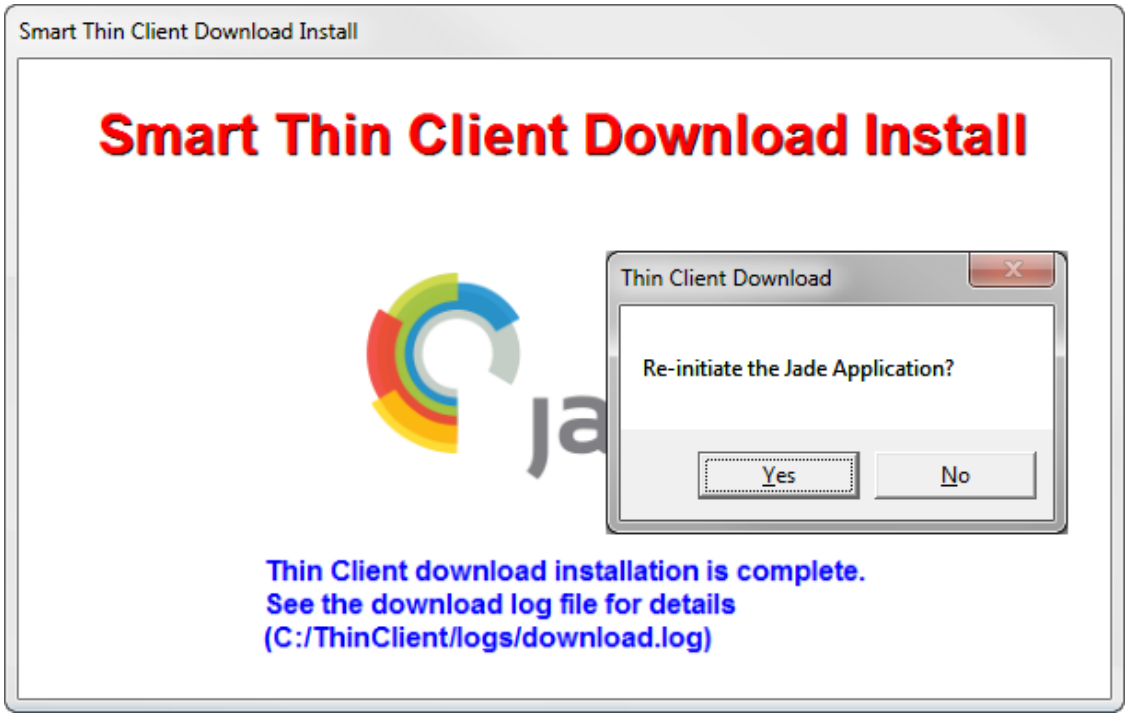
You can create a cached forms file locally and copy it to remote thin clients, to eliminate the first-time wait when accessing forms and pictures.

Automatic Download

When a new release of the JADE software is installed on an application server, the following dialog is presented to a thin client the next time it connects.



When you click the **Yes** button, the new software is automatically downloaded from the application server.



If you want the default automatic download, you need do nothing. However, you can also download other files, and you can download the new thin client software in advance.

The download process is controlled by the following entries in the JADE initialization file.

```
[JadeAppServer]
AutomaticDownLoad=true
DownLoadDirectory=
DownLoadVersion=
DownLoadMaximum=0
PreDownLoadDirectory=
PreDownLoadCount=0

[JadeThinClient]
AutomaticDownLoad=true
DownLoadDirectory=
PreDownLoadDirectory=
PostInstallExe=
```

Module 7 Shared Memory Transport

This module covers the following topics.

Introduction

When an application server or a standard client is on the same physical machine as the database server, the nodes can communicate by using shared memory rather than TCP/IP. This can significantly improve performance.

The JADE initialization file for the database server would contain the following setting.

```
[JadeServer]
NetworkSpecification1=JadeLocal,Enabled,TestSystem
```

The JADE initialization file for the application server would contain the following setting.

```
[JadeClient]
ServerNodeSpecifications=JadeLocal,TestSystem
```

JadeLocal and HPSM Transports

The Hybrid Pipe Shared Memory (HPSM) transport is available from the JADE 7.0 release as an alternative to the older **JadeLocal** transport.

The JADE initialization file entries to use **HPSM** are identical to those for **JadeLocal**; that is, simply replace **JadeLocal** with **HPSM**.

Exercise 7.1 – Using Shared Memory

In this exercise, you will make changes to the JADE initialization file used by the database server and application server so that they connect using the shared memory transport.

Connections between the application server and thin clients will continue to use TCP/IP port 60000.

1. Close all clients and servers for the Erewhon system.
2. Open the **C:\Erewhon\system\jade.ini** file in Notepad.
3. Add another network specification parameter (**NetworkSpecification2**) to the file, as follows.

   ```
   [JadeServer]
   NetworkSpecification1=tcpip,enabled,60000
   NetworkSpecification2=HPSM,enabled,ErewhonSystem
   ```

4. Save and then close the file.
5. Open the **C:\AppServer\bin\jade.ini** file in Notepad.

6. Make the following change to the file.

```
[JadeClient]
ServerNodeSpecifications=HPSM,ErewhonSystem
```

7. Save and then close the file.
8. Start the database server from your shortcut (*not* as a service, which applies to TCP/IP connections).
9. Start the application server from your shortcut.
10. Start the thin client running the **ErewhonShop** application from your shortcut.

Module 8 Non-GUI Applications and Windows Services

This module covers the following topics.

Introduction

A non-GUI application is one that executes JADE code but does not display forms, nor does it print reports. Whilst the **jade.exe** executable (which is the executable used for GUI applications) can be used, it is more common to use the **jadclient.exe** executable.

For more details, see Chapter 1 of the *JADE Runtime Application Guide* (**RuntimeApps.pdf**).

Running Non-GUI Applications

In Module 4, the following non-GUI application shortcut was used to load initial data into the database.

```
C:\Erewhon\bin\jadclient.exe path=C:\Erewhon\system
                             app=DataLoader
                             schema=ErewhonInvestmentsModelSchema
                             server=singleUser
                             endjade C:\Erewhon\examples\erewhon\DataFiles
```

Because a non-GUI application does not display forms to the user, it is sometimes called a *background application*.

Information is passed to the application after the **endjade** parameter as a series of string commands, which are packaged into an array that is passed to the **initialize** method of the application.

Note You should provide documentation if the application requires additional information.

Starting Non-GUI Applications from the Initialization File

A list of non-GUI applications can be specified for the database server or an application server in the [JadeServer] and [JadeAppServer] sections of the JADE initialization file, as follows.

```
ServerApplication1=ExampleSchema,ExampleApp
ServerApplication2=UtilitySchema,BackupApp,2330
```

The value for a **ServerApplication<*n*>** entry is the schema name, application name, and optionally a four-digit number representing the start time of the application in a 24-hour time format. In the previous example, **BackupApp** is scheduled to start at 11:30 pm.

Starting Non-GUI Applications from an Application

An application can be written to control the starting and stopping of non-GUI applications. It will use the **startApplication** method (or related methods) of the **Application** class, which has the following syntax.

```
app.startApplication("ExampleSchema", "ExampleApp");
```

Notifications can be used by the controlling application to request a non-GUI application to terminate.

Creating a Windows Service

The following shortcut installs a non-GUI client application as a service.

```
jadclient.exe service=install
              nodeName=backgroundApp
              nodeNameDescription="NonGuiApp in SomeSchema"
              path=c:\jade\system
              ini=c:\jade\system\jade.ini
              schema=SomeSchema
              app=NonGUIApp
```

The following shortcut removes a non-GUI client application service.

```
jadclient.exe service=remove
              nodeName=backgroundApp
              ini=c:\jade\system\jade.ini
```

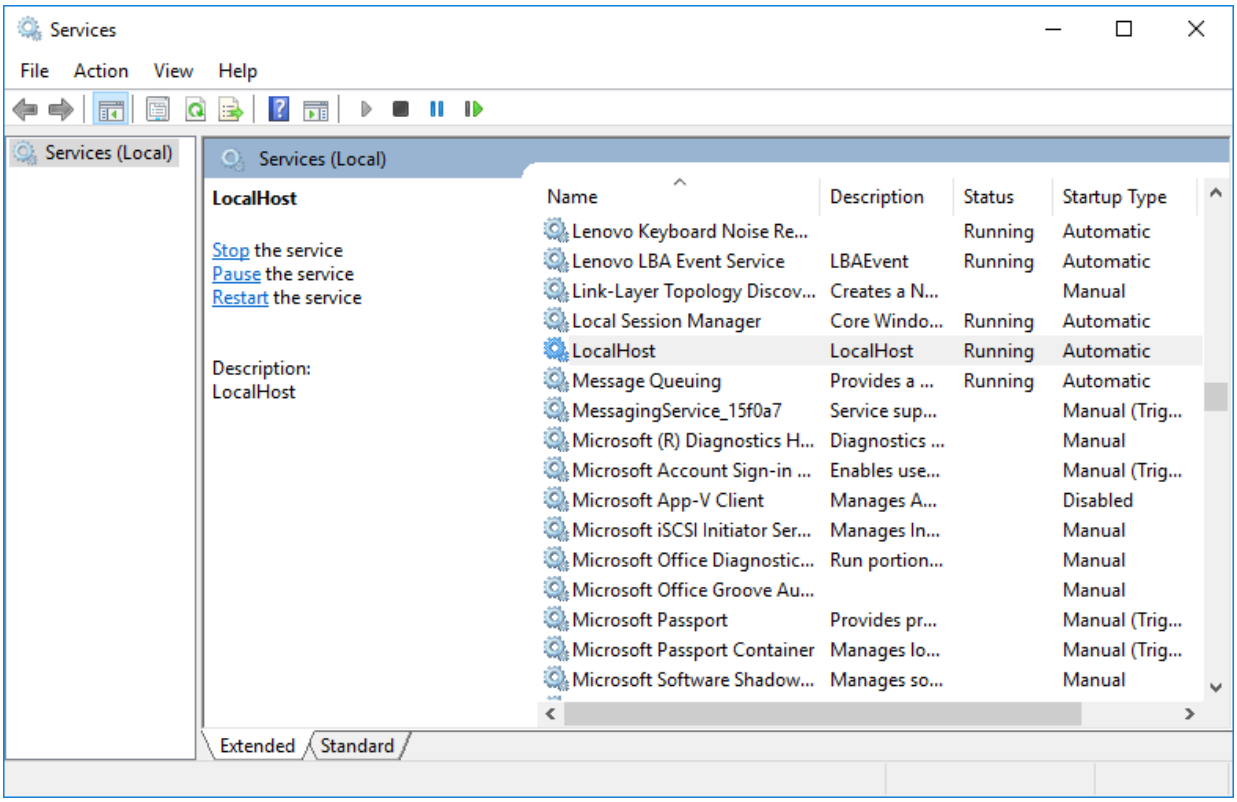
Note When you run **jadclient** to install or remove a service, you must be running with administrator rights.

Controlling Services

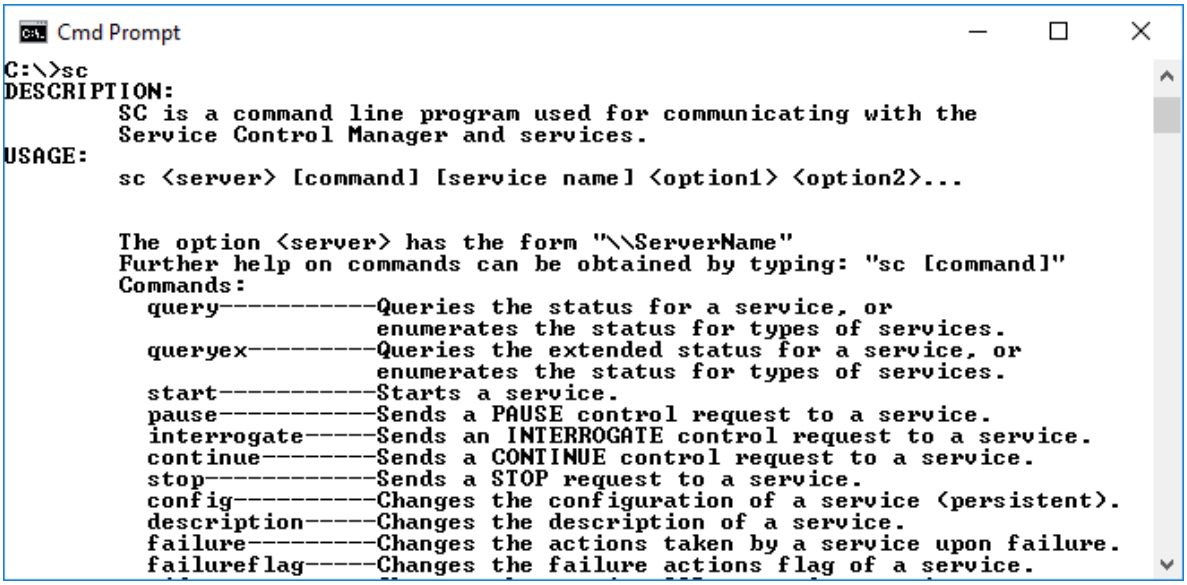
JADE does not provide a mechanism for controlling the order for services that are started automatically.

If you have services that depend on other services, you must arrange to start them in the correct order.

Windows services can be started and stopped from the **Services** application in the **Administrative Tools** grouping in Control Panel.



The Services Control command line utility (**sc**) offers many more functions, including the creation and deletion of services.



The following batch file contains commands to stop one service and to start another.

```
sc stop JadeNonGUIapplication1
sc start JadeNonGUIapplication2
```

Note There is an older utility called **net** that you can use to start and stop services.

```
net stop JadeNonGUIapplication1
net start JadeNonGUIapplication2
```

Exercise 8.1 – Running a Non-GUI Application

In this exercise, you will create a batch file to run the non-GUI version of the JADE Logical Certifier utility.

1. Close all clients and servers for the Erewhon system, as the Logical Certifier utility must be run in single user mode.
2. Open Notepad and then enter the following command in a single line.

```
C:\Erewhon\bin\jadclient path=C:\Erewhon\system
                        ini=C:\Erewhon\system\jade.ini
                        schema=RootSchema
                        app=JadeLogicalCertifierNonGui
                        server=SingleUser
                        endJade operation=certify logDir=C:\Erewhon\logs
```

3. Save the file as **C:\Temp\LogicalCertifier.bat**.
4. Execute **LogicalCertifier.bat** by double-clicking the file in Windows Explorer.
5. Check that **C:\Erewhon\Logs** contains the **_logcert.cls**, **_logcert.err**, **_logcert.fix**, and **_logcert.log** files.

Module 9 JADE Schema Load Utility

This module covers the following topics.

Introduction

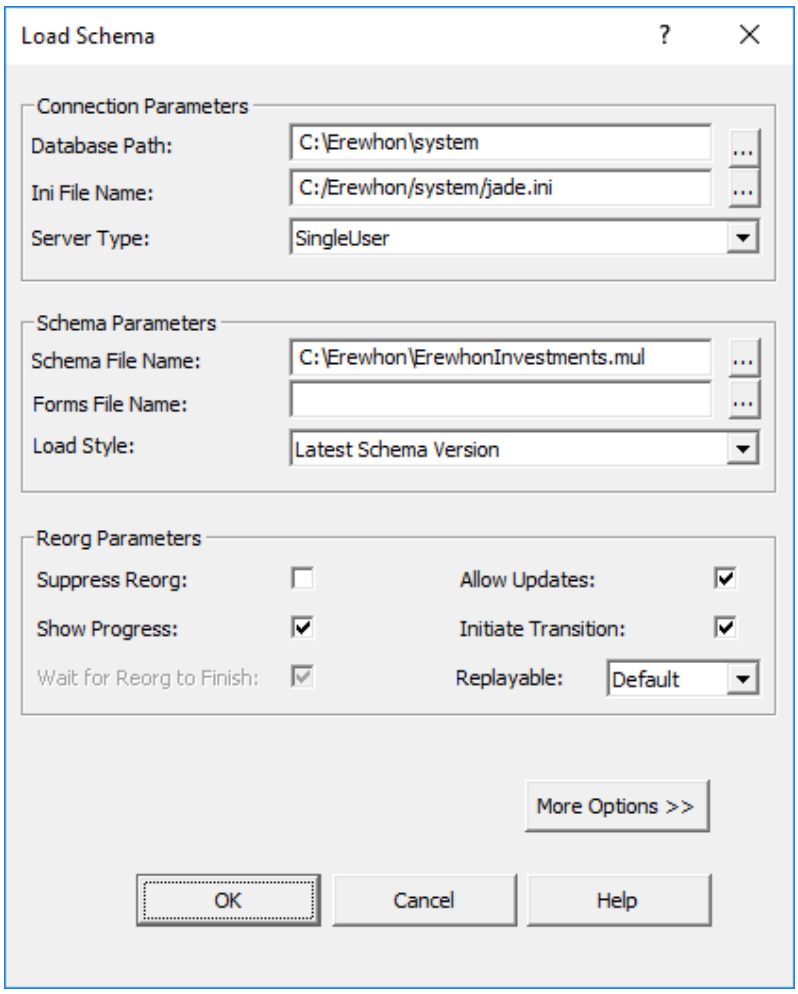
The standalone JADE Schema Load utility, which is often referred to as the JADE Loader, enables you to load JADE schema files and other files into a JADE database.

You can run the utility in single user mode only; that is, you must first stop the database server.

For more details about this utility, see the *JADE Schema Load Utility User's Guide* (**JadLoad.pdf**).

Interactive Schema Load

The interactive version of the JADE Schema Load utility (**jadload.exe**) is shown in the following diagram.



To load a schema, the schema file (with a **.scm** suffix) and the forms definition file (with a **.ddb** suffix) are specified in the Load Schema dialog.

The following other types of files can be loaded.

- Multiple schema file (with a .**mul** suffix)
- Method file (with a .**mth** suffix)
- Class file (with a .**cls** suffix and possibly a .**ddb** forms definition file)
- Report Writer definition file (with a .**rwr** suffix)
- Report Writer view definition file (with a .**rwv** suffix)
- Report Writer folder file (with a .**rwf** suffix)
- Report Writer user options file (with a .**rwu** suffix)
- Report Writer system options file (with a .**rwo** suffix)

If the files that you are loading will not cause a reorganization (for example, loading new methods and changes to existing methods), you can select the **Current Schema Version** rather than the **Latest Schema Version** load style. (With the **Latest Schema Version** load style, a database reorganization is unavoidable.)

Batch Schema Load

The batch version of the JADE Schema Load utility (**jadloadb.exe**) has all of the functionality of the interactive version. You have already used the batch version in Module 4, to load schema files.

The following functions are available in the batch version only.

- Deleting a schema
- Loading a JADE command file

JADE Command File

Some development changes must be manually entered in a JADE command file, because the extracted schema file would be ambiguous; for example, if you were to rename an existing class **Customer** as **Client**. When the schema file is extracted, it would appear that the **Customer** class no longer exists and that **Client** is a new class. Consequently, all **Customer** objects would be removed.

The ambiguity would be removed by loading a command file containing a command to rename the **Customer** class to **Client**, before loading the schema and forms files.

A command file enables you to carry out the following functions.

- Delete and rename a class, property, or other schema element
- Delete instances of a class
- Create or delete a database file
- Move a class within the class hierarchy
- Remap a class to new database file
- Move instances to the new database file

You could do these things easily enough in the JADE development environment.

In the following command file, a new database file called **new_agent.dat** is created in the schema **ErewhonInvestmentsModelSchema**. The **Agent** class is remapped to **new_agent.dat**, and instances are moved to the new file.

```
JadeCommandFile
JadeVersionNumber 16.0.1
Commands
Create DbFile ErewhonInvestmentsModelSchema::new_agent
Remap Class ErewhonInvestmentsModelSchema::Agent new_agent
MoveInstances
```

Note To move a database file to a new location, change the logical location by using the **SetFilePath** command in the batch JADE Database utility or the JADE Database Administration utility, and then physically move the file.

The batch file to load and execute these commands is as follows.

```
C:\Erewhon\bin\jadloadb.exe path=C:\Erewhon\system
                           ini= C:\Erewhon\system\jade.ini
                           commandfile=C:\Temp\commands.jcf
                           loadStyle=currentSchemaVersion
```

Note Command files cannot be loaded with the default **loadStyle** of **latestSchemaVersion**.

Exercise 9.1 – Loading a Command File

In this exercise, you will create a command file and load it using the batch version of the JADE Schema Load utility.

1. Close all clients and servers for the Erewhon system.
2. Open Notepad and then enter the following text.

```
JadeCommandFile
JadeVersionNumber 16.0.1
Commands
Create DbFile ErewhonInvestmentsModelSchema::new_agent
Remap Class ErewhonInvestmentsModelSchema::Agent new_agent
MoveInstances
```

3. Save the file as **C:\Temp\Commands.jcf**.
4. Open Notepad and then enter the following command in a single line.

```
C:\Erewhon\bin\jadloadb.exe path=C:\Erewhon\system
                            ini= C:\Erewhon\system\jade.ini
                            commandfile=C:\Temp\Commands.jcf
                            loadStyle=currentSchemaVersion
```

5. Save the file as **C:\Temp\LoadCommands.bat**.
6. Execute **LoadCommands.bat** by double-clicking the file in Windows Explorer.
7. Check that the **new_agent.dat** database file has been created in **C:\Erewhon\system**.

Module 10 JADE Database Utility

This module covers the following topics.

Introduction

The first part of this module contains information about the JADE database files, journals, and the operation of the database.

This module also contains information about the JADE Database utility, which is a single-user offline interface for initiating database maintenance functions, including:

- Backing up the database and journal files offline
- Restoring a database and journal files from backup
- Checking the integrity and efficiency of the JADE database files, including operations to compact and rebuild selected database files
- Compacting the database files to reclaim deleted object space
- Rebuilding database indexes
- Verifying checksums
- Allocating the initial file size and the extent of file growth
- Initiating roll-forward recovery

For more details about this utility, see Chapter 1, “Using the JADE Database Utility”, of the *JADE Database Administration Guide* (**DbAdmin.pdf**).

Journals and Database Files

When the database server receives transaction information, updates are not immediately stored in database map files. It is more efficient to store them in cache and perform updates at regular intervals (checkpoints). However, transaction information is always written immediately into a database journal file.

What this means is that the database on disk cannot be considered complete or consistent by itself, because it is missing vital information in cache. Normally this does not matter, because JADE is aware of the current state and location of objects. However, should JADE terminate abnormally, the database on disk is left in an inconsistent state.

Journals are used for database recovery and should be stored on a separate disk from the database. The default location for the journals is a subfolder of the system folder. A different location can be specified in the JADE initialization file.

Restart Recovery

JADE maintains journals of transaction information from which it automatically recovers when restarted after an abnormal termination such as a power outage or other malfunction.

Journals are named **db*nnnnnnnnnn*.log**, where the ***nnnnnnnnnn*** value is an automatically generated sequential integer.

For performance and security, the journals should be located on a different disk to the database. You can specify the location in the **JournalRootDirectory** parameter in the [PersistentDb] section of the JADE initialization file.

```
[PersistentDb]
JournalRootDirectory=<separate-disk>:\journals
```

When JADE is closed down normally, the database on disk is updated with all of the information in cache. At that stage, the database is in a consistent state, and the journals are no longer required for restart recovery.

The journals are subsequently deleted unless archival recovery is enabled, as follows.

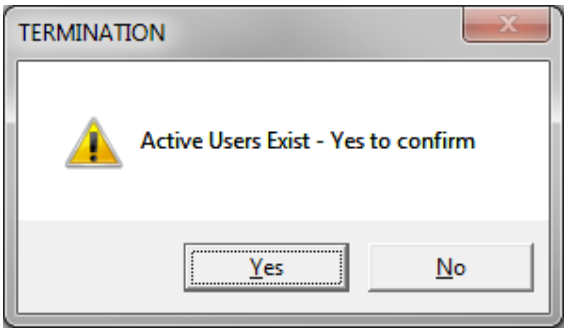
```
[PersistentDb]
EnableArchivalRecovery=true
```

Archival Recovery

For a production system, the journals should be retained so that after restoring files from an earlier backup, you can roll forward through the journals. The JADE Database utility enables you to carry out this and other database operations.

Preparing for an Offline Backup

To do an offline backup, you must stop the database server program, which in turn means requesting users to log off. If you are running the database server program manually (that is, *not* as an NT service), you will receive the following warning if users are still logged on.



If you are running the database server as a service, you can stop the service by running the database server program (**jadrap.exe**) or from the **Services** applet of Control Panel's Administrative Tools.

Note You are not advised if users are still logged on. One way to check whether they have all logged off is to run the JADE Monitor application.

After the database server program has stopped, you can backup the JADE database.

Managing Journals

When a journal is closed, it can be moved to a new location automatically. This makes it easier to identify the journals that are current.

```
[PersistentDb]
JournalArchiveDirectory=<separate-disk>:\journals\archive
JournalCloseAction=Move
```

Compacting Data

The deletion of an object from a map file results in a gap, which could make the map file larger than it needs to be.

In versions of JADE prior to release 7.0, the following setting in the JADE initialization file allowed the space to be reused.

```
[PersistentDb]
SpaceReuseOption=true
```

Setting the **SpaceReuseOption** parameter to **false** meant that a new object was added at the end of the map file rather than trying to plug a gap. This lead to faster performance of the add operation, at the expense of a larger than necessary map file.

Note The **SpaceReuseOption** parameter has been made obsolete with the new DiskCache mechanism.

Space in database files can be reclaimed by carrying out a database compaction. Compaction reclaims disk space but may not improve performance significantly. To compact map files, run the JADE Database utility and select **Compact Files** from the Operations menu. Select the map files to be compacted and then click the **OK** button.

Certifying Files

Certifying database files checks the physical integrity of those files. This process involves a series of scans that verify the contents of records and performs consistency cross-checks between the index and the body of the database files.

A summary of the certification process, including statistics on the number of instances of objects and subobjects found in each scanned class and any errors that are detected, is reported in the **certify.log**.

Whilst you can verify the actual database files, it is more common to certify a backup of the database. With a quiesced or offline backup, the certification can be carried out as part of the backup process with appropriate settings for the **BackupIndexCrosscheckDisabled** and **BackupOrphanCheckDisabled** parameters in the [PersistentDb] section of the JADE initialization file. However, if this checking is disabled or if you carry out an online backup when the checking is not possible, you should definitely certify the backed-up files.

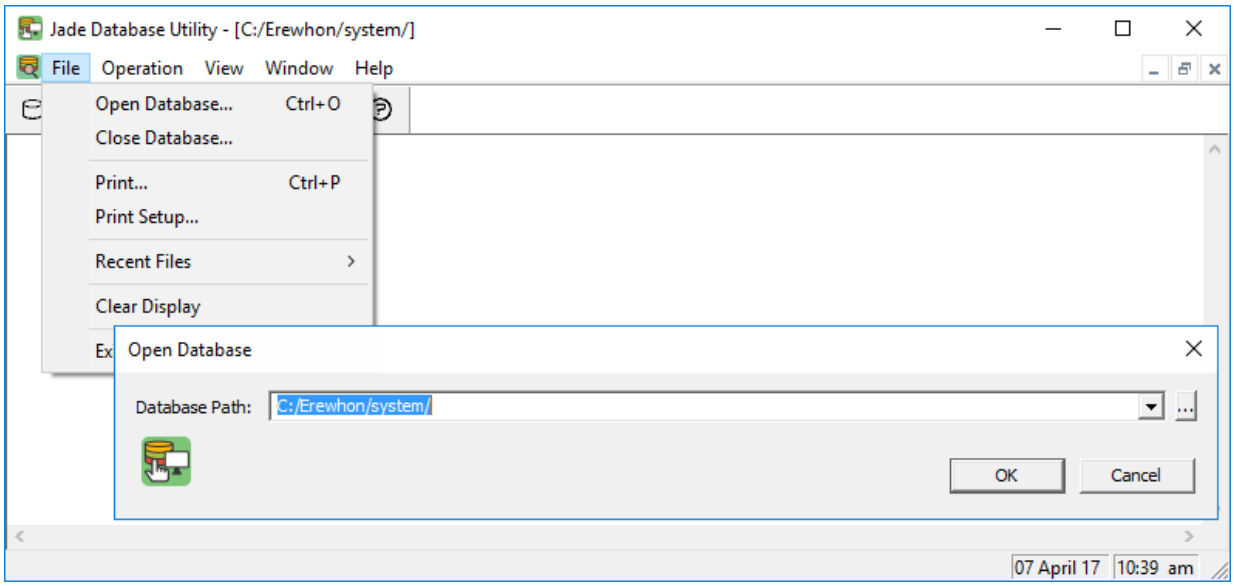
JADE Database Utility

The JADE Database utility requires exclusive access to the database; that is, it must be run in single user mode. For more details about this utility, see Chapter 1, “Using the JADE Database Utility”, in the *JADE Database Administration Guide* (**DbAdmin.pdf**).

The shortcut to run the JADE Database utility is as follows

```
C:\Erewhon\bin\jdbutil.exe
```

To carry out most operations, you must first open the database from the File menu.



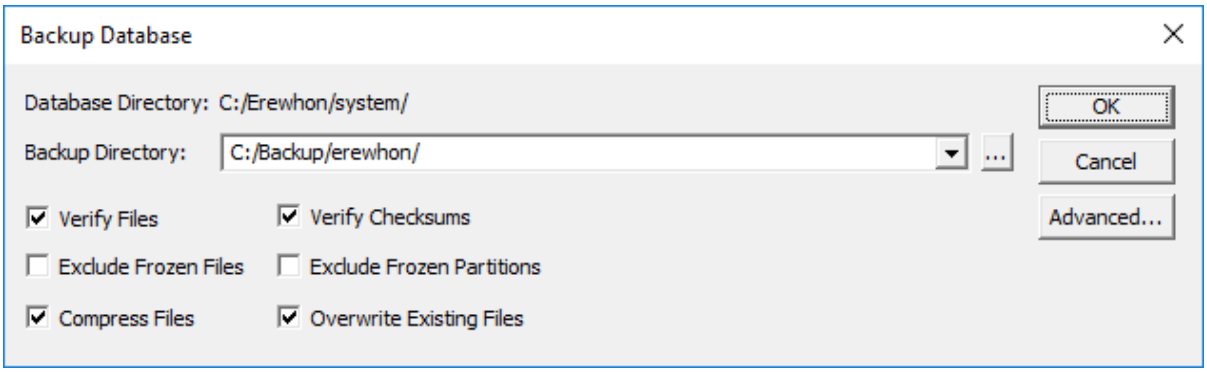
The following table describes the commands available from the Operations menu.

Command	Description
Certify Files	Checks the physical integrity of database files
Compact Files	Compacts the database files based on indexes
Evaluate Free Space	Evaluates the amount of free-space in a file

Command	Description
Delete Files	Deletes database files
Reindex Files	Reindexes database files to repair damaged file indexes or performs free-space garbage collection serially
Reset Timestamps	Resets database timestamps
Verify Checksums	Compares the checksums of database files with those stored in the **backupinfo** or **restoreinfo** file to see whether files have been corrupted during transfer
Set File Attributes	Sets the initial file size and the extent of file growth for selected files
Backup Locations	Adds or changes logical backup destinations
Backup Database	Backs up all or selected database files offline
Restore Database	Restores database files from an online or offline backup and optionally performs roll-forward recovery
Initiate Recovery	Initiates recovery of the database from journals after restoring database files
Backup Journals	Backs up selected journals offline
Restore Journals	Restores journals from backup
Verify Journals	Checks the integrity of database journal files
Dump Journals	Produces a formatted version of database journal files
Journaling Rates	Produces journaling rates summary text file and a detailed CSV file report
Production Mode	Sets or unsets production mode (a system in production mode may perform better, because changes to the database occur under managed conditions only)

Offline Backup

To carry out an offline backup, select the JADE Database utility **Backup Database** operation.



Batch Version of the JADE Database Utility

You can automate the functions provided by the JADE Database utility by using the batch version (**jdbutilb.exe**). For example, the previous offline backup could be carried out with the following commands.

```
C:\Erewhon\bin\jdbutilb.exe path=C:\Erewhon\system
                            ini=C:\Erewhon\system\jade.ini
                            backup
                            overwrite
                            verify
                            backupDir=C:\Backup
```

The backed up files can be certified with the following commands.

```
C:\Erewhon\bin\jdbutilb.exe path=C:\Backup
                            ini=C:\Erewhon\system\jade.ini
                            certify
```

Other actions that you can carry out include:

- Changing the path of database files
- Partitioning database files and managing the partitions
- Freezing and thawing database files
- Marking database files offline and online

Exercise 10.1 – Backing Up the Database

In this exercise, you will backup the database using the batch version of the JADE Database utility.

1. Close all clients and servers for the Erewhon system.
2. Open Notepad and then enter the following command in a single line.

```
C:\Erewhon\bin\jdbutilb.exe path=C:\Erewhon\system
                            ini=C:\Erewhon\system\jade.ini
                            backup
                            overwrite
                            verify
                            backupDir=C:\Backup
```

3. Save the file as **C:\Temp\Backup.bat**.
4. Execute **Backup.bat** by double-clicking the file in Windows Explorer.
5. Check that the database files have been backed up to the **C:\Backup** folder.

Exercise 10.2 – Certifying a Backup

In this exercise, you will certify the backup carried out in the previous exercise.

1. Open Notepad and then enter the following command in a single line.

```
C:\Erewhon\bin\jdbutilb.exe path=C:\Backup
                            ini=C:\Erewhon\system\jade.ini
                            certify
```

2. Save the file as **C:\Temp\Certify.bat**.

3. Execute **Certify.bat** by double-clicking the file in Windows Explorer.
4. Check that the database files have been certified, by opening the **certify.log** file in the **C:\Erewhon\logs** folder.

Module 11 JADE Database Administration Utility

This module covers the following topics.

Introduction

The JADE Database Administration utility (**jdbadmin**) is a command line interface similar to the single-user offline batch database utility (**jdbutilb**). It can execute database administrative operations, including file partition-related operations, online in single-user mode or in multiuser mode.

Note The schema names, such as **CommonSchema**, must be specified in the correct case.

The JADE Database Administration utility enables you to:

- Back up and restore the database and journal files
- Check the integrity and efficiency of the JADE database files
- Compact and rebuild the database files
- Certify files and verify checksums
- Change the path of database files
- Partition database files and manage the partitions
- Freeze and thaw database files
- Mark database files offline and online
- Delta database-related functions

The JADE Database Administration utility syntax is as follows.

```
C:\Erewhon\bin\jdbadmin.exe path=database-path
                            ini=initialization-file-name
                            server=multiUser|singleUser
                            action=an-available-function
                            parameters-relating-to-the-action
```

For more details about this utility, see Chapter 2, “Using the JADE Database Administration Utility”, of the *JADE Database Administration Guide* (**DbAdmin.pdf**).

Backup Offline or Online

You can backup the database using the JADE Database Administration utility with the following commands, which correspond to the **jdbutilb** commands in the previous module.

```
C:\Erewhon\bin\jdbadmin.exe path=C:\Erewhon\system
                            ini=C:\Erewhon\system\jade.ini
                            action=backup
                            overwrite=true
                            verify=true
                            backupDir=C:\Backup
                            quiesced=false      (the default value)
                            server=multiUser    (the default value)
```

Database Certification

Offline and quiesced backups are automatically certified based on the settings of the **BackupIndexCrosscheckDisabled** and **BackupOrphanCheckDisabled** parameters in the [PersistentDb] section of the JADE initialization file.

The **BackupIndexCrosscheckDisabled** parameter, which defaults to **false**, relates to checking that if the index of the map file contains an entry for an object, the object exists in the file.

The **BackupOrphanCheckDisabled** parameter, which defaults to **true**, relates to checking that if an object exists in the map file, there is a corresponding entry in the index; that is, there are no orphan objects in the map file without corresponding index entries. Disabling these checks during a backup is acceptable, provided that the backed up files are certified after the backup.

It is not possible for online backups to certify the database files as they are being backed up.

Exercise 11.1 – Online Backup

In this exercise, you will backup the database using the batch version of the JADE Database Administration utility.

1. Start the database server from your desktop shortcut.
2. Open Notepad and then enter the following command in a single line.

```
C:\Erewhon\bin\jdbadmin.exe path=C:\Erewhon\system
                            ini=C:\Erewhon\system\jade.ini
                            action=backup
                            overwrite=true
                            verify=true
                            backupDir=C:\Backup
```

3. Save the file as **C:\Temp\Backup.bat**.
4. Execute **Backup.bat** by double-clicking the file in Windows Explorer.
5. Check that the database files have been backed up to the **C:\Backup** folder.

Module 12 JADE Care Start Backup

This module covers the following topics.

Introduction

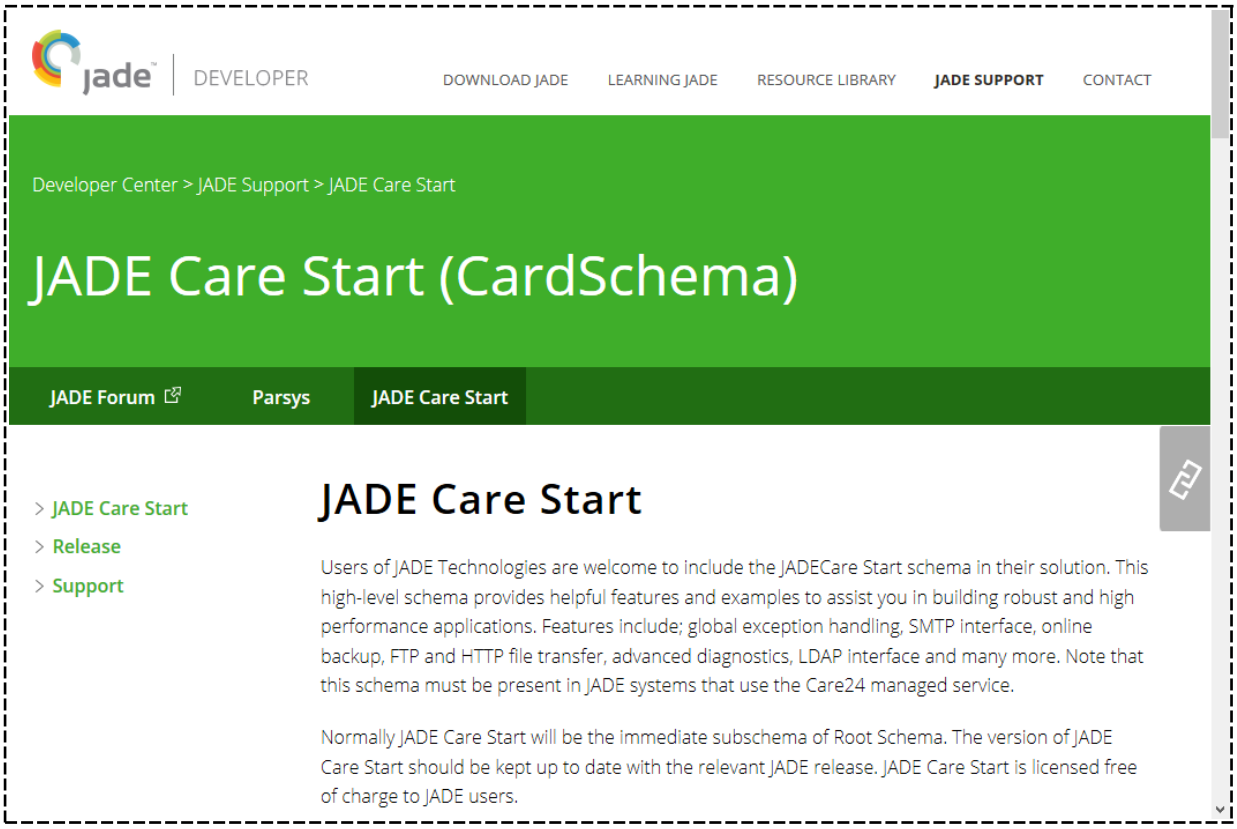
In this module, you will use the backup functionality from the JADE Care Start schema (**CardSchema**), which is provided by the JADE Care group. This schema provides functionality that can be incorporated into applications by developers; for example, LDAP and e-mail. However, these LDAP and e-mail topics, which are more relevant to developers, are not covered in this course.

CardSchema is used by the JADE Care group to manage JADE systems for customers. It provides functionality that has been extensively tested and adds to the standard logging in the **jommsg.log** file with additional **cn_ log.log** and other files.

JADE Care

JADE Care is the group within Jade Software Corporation that develops tools to manage JADE systems (and other technologies).

For more information, see https://www.jadeworld.com/developer-center/jade-platform/jade-support/jade-care.



JADE applications that are managed with JADE Care must have the JADE Care Start class library installed as a superschema of each application. This schema is available to all JADE users who can utilize the classes and applications in the **CardSchema.scm** and **CardSchema.ddb** files in their own systems.

You can download JADE Care Start with a free license from the JADE web site. The zip file contains the following folders.

- **_ReadMe**, which contains documentation including the **User Guide** document
- **_SchemaFiles**, which contains the files for the **CardSchema**, **Mail**, and **BackupTest** schemas
- **i686-msoft-win32**, which contains 32-bit library (**dll**) and debug (**pdb**) files
- **x64-msoft-win64**, which contains 64-bit library (**dll**) and debug (**pdb**) files

CardSchema and Karma.dll

It is important to download the correct version of the JADE Care Start schema (**CardSchema**); that is, the version that corresponds to your version of JADE. The **CardSchema** schema files should be loaded from the **_SchemaFiles** folder using the JADE Schema Load utility, described in Module 9.

Many of the **CardSchema** methods are external methods in the **karma.dll** library. The correct file must be identified, copied to the Erewhon **bin** folder, and renamed. For example, if your system is 64-bit JADE 2016 ANSI, the required file from the **x64-msoft-win64** folder is **karma.dll.x64.ansi160**. You should rename it to **karma.dll** by removing the informational file extensions (that is, **.x64.ansi160**), and then copy it to the **bin** folder.

You should also copy and rename the associated debug information (**pdb**) file.

KCDatabaseBackupMulti Application

The **KCDatabaseBackupMulti** application performs a comprehensive backup of the entire environment similar to that provided in the JADE Care tool set. It uses multiple threads for speed and efficiency, and logs the progress of the backup. For more details about this application, see section 8.7 of the *JADE Care Start User Guide*.

KCDatabaseBackupMulti is a non-GUI application defined in **CardSchema**. After loading **CardSchema** into the Erewhon system you installed earlier in the course, you can set up the following shortcut.

```
C:\Erewhon\bin\jadclient.exe path=C:\Erewhon\system
                             ini=C:\Erewhon\system\jade.ini
                             schema=CardSchema
                             app=KCDatabaseBackupMulti
```

The information that the backup application requires can be specified by extending the shortcut with **endjade**, followed by parameters as follows.

```
C:\Erewhon\bin\jadclient.exe path=C:\Erewhon\system
                             ini=C:\Erewhon\system\jade.ini
                             schema=CardSchema
                             app=KCDatabaseBackupMulti
                             endjade environmentid=Erewhon
                             backupdirectory=C:\Backup
                             backupworkers=2
                             compressfiles=true
                             quiesce=false
```

Alternatively, the information can be specified in the JADE initialization file, as follows.

```
[KCDatabaseBackup]
Environmentid=Erewhon
BackupDirectory=C:\Backup
BackupWorkers=2
CompressFiles=true
Quiesce=false
```

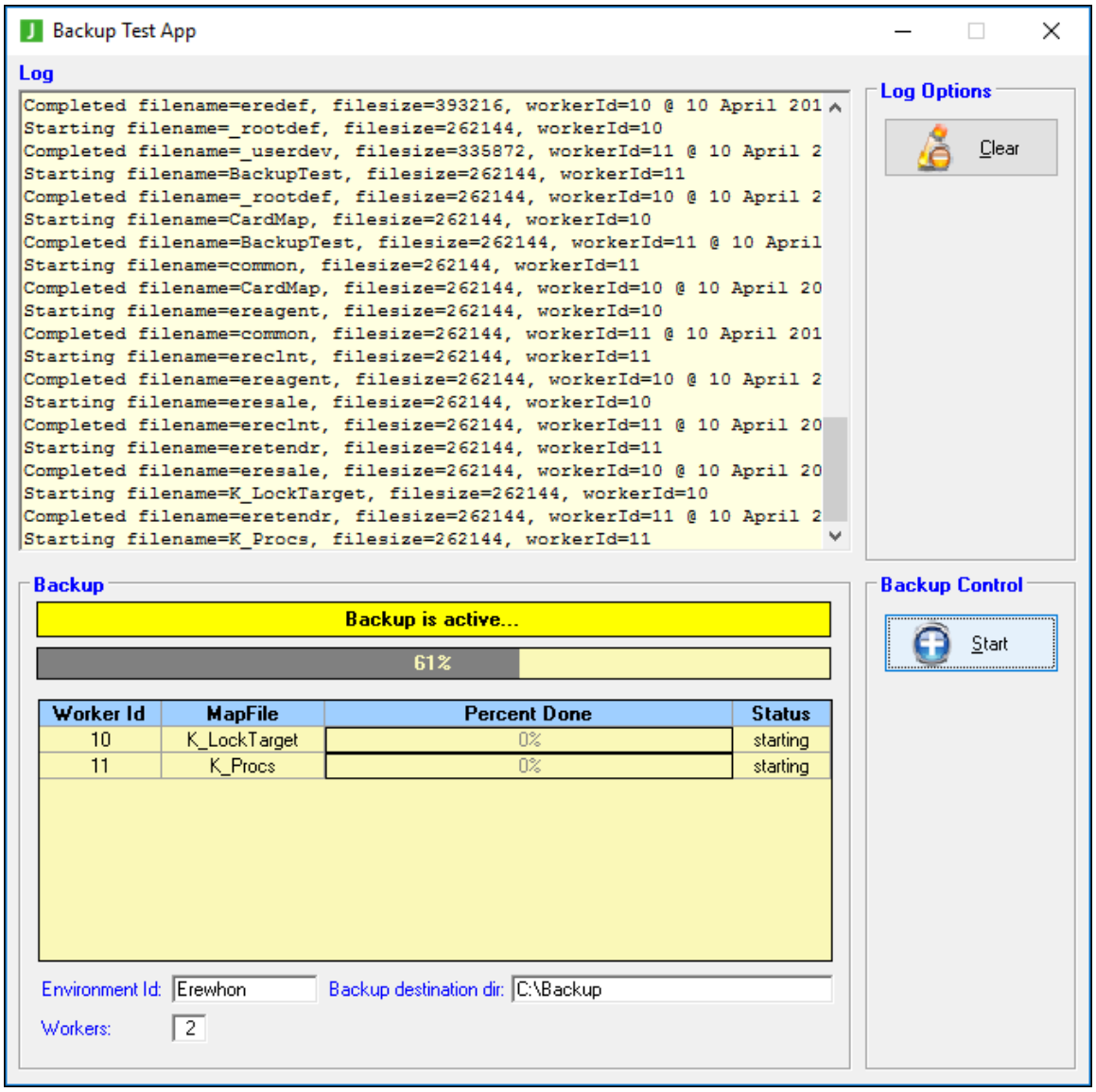
Example Backup Application

The JADE Care Start zip file provides **BackupTest** schema files containing an example application that is a GUI front-end for **KCDatabaseBackupMulti**.

After loading the **BackupTest** schema into the Erewhon system you installed earlier in the course, you can set up the following shortcut.

```
C:\Erewhon\bin\jade.exe path=C:\Erewhon\system
                        ini=C:\Erewhon\system\jade.ini
                        schema=BackupTest
                        app=BackupTest
```

This application enables you to enter the backup information and to be notified of progress, as shown in the following diagram.



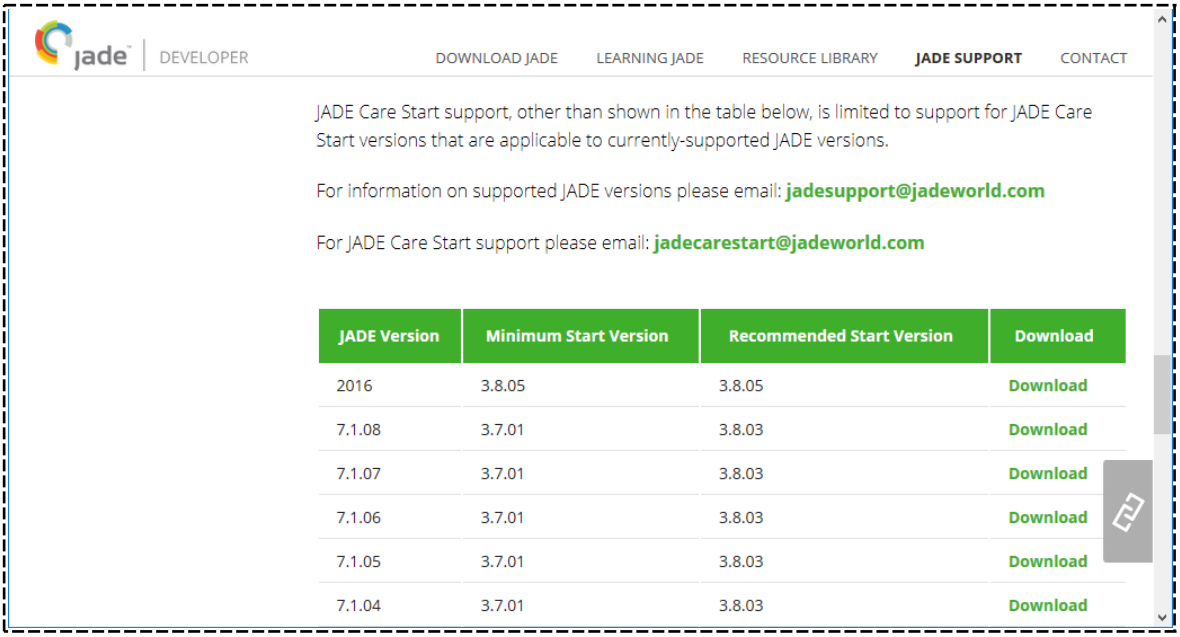
Tip As this application runs in single-user mode, if the server is still in multiuser mode from previous modules in this course, set the **server** parameter to **SingleUser** in the [Jade] section of the **C:\Erewhon\system\jade.ini** file.

Exercise 12.1 – Downloading CardSchema

In this exercise, you will download the appropriate version of the JADE Care Start schema for your JADE version.

1. Enter the URL https://www.jadeworld.com/developer-center/jade-platform/jade-support/jade-care in your browser.

2. Download the appropriate version of JADE Care Start; for example, 3.8.05.



3. Extract the folders from the downloaded zip file.

Exercise 12.2 – Installing CardSchema

In this exercise, you will install **CardSchema.scm** and **CardSchema.ddb** that you previously downloaded and extracted.

1. Run the JADE Schema Load utility.
2. Browse for the **CardSchema.scm** file in the **Schema File Name** text box and for the **CardSchema.ddb** file in the **Forms File Name** text box, and then click the **OK** button.
3. Rename the **karma.dll.x64.ansi160** and **karma.pdb.x64.ansi160** files that you extracted as **karma.dll** and **karma.pdb**.
4. Copy the renamed files to the **C:\Erewhon\bin** folder.

Exercise 12.3 – Running KCDatabaseBackupMulti

In this exercise, you will create a batch file to run the non-GUI backup application **KCDatabaseBackupMulti** provided in **CardSchema**.

1. Open the file **C:\Erewhon\system\jade.ini** in Notepad.
2. Add the following section at the end of the JADE initialization file.

```
[KCDatabaseBackup]
Environmentid=Erewhon
BackupDirectory=C:\Backup
BackupWorkers=2
CompressFiles=true
Quiesce=false
```

3. Save and then close the file.

4. Open Notepad and then enter the following command in a single line.

```
C:\Erewhon\bin\jadclient.exe path=C:\Erewhon\system
                            ini=C:\Erewhon\system\jade.ini
                            schema=CardSchema
                            app=KCDatabaseBackupMulti
```

5. Save the file as **C:\Temp\KCDatabaseBackupMulti .bat**.
6. Check that the database server is running.
7. Execute **KCDatabaseBackupMulti .bat**, by double-clicking the file in Windows Explorer.
8. Examine the backup in the **C:\Backup\Erewhon** folder.

Exercise 12.4 – Running BackupTest

In this exercise, you will load the **BackupTest** schema and create a batch file to run the application **BackupTest**.

Note The **BackupTest** application runs **KCDatabaseBackupMulti**, so the section of the JADE initialization file that you added in the previous exercise is required.

1. Run the JADE Schema Load utility.
2. Browse for the **BackupTest.scm** file in the **Schema File Name** text box and for the **BackupTest.ddb** file in the **Forms File Name** text box, and then click the **OK** button.
3. Open Notepad and then enter the following command in a single line.

```
C:\Erewhon\bin\jade.exe path=C:\Erewhon\system
                        ini=C:\Erewhon\system\jade.ini
                        schema=BackupTest
                        app=BackupTest
```

4. Save the file as **C:\Temp\BackupTest.bat**.
5. Check that the database server is running.
6. Execute **BackupTest.bat**, by double-clicking the file in Windows Explorer.
7. Enter **Test** in the **Environment Id** text box, **C:\Backup** in the **Backup destination dir** text box, and then click the **Start** button.
8. Examine the backup files in the **C:\Backup\Test** folder.

Module 13 JADE Initialization File

This module covers the following topics.

Introduction

This module covers some of more than 450 JADE initialization file parameters that you can set. These parameters enable you to specify:

- Names and locations of files
- Memory and file sizes
- Whether options are enabled or disabled

The values of some parameters are set by a JADE program; for example, the **RunAsService** parameter in the [JadeServer] section is set in the database server program.

This module does not cover all of the parameters that you can set. You do not need to bother with most of the parameters, as they have default values that are perfectly adequate for most environments.

For more details about JADE initialization file sections and parameters, see the *JADE Initialization File Reference* (**JADEini.pdf**).

Default Values for Parameters

The JADE initialization file that is created when JADE is installed contains a small number of parameters. Subsequently, when a JADE program (for example, the database server, the application server, a standard or presentation client, or one of the utilities) is run, additional parameters are written to the JADE initialization file.

For example, after installing JADE and running **jade.exe**, the [JadeClient] section is as follows.

```
[JadeClient]
ServerNodeSpecifications=tcpip,localhost,50000
Language=<default>
ObjectCacheSizeLimit=<default>
TransientCacheSizeLimit=<default>
AutomaticCacheCoherency=<default>
SamplingNode=<default>
ReadOnlySchema=<default>
ReadOnlySystemSchema=<default>
InitializationHandlerLibrary=<default>
NotifyQueueDepthWarningThreshold=<default>
PlatformOptions=<default>
TerminateProcessOnDisconnect=<default>
MaxWaitAppStart=<default>
```

The value of **<default>** specifies that the parameter has the default value for the release of JADE that is installed. In many cases, the default value does not change from one release to the next. One case where values can change is when a feature requires additional memory or disk storage in a new release. In that case, the **<default>** value for the corresponding parameter will increase.

You can look up the actual value for a parameter with a value of **<default>** in the *JADE initialization File Reference*. You can override a value of **<default>** with a specific value.

Qualified Section Names

You can qualify a section name by prefixing a unique identifier. If a JADE program shortcut has a matching **name=*unique-identifier*** command line parameter, those sections in the JADE initialization file with a matching prefix are read. For example, you can define a number of [JadeAppServer] sections as follows.

```
[JadeAppServer]
AppServerPort=4501

[internal.JadeAppServer]
AppServerPort=4502

[external.JadeAppServer]
AppServerPort=4503
```

Specifying **appserverport=4500** in the program shortcut overrides any setting in the JADE initialization file and results in the application server listening on port 4500. If there is no **appserverport** parameter in the program shortcut:

- **name=internal** in the program shortcut results in the application server listening on port 4502.
- **name=external** in the program shortcut results in the application server listening on port 4503.

If there is no **name** parameter in the program shortcut, the application server will listen on port 4501.

Overriding the JADE Initialization File

You can override any JADE initialization file values, by placing them on the command line.

The format to override an initialization file parameter in a program shortcut is *section-name.parameter-name=value*. For example, the following shortcut starts an application server that accepts connections only from thin clients running the **SpecialApp** application in the **SpecialSchema** schema.

```
C:\jade\bin\jadapp.exe appServerPort=1500
                       path=C:\jade\system
                       ini=C:\jade\system\jade.ini
                       JadeAppServer.EnableAppRestrictions=true
                       JadeAppServer.AllowSchemaAndApp1="SpecialSchema,SpecialApp"
```

This is equivalent to changing the parameters in the JADE initialization file (or by using an alternative initialization file), as follows.

```
[JadeAppServer]
EnableAppRestrictions=true
AllowSchemaAndApp1=SpecialSchema,SpecialApp
```

JADE Command Line Section

The [JadeCommandLine] section of the JADE initialization file enables you to specify parameters that would otherwise have to be specified as part of the shortcut, as shown in the following example for a standard client application.

```
[JadeCommandLine]
Path=C:\Erewhon\system
App=ErewhonShop
Schema=ErewhonInvestmentsViewSchema
Server=multiuser
```

The only parameter that you *cannot* add to this section is the **ini=** parameter.

Persistent Database Section

The following parameters in the [PersistentDb] section relate to the management of database journal files.

Parameter	Notes
BackupIndexCrosscheckDisabled=false BackupOrphanCheckDisabled=true	The two checks in database certification are *index block* to *target object* and *target object* to *index*. These parameters determine the level of verification of an offline or quiesced backup.
BackupThreadPriority=Normal	Priority of the operating system threads involved in the backup.
EnableArchivalRecovery=true	Retains journal files when they are closed, rather deleting them. Could be **false** for development, but should be **true** for production.
EnableDeltaLogging=true	Writes object changes only to the journal file, instead of complete before and after images of objects. This parameter has nothing to do with programming deltas or delta databases.
JournalCloseAction=Move	What to do for transaction abort processing or restart recovery processing when a journal file that is no longer required is closed and released.
JournalMaxSize=64M	Size of a new empty journal file used for restart or roll-forward recovery. When it is full with transactions, it is closed.
JournalMinSize=2M JournalSwitchInterval=5	The two conditions for closing a journal file. In this case, a journal is closed after five minutes, provided it has 2M of transactions. If **JournalSwitchInterval=0**, a journal file must be full before it is closed.

Parameter	Notes
JournalRootDirectory=E:\journals	Root folder for recovery journal files.
VerifyJournal=true	Whether a journal file is verified when it is closed.

JADE Application Startup Section

The following parameters in the [Jade] section relate to what is displayed when an application starts up.

Parameter	Notes
ShowSplashScreen=true	Specifies whether a splash screen is shown when the application starts. If set to **false**, no splash screen, video, or messages are displayed.
SplashScreenFile=picture.png	Graphic for the splash screen.
AviFile=video.avi AviPos=<default>	Video displayed on the splash screen and its position on the screen.
ApplicationPos=<default> PathPos=<default> SchemaPos=<default> ServerPos=<default> StatusPos=<default> VersionPos=<default>	Position of messages displayed on the splash screen, relative to the top left-hand corner. If you change a **<default>** value to **null**, the entity is not displayed.

JADE Interpreter Section

The following parameter in the [JadeInterpreter] section handles situations where a **write** instruction used for debugging has not been removed from code.

```
[JadeInterpreter]
WriteEnabled=true
```

Tip The value of this parameter should probably be **true** for development and **false** for production.

JADE Server Section

The following parameters are defined in the [JadeServer] section.

Parameter	Notes
NetworkSpecification1=tcpip,enabled,50000 NetworkSpecification2=JadeLocal,enabled,TestSystem	Specifies how the database server listens for connections from clients.
DeltaDatabaseCapable=true	Must be set before you can create a delta database.
NodeName=TestJadeServer NodeNameDescription="Jade Test Server" NodeNameFriendly=TestJadeServer	Specifies how the Windows service for the database server is displayed in the Control Panel, in Microsoft Management Console (**services.msc**), and the Services Control command line utility (**sc.exe**).
ServerApplication1=ExampleSchema,ExampleApp ServerApplication2=TestSchema,TestApp,0630	Background processes to run on the database server. **ExampleApp** will start immediately; **TestApp** will start at 6:30 am.

JADE Client Section

The **TransientDbPath** parameter in the [JadeClient] section specifies the folder in which database files for transient objects will be created. These files have names in the format **tdb_*process-info*.tmp**, where ***process-info*** identifies the process in which the transient objects were created.

Parameter	Notes
ServerNodeSpecifications=TcpIp,DBServer,50000	How a client connects to the database server.
TransientDbPath=C:\Temp	Should be a local folder that exists.

Module 14 Synchronized Database Service

This module covers the following topics.

Introduction

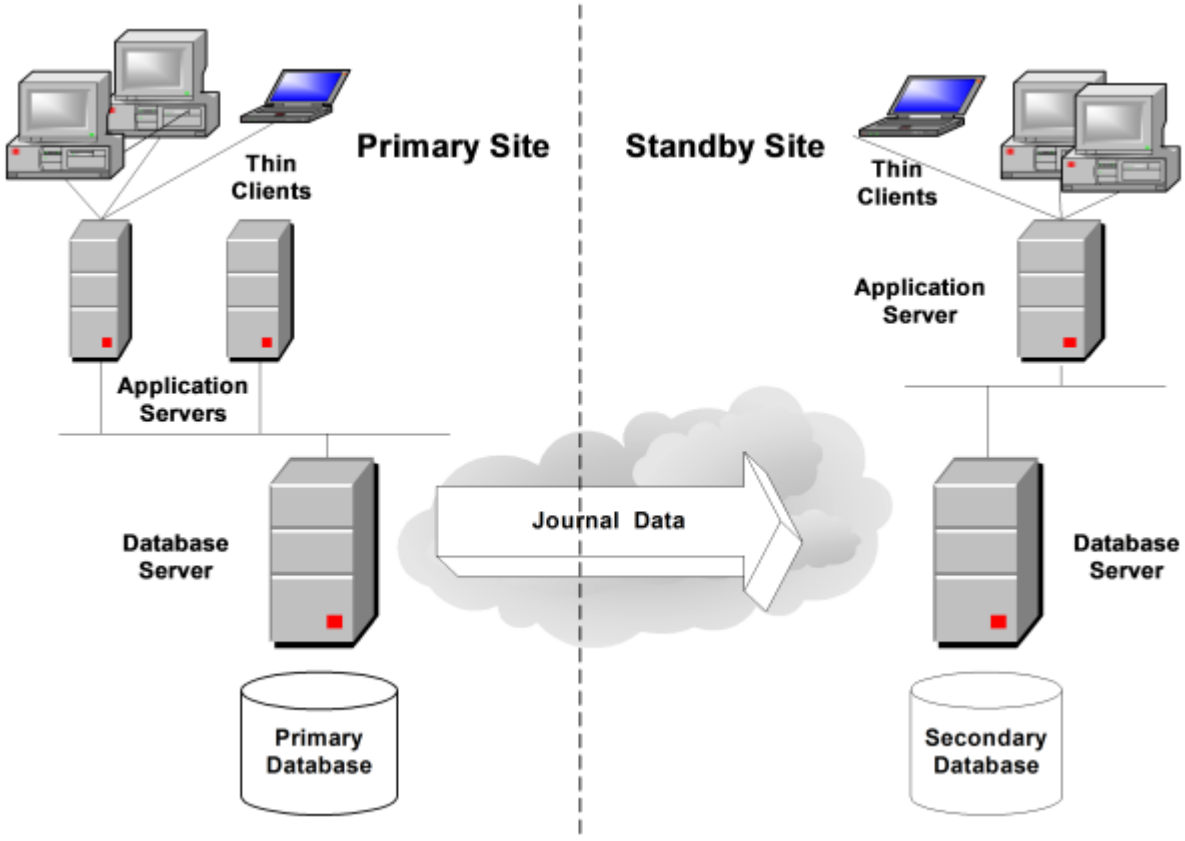
The Synchronized Database Service (SDS) is the name given to the software service in a JADE database that provides the functionality to keep one or more secondary databases synchronized with the primary database.

SDS automates the otherwise-manual process of maintaining a hot standby database that can be used if the primary database is taken offline for routine maintenance, becomes damaged, or is lost entirely.

A secondary database is synchronized by periodically applying the journal data.

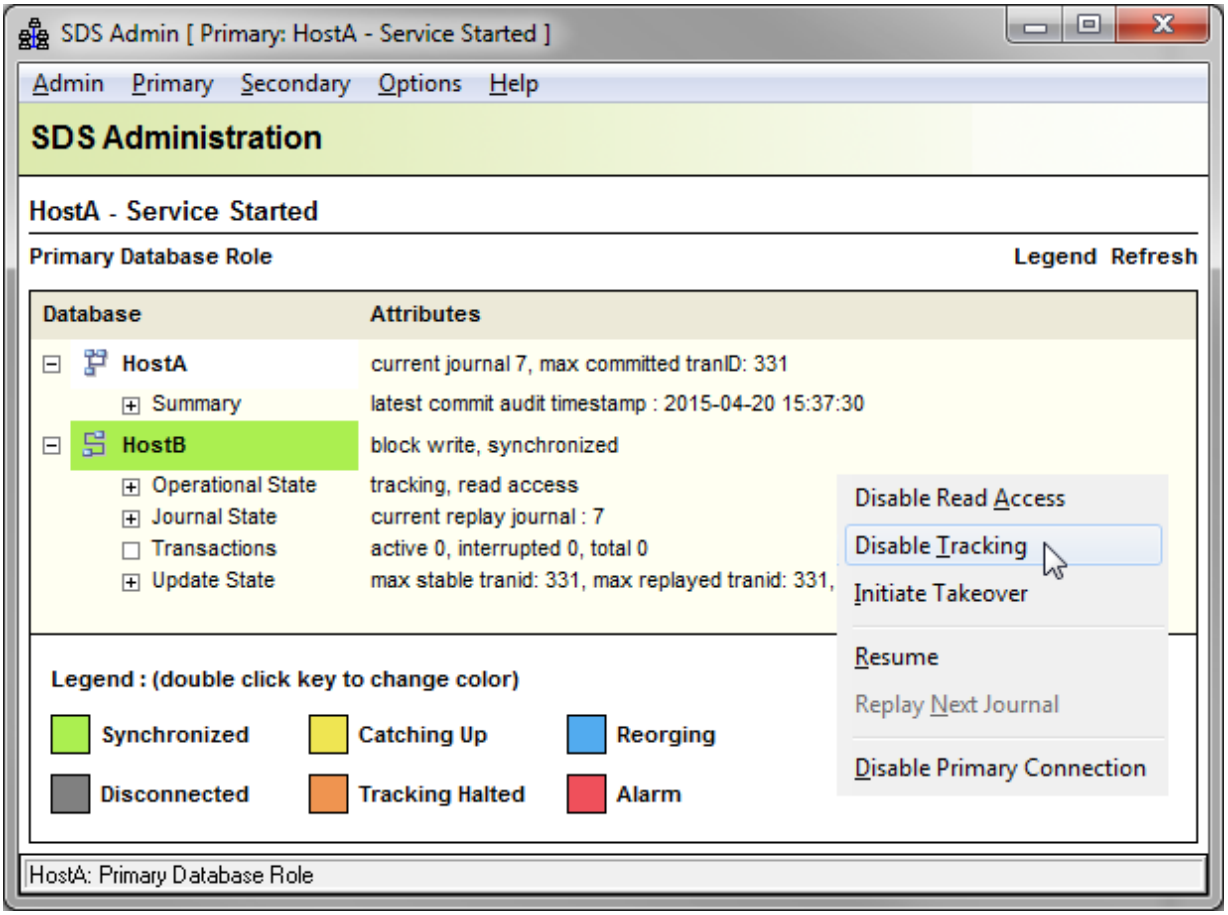
The secondary server can be installed at a different location to the primary. In this example, the secondary database provides a remote ‘hot standby’ database while at the same time supporting read-only database access for inquiry transactions.

In a disaster scenario where a catastrophic failure occurred to the primary database server, processing could be relocated to the secondary database server.



SDS Administration Utility

The SDS Administration utility enables you to monitor and control an SDS environment at run time.



Registering the Primary with SDS Licenses

A database can be converted to an SDS database by registering with an appropriate license. The database should be registered with the SDS primary license and the SDS secondary license, because the server may play either role in the future.

If a secondary database performs a takeover, the primary server will assume the secondary role.

Licenses are registered by running the interactive **jadreg.exe** program or the batch **jadregb** equivalent.

Initialization File Settings for the Primary

Parameters should be set in the JADE initialization file for the primary database server. You also need to set parameters in the [ConnectionParams.HostA] section, which is used when **HostA** is the primary database and listens for connections from secondary databases.

```
[SyncDbService]
DatabaseRole=PrimaryRole
MyName=HostA

[ConnectionParams.HostA]
NetworkSpecification1=TcpIp,enabled,20000
```

Note The **MyName** parameter is the name that is displayed in the SDS administration utility.

You can optionally set parameters in the [ConnectionParams.HostB] section, which would be used if **HostB** performed a *takeover* and became the primary database server.

```
[ConnectionParams.HostB]
ServerNodeSpecifications=TcpIp,localhost,10000
```

Exercise 14.1 – Setting Up the Primary

In this exercise, you will convert the Erewhon system to be an SDS and RPS primary database by registering with a temporary license that will be provided by your instructor.

You will make changes to the JADE initialization file used by the database server appropriate for an SDS primary, and then you will create a shortcut to run the SDS administration program.

1. Close down the database server program.
2. Open Notepad and then enter the following commands, each one in a single line.

```
C:\Erewhon\bin\jadregb.exe path=C:\Erewhon\system
                          name="Primary SDS"
                          key=XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

C:\Erewhon\bin\jadregb.exe path=C:\Erewhon\system
                          name="Secondary SDS"
                          key=XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
```

Note The license names and keys will be provided by your instructor.

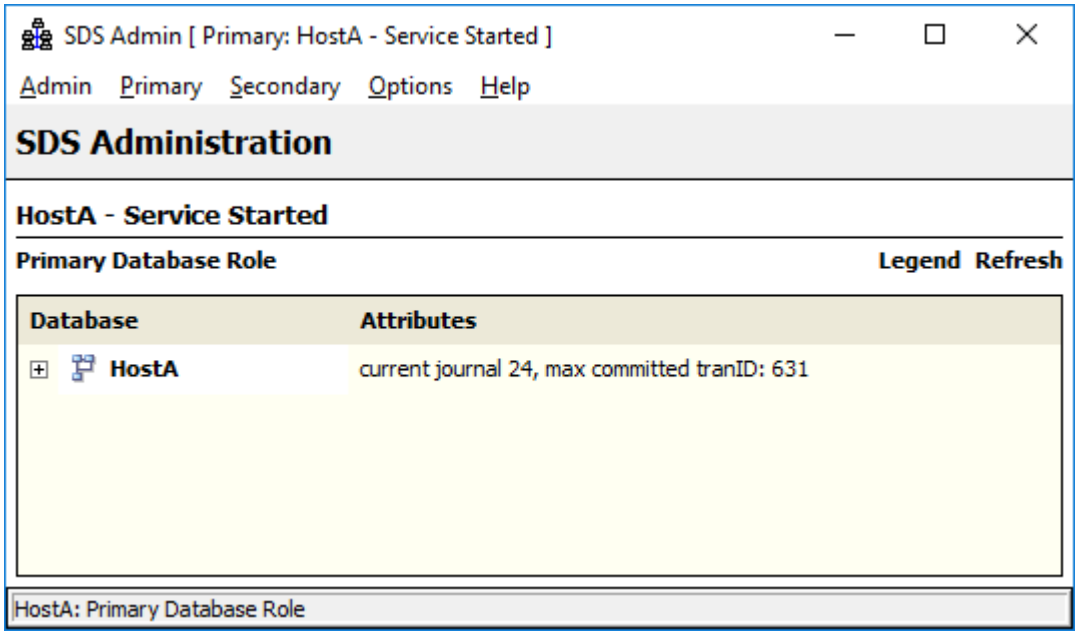
3. Save the file as **C:\Temp\RegisterSDS.bat**.
4. Execute **RegisterSDS.bat** by double-clicking the file in Windows Explorer.
5. Open the **C:\Erewhon\system\jade.ini** file in Notepad.
6. Make the following changes to the file.

```
[Jade]
server=MultiUser

[SyncDbService]
DatabaseRole=PrimaryRole
MyName=HostA

[ConnectionParams.HostA]
NetworkSpecification1=TcpIp,enabled,20000
```

7. Save and then close the file.
8. Start the database server program.
9. Add the following desktop shortcut for the SDS administration program.

```
C:\Erewhon\bin\jade.exe path=C:\Erewhon\system
                        ini=C:\Erewhon\system\jade.ini
                        schema=JadeMonitorSchema
                        app=JadeSDSAdmin
```

10. Run the SDS administration program from your shortcut.



Cloning the Primary to Create a Secondary

The simplest way to establish an SDS environment is to clone the secondary database from the files on the primary database server. After stopping the primary database server, copy the following groups of files.

- Database files; that is, all of the files with a **.dat** extension
- Current transaction journals; that is, the files named **dbnnnnnnnnnn.log**

After copying, you will need to:

- Create shortcuts for the secondary
- Change settings in the JADE initialization file for the secondary

Initialization File Settings for a Secondary

You should set parameters in the JADE initialization file for the secondary database server. You also need to set parameters in the [ConnectionParams.HostA] section, which is used when **HostA** is the primary database.

```
[SyncDbService]
DatabaseRole=SecondaryRole
MyName=HostB
PrimaryServerName=HostA

[ConnectionParams.HostA]
NetworkSpecification1=TcpIp,Enabled,20000
ServerNodeSpecifications=TcpIp,localhost,20000
```

You can optionally set parameters in the [ConnectionParams.HostB] section, which would be used if **HostB** performed a *takeover* and became the primary database server.

```
[ConnectionParams.HostB]
NetworkSpecification1=tcpip,enabled,10000
ServerNodeSpecifications=TcpIp,localhost,10000
```

Exercise 14.2 – Cloning the Erewhon System

In this exercise, you will create the SDS secondary system by cloning the primary system. You will also need to make changes to avoid port conflicts, because the primary and secondary systems will be run on a single computer.

1. Close down the database server for the primary system, and stop the service if the primary was started as a service.
2. Copy the **C:\Erewhon** folder.
3. Paste the folder and change the name to **C:\ErewhonSDS**.
4. Add the following desktop shortcut.

```
C:\ErewhonSDS\bin\jadrap.exe path=C:\ErewhonSDS\system
                             ini=C:\ErewhonSDS\system\jade.ini
```

Note Do not run the shortcut at this stage.

5. Open the file **C:\ErewhonSDS\system\jade.ini** in Notepad.
6. Make the following changes to the file.

```
[JadeServer]
NetworkSpecification1=tcpip,enabled,30000
NetworkSpecification2=HPSM,enabled,ErewhonSystemSDS

[JadeClient]
ServerNodeSpecifications=tcpip,localhost,30000
```

7. Save and then close the file.

Exercise 14.3 – Setting Up the SDS Secondary

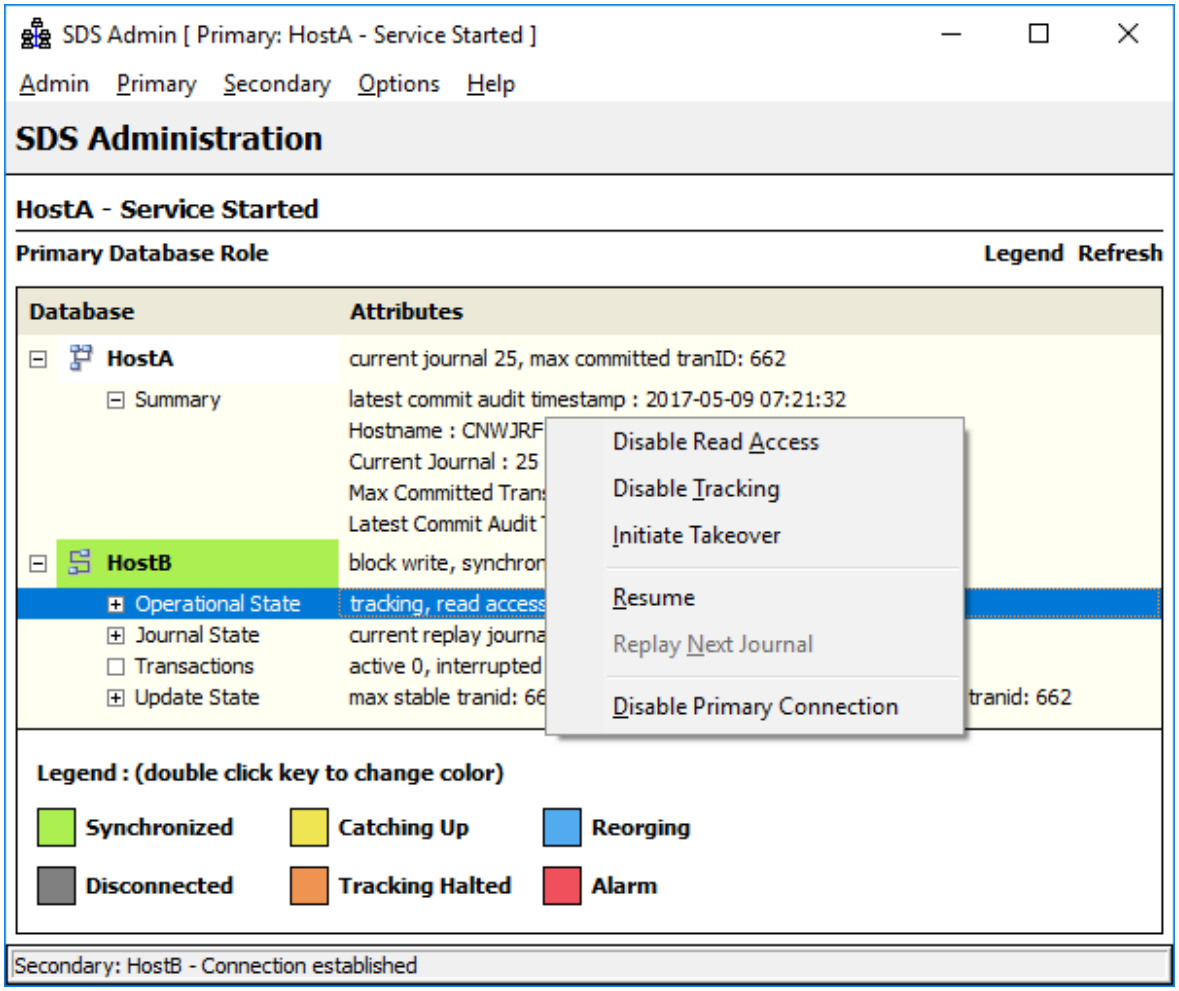
In this exercise, you will make changes to the SDS sections of the JADE initialization file used by the secondary database server.

1. Open the **C:\ErewhonSDS\system\jade.ini** file in Notepad.
2. Make the following changes to the file.

```
[SyncDbService]
DatabaseRole=SecondaryRole
MyName=HostB
PrimaryServerName=HostA

[ConnectionParams.HostA]
NetworkSpecification1=TcpIp,Enabled,20000
ServerNodeSpecifications=TcpIp,localhost,20000
```

3. Save and then close the file.
4. Start the database server program from the shortcut that you created in the previous exercise.
5. Start up the Erewhon SDS from your desktop shortcut.

6. Run the SDS administration program from the shortcut that you created in a previous exercise.



Exercise 14.4 – Testing SDS Functionality

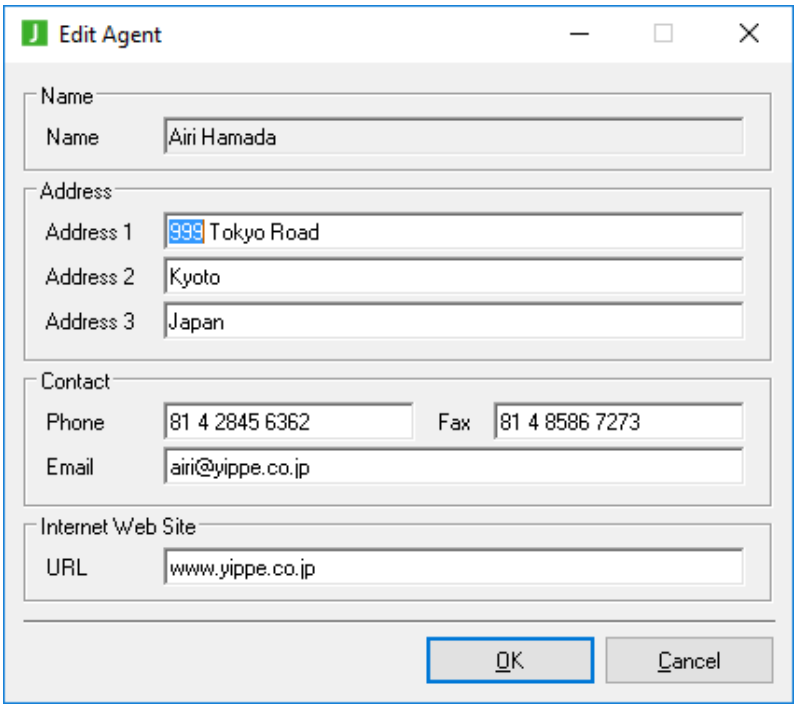
In this exercise, you will test that SDS is working by making a change to the data in the SDS primary system and then viewing the change, which will have been replicated in the SDS secondary system. To do this, you will create shortcuts to run the **Administration** application in the **ErewhonInvestmentsViewSchema**, which is used to maintain information about agents in the Erewhon system.

1. Add the following desktop shortcut.

```
C:\Erewhon\bin\jade.exe path=C:\Erewhon\system
                        ini=C:\Erewhon\system\jade.ini
                        schema=ErewhonInvestmentsViewSchema
                        app=Administration
```

2. Run the **Administration** program from your shortcut and log on as agent **Airi Hamada**.

3. Select **Contact Details** from the Edit menu and then change the address.



4. Close down the **Administration** program on the SDS primary.

5. Add the following desktop shortcut.

```
C:\ErewhonSDS\bin\jade.exe path=C:\ErewhonSDS\system
                           ini=C:\ErewhonSDS\system\jade.ini
                           schema=ErewhonInvestmentsViewSchema
                           app=Administration
```

6. Run the **Administration** program from your shortcut and log on as agent **Airi Hamada**.

s

7. Select **Contact Details** from the Edit menu.

   Note that the address change has been replicated on the SDS secondary.

8. Close down the **Administration** program on the SDS secondary.

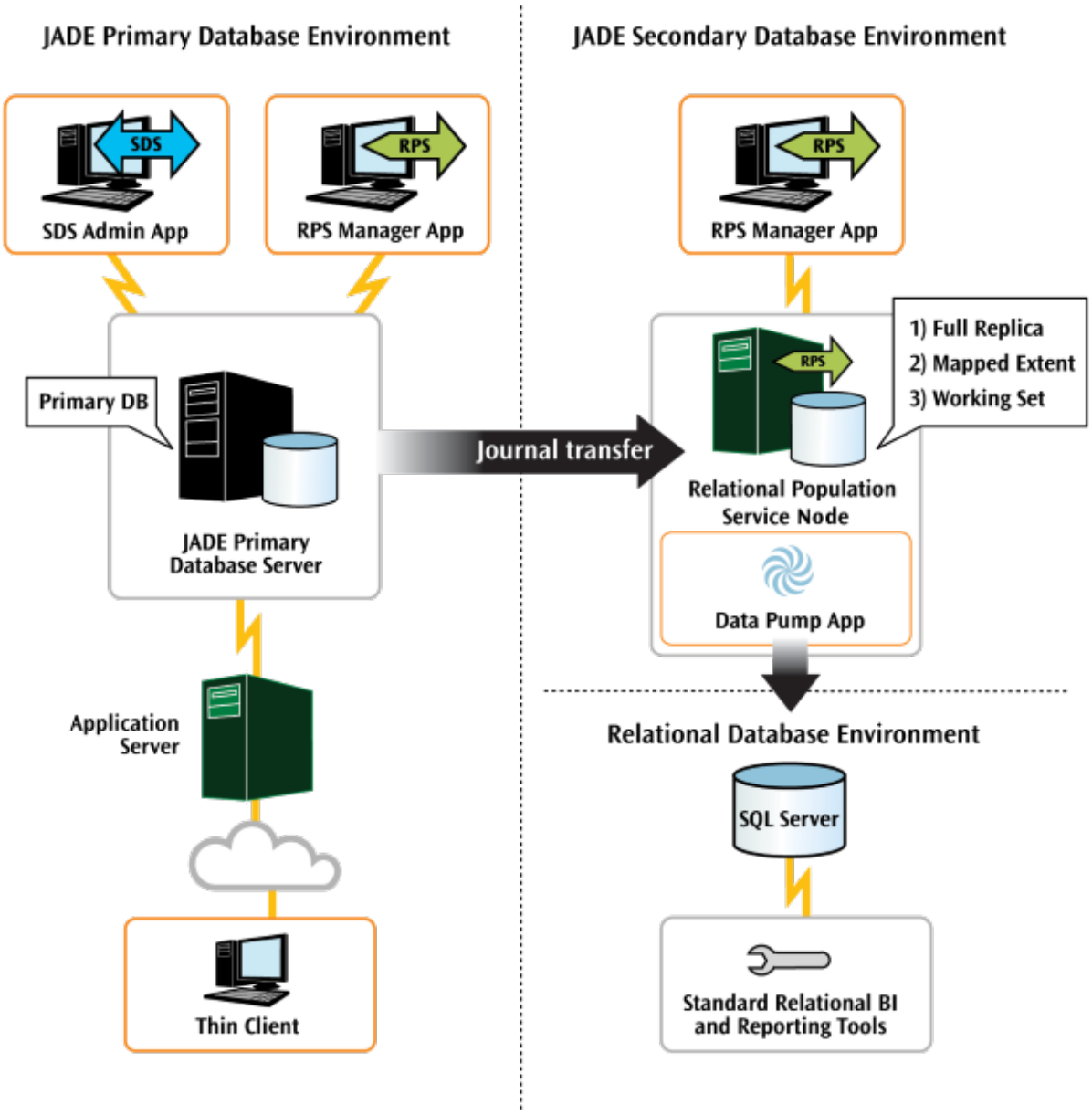
Module 15 Relational Population Service

This module covers the following topics.

Introduction

The Relational Population Service (RPS) enables JADE systems to automatically replicate data into a SQL Server database in near real-time.

Developers can specify the classes, objects, and properties that are to be replicated to the required relational database or databases. This allows an entire JADE database to be replicated, or just the data that is required for external purposes.

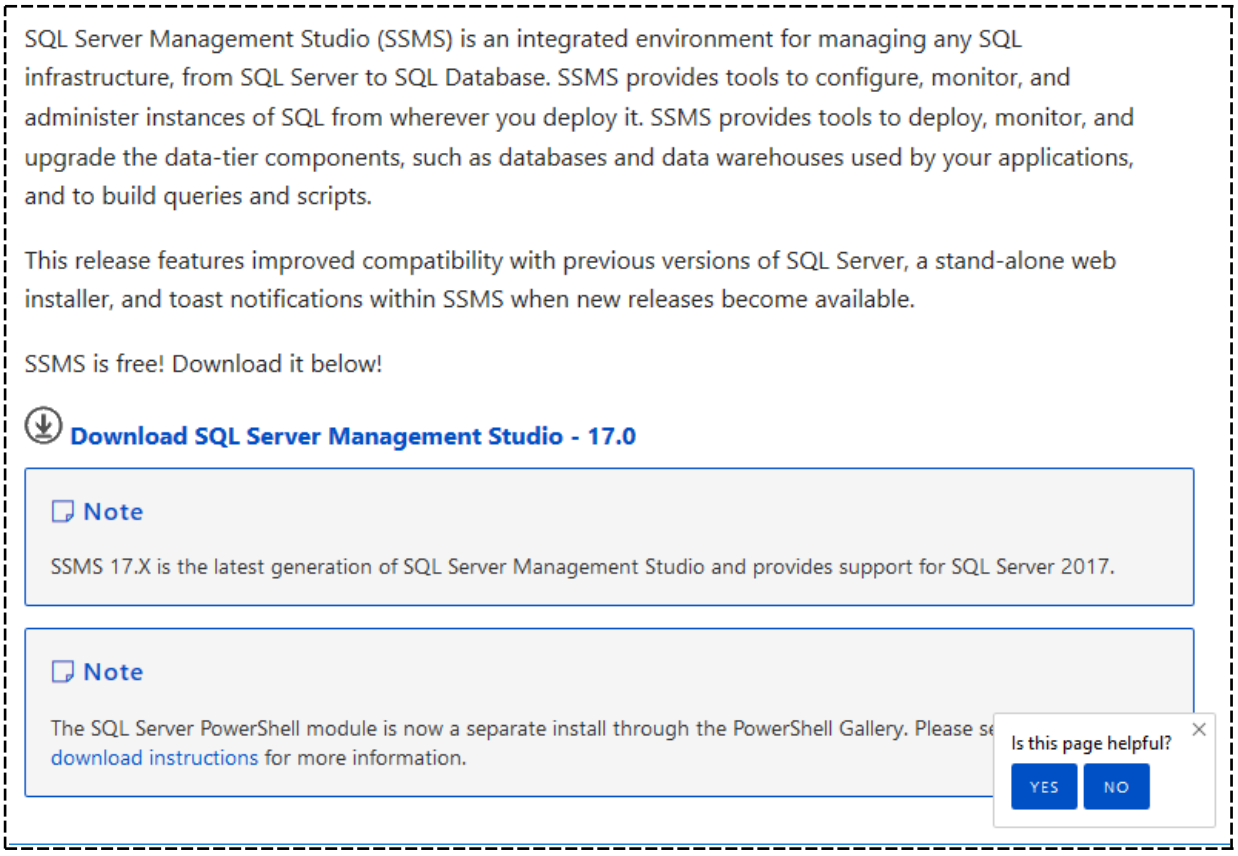


RPS is built on Synchronized Database Service (SDS) technology and uses the same mechanisms as SDS for propagating updates to secondary databases. Updates recorded in database journals written by the primary database are mirrored to attached secondary databases and applied. RPS can populate an entirely independent relational database, or tables within an existing relational database where that database can be updated from multiple sources (that is, via JADE's RPS and also from non-JADE systems). In either case, the tables updated by RPS are defined and controlled by JADE.

Downloading SQL Server

You can download the community edition of Microsoft SQL Server 2016 at https://www.microsoft.com/en-us/sql-server/sql-server-downloads.

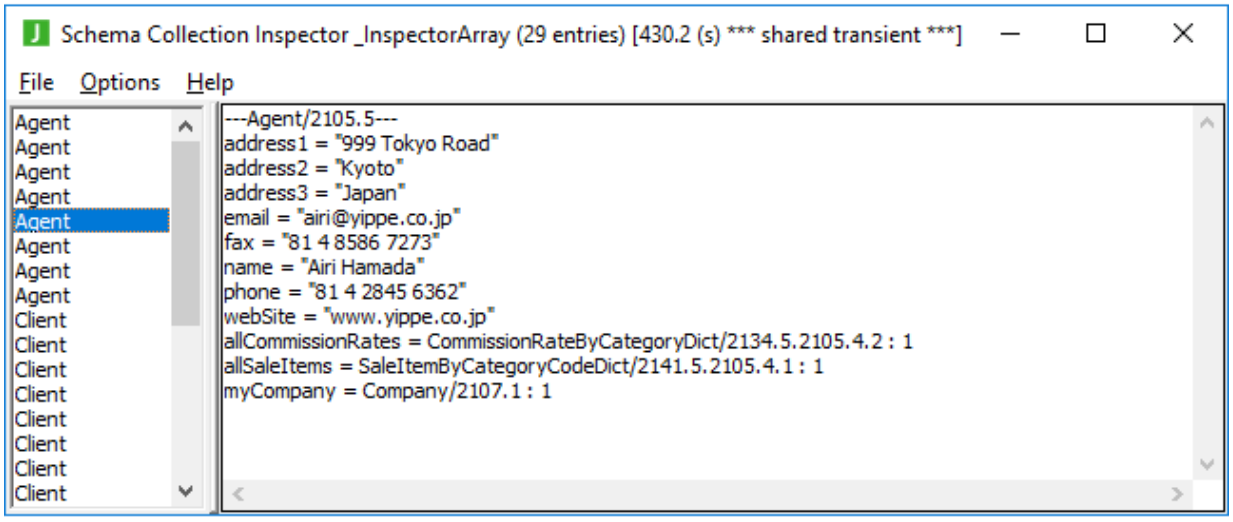
Click the **Download now** button under the Express edition on the right of the web page and then select **Download SQL Server Management Studio (SSMS)** Tools option. The Download SQL Server Management Studio (SSMS) web page is then displayed, to enable you to download the current release (that is, 16.5.3).



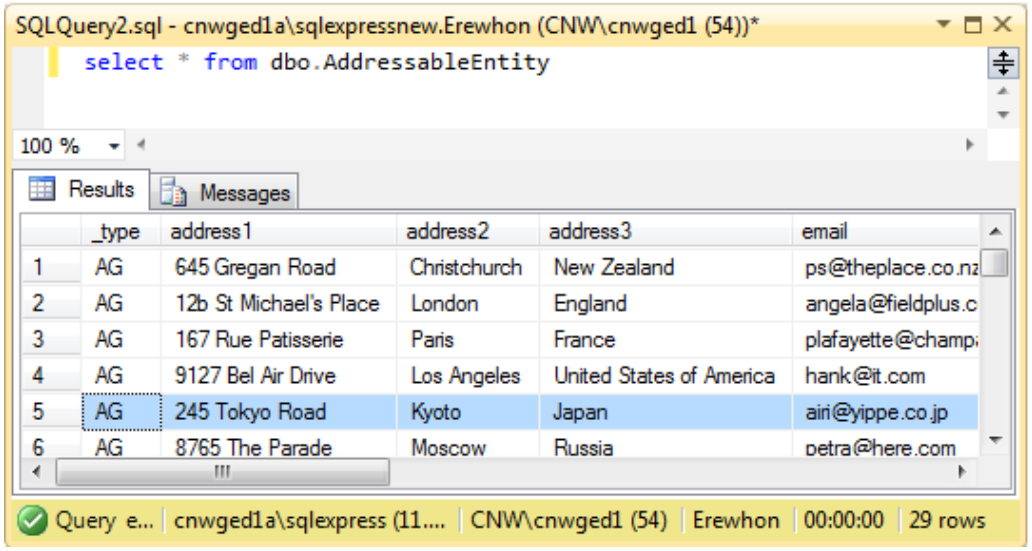
RPS Mapping

An RPS mapping is created by a JADE developer. JADE classes are mapped to tables in an SQL Server database. JADE properties and methods that return values are mapped to columns in the SQL Server tables.

Instances of classes in JADE



Rows in tables in SQL Server

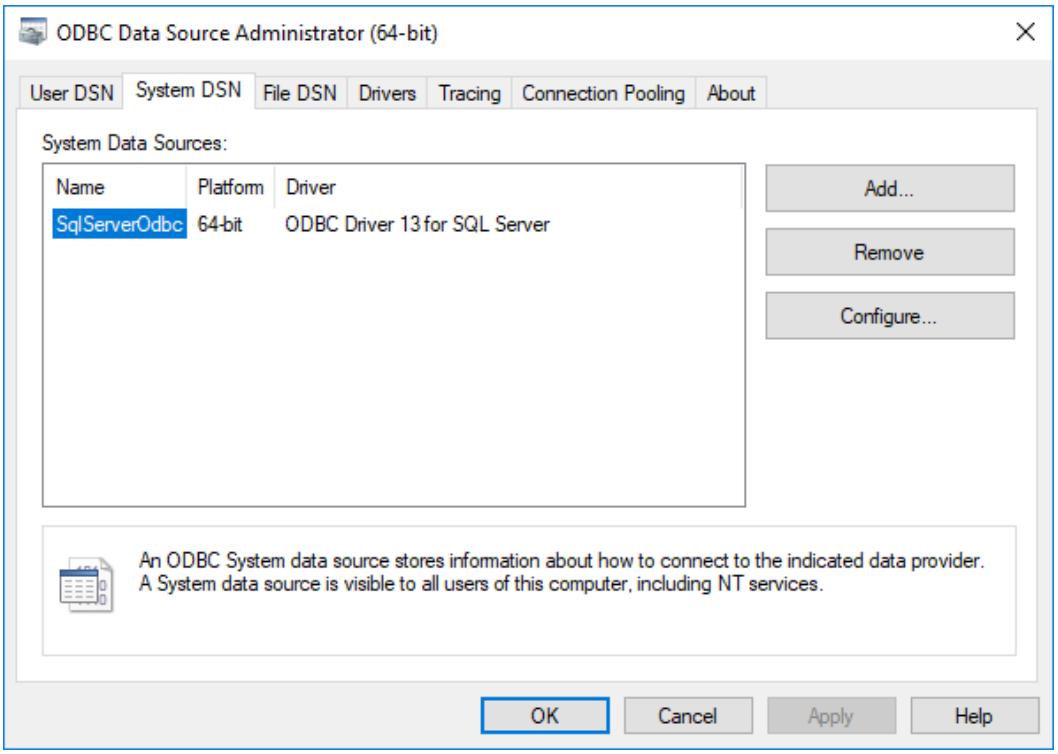


An RPS mapping called **ErewhonRPS** has been defined in the **ErewhonInvestmentsModelSchema**.

Data Source Name

The connection between the JADE secondary database server and SQL Server uses the ODBC driver provided by the installation of SQL Server.

In Control Panel's administrative tools, you can add a Data Source Name (DSN) to be used by the connection.



Exercise 15.1 – Installing SQL Server Express

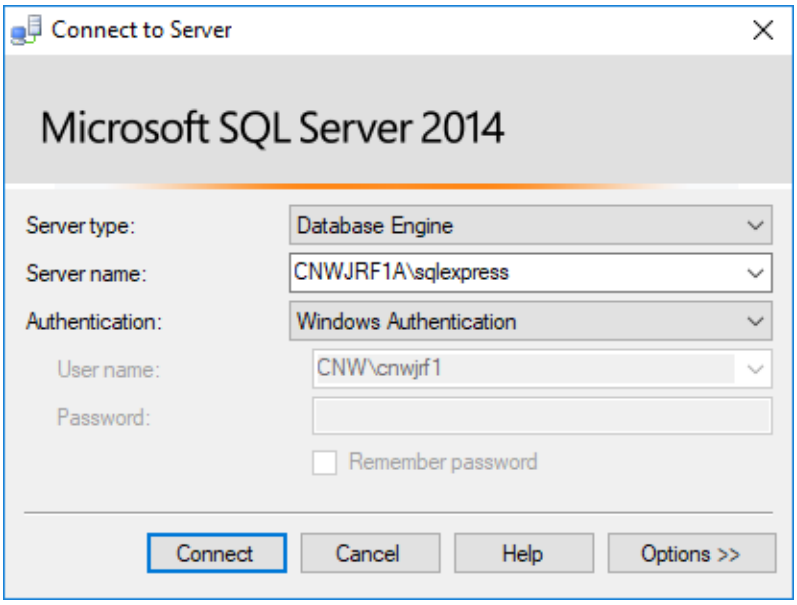
In this exercise, you will install SQL Server 2014 Express Edition with Tools and use SQL Server Management Studio to create an **Erewhon** database.

1. Download and install SQL Server 2014 Express Edition with Tools **SQLEXPRWT_x64_ENU.exe**.

   After this installation, you have an instance of SQL server.

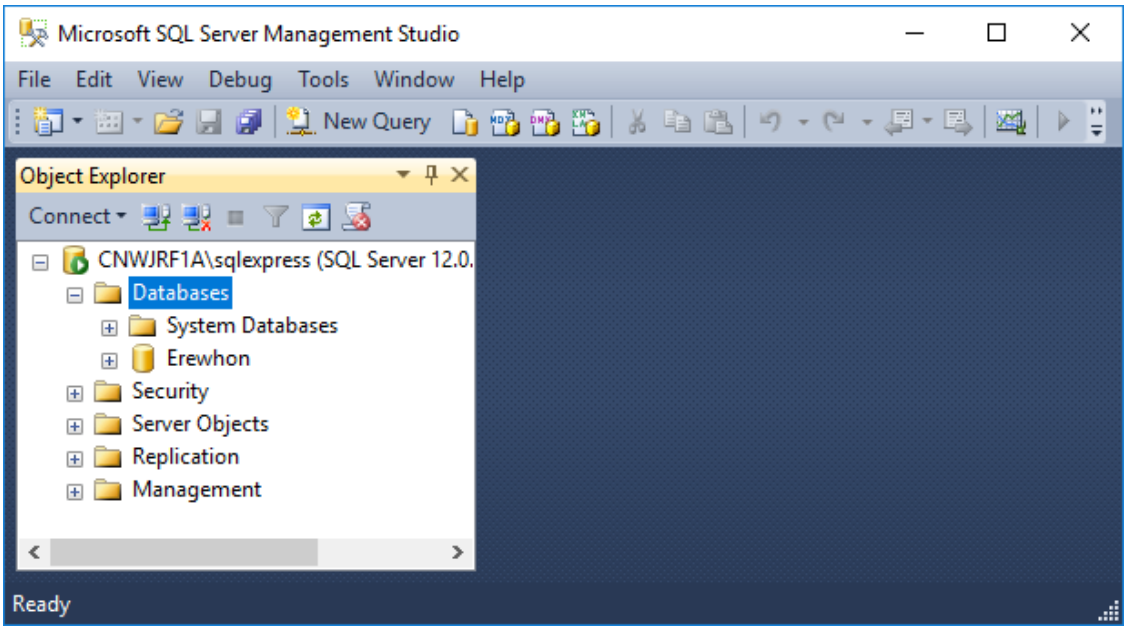
2. Run SQL Server Management Studio from the Microsoft SQL Server 2014 folder on the Windows Start menu.

3. Enter your computer name followed by **\sqlexpress** in the **Server name** text box and then click the **Connect** button.



4. Right-click on **Databases** and then select the **New Database** command from the popup menu.

5. Enter **Erewhon** as the database name and then click the **OK** button.

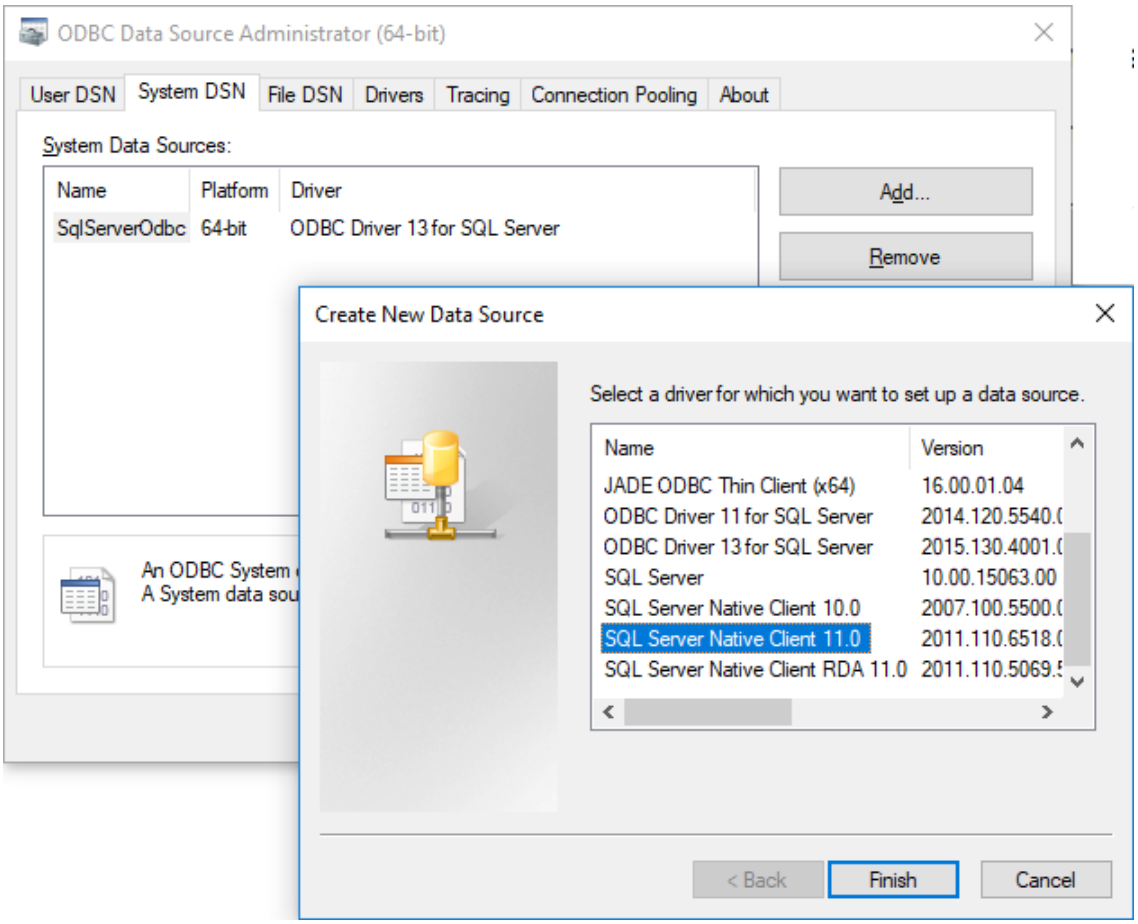


6. Close SQL Server Management Studio.

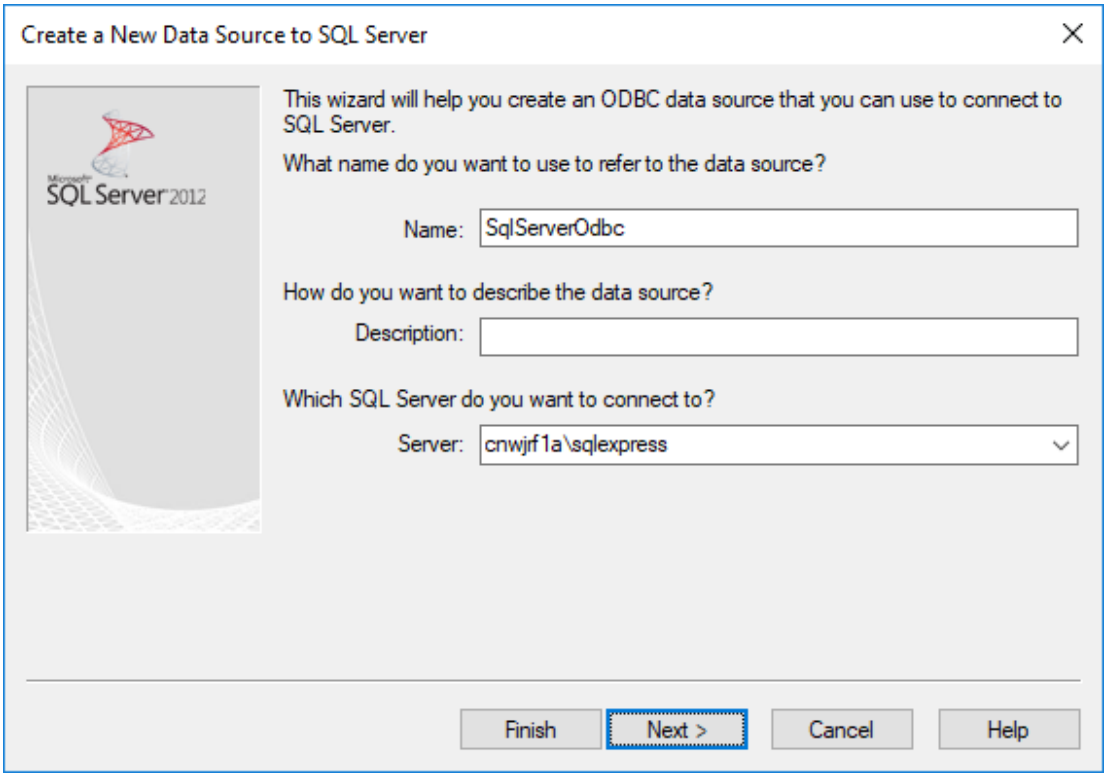
Exercise 15.2 – Creating a Data Source Name

In this exercise, you will create a Data Source Name (DSN) that JADE will use to connect to the **Erewhon** database in SQL Server and run scripts.

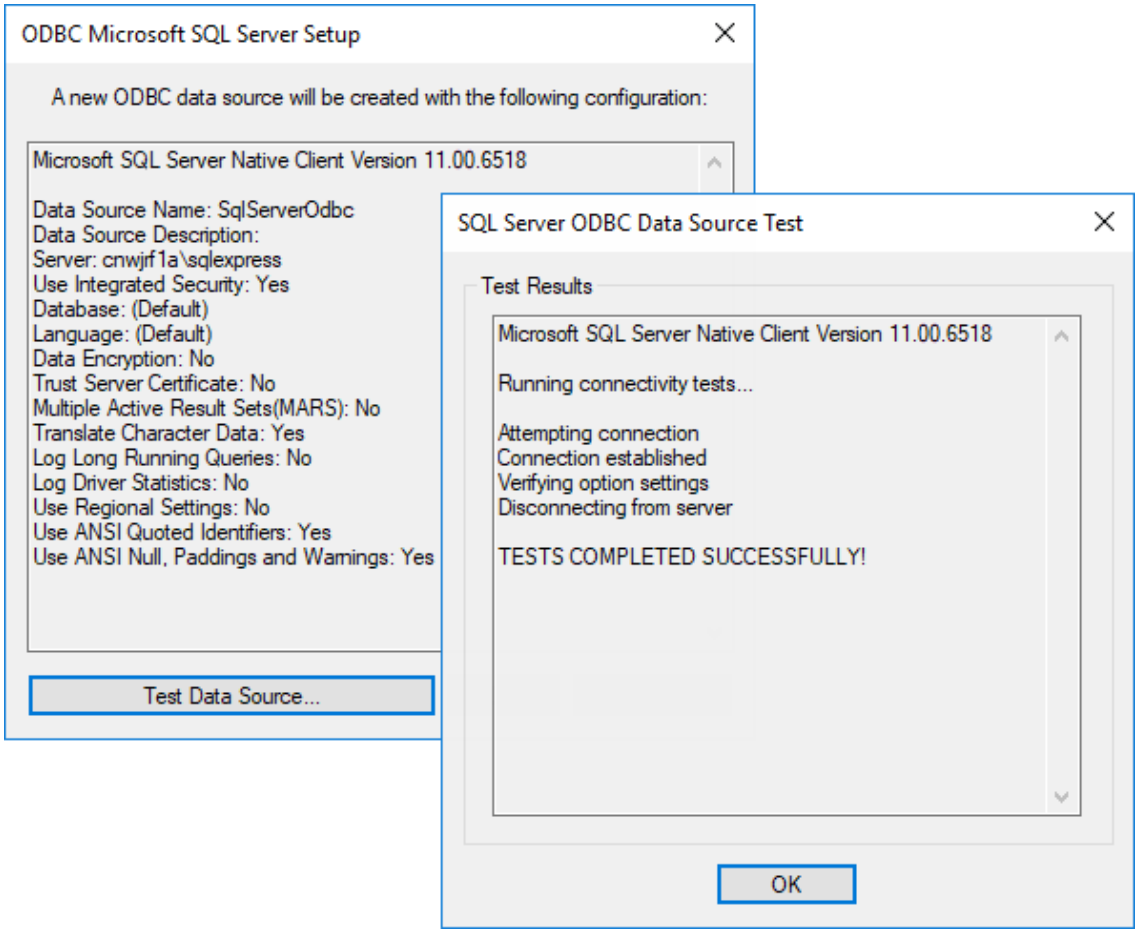
1. Run the **Data Source** application from Administrative Tools in Control Panel.
2. Add a System DSN using the SQL Server Native Client 11.0 driver.



3. Name the DSN **SqlServerODBC** and then connect to the SQL instance that you connected to earlier.



4. Accept the default values for all steps in the wizard and then test the connection in the final step.



Exercise 15.3 – Registering Secondary Server for RPS

In this exercise, you will register the **ErewhonSDS** secondary server with an RPS license.

You will also make a change in the JADE initialization file to change the subrole from the default value of **NativeRole**, which means SDS only, to **RelationalRole**, which means RPS.

1. Close down the database server program for the secondary SDS server.
2. Open Notepad and then enter the following command in a single line.

```
C:\ErewhonSDS\bin\jadregb.exe path=C:\ErewhonSDS\system
                              ini=C:\ErewhonSDS\system\jade.ini
                              name="Secondary RPS"
                              key=XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
```

Note The license name and key will be provided by your instructor.

3. Save the file as **C:\Temp\RegisterRPS.bat**.
4. Execute **RegisterRPS.bat** by double-clicking the file in Windows Explorer.
5. Open the **C:\ErewhonSDS\system\jade.ini** file in Notepad.

6. Add the following line to the [SyncDbService] section.

```
DatabaseSubrole=RelationalRole
```

7. Save and then close the JADE initialization file.

8. Restart the database server program for the secondary SDS server.

Exercise 15.4 – Loading Data into SQL Server

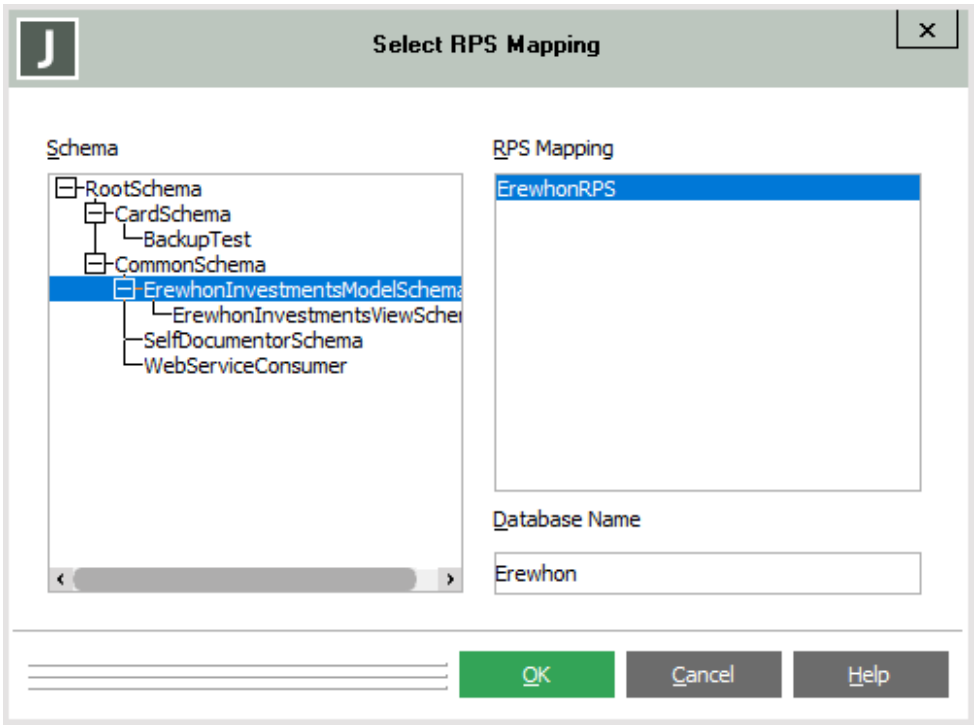
In this exercise, you will add a shortcut to run the RPS Manager program for the secondary system. You will use the RPS Manager to configure the way in which the **Erewhon** SQL Server database is populated by the secondary server.

1. Add the following desktop shortcut.

```
C:\ErewhonSDS\bin\jade.exe path=C:\ErewhonSDS\system
                           ini=C:\ErewhonSDS\system\jade.ini
                           schema=JadeMonitorSchema
                           app=RPSManager
```

2. Run the JADE RPS Manager program on the secondary system.

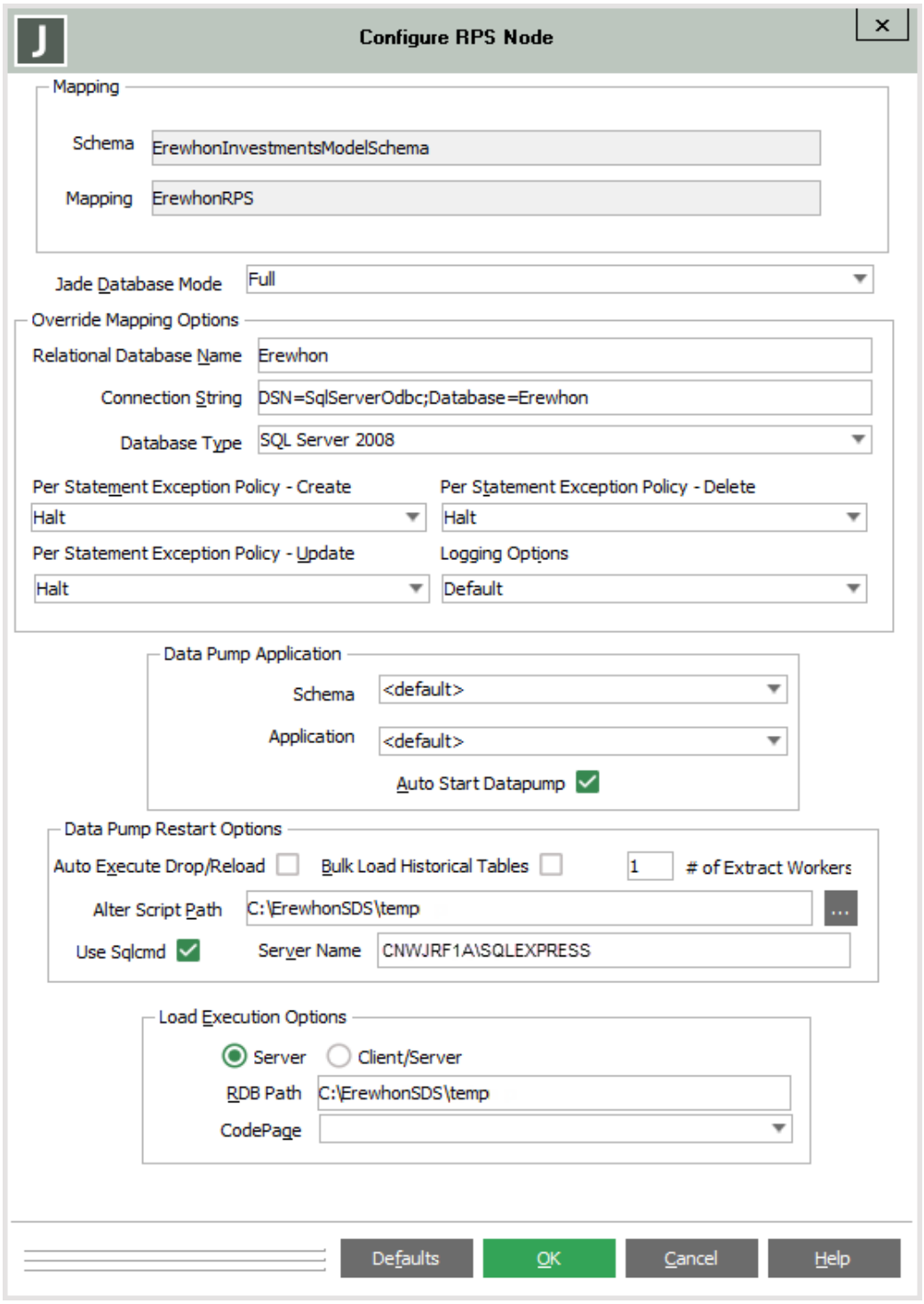
3. In the Select RPS Mapping dialog, select the **ErewhonInvestmentsModelSchema** schema and the **ErewhonRPS** mapping. Enter **Erewhon** as the **Database Name** and then click the **OK** button.



4. A message advises you that the RPS node must be specified in the RPS node configuration. Click the **OK** button.

   The RPS Node Configuration dialog is then displayed.

5. Complete the dialog as shown in the following diagram.



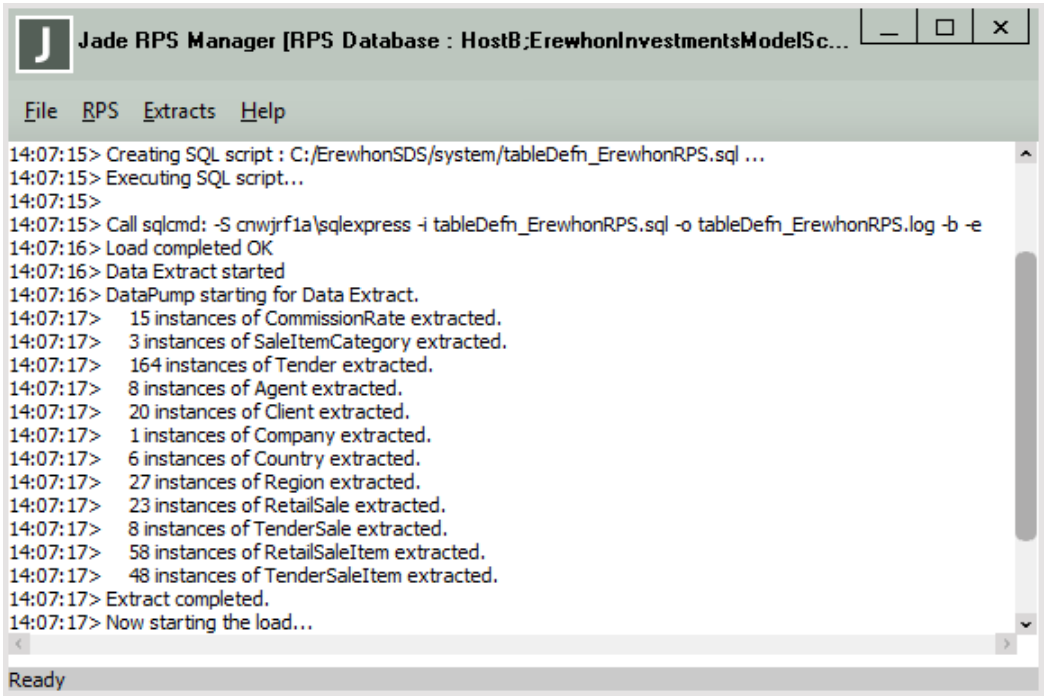
Notes Check the **Auto Start Datapump** check box.

Enter a path for SQL scripts in the**Alter Script Path** field, the location of the secondary database in the **RDB Path** field, and the name of the SQL instance in the **Server Name** field.

6. When you have configured the RPS node and clicked **OK**, the Confirm Script Execution message box prompts you to click **Yes** to confirm that the relational database can be modified for the new database type.

The Jade RPS Manager window is then displayed.

7. From the RPS menu, select the **Setup RDBMS** command. Data is extracted from the secondary database and pumped into the SQL Server **Erewhon** database by executing scripts.



8. From the RPS menu, select the **Start Datapump** command.

9. Close the **RPS Manager** application.

Exercise 15.5 – Testing RPS Functionality

In this exercise, you will test that RPS is working, by making a change to the data in the SDS primary system and then viewing the change, which will have been replicated in the SDS secondary system and pumped into the **Erewhon** SQL Server database.

1. Run SQL Server Management Studio.

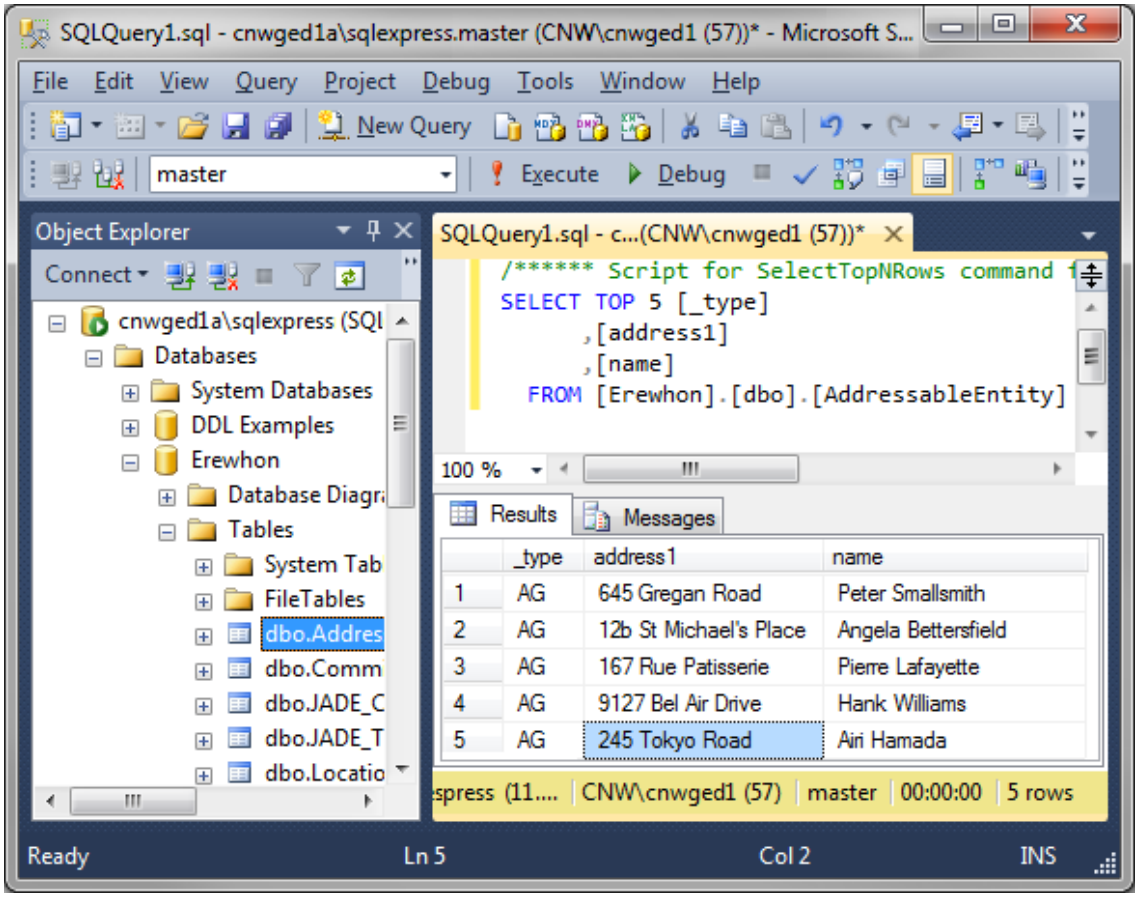
2. Select the **AddressableEntity** class in the **Erewhon** database.

3. Right-click and then select the **Select Top 1000 Rows** command.

4. Change the query as follows.

```
/****** Script for SelectTopNRows command from SSMS  ******/
SELECT TOP 5 [_type]
      ,[address1]
      ,[name]
  FROM [Erewhon].[dbo].[AddressableEntity]
```

5. Click the **Execute** button. The results are displayed as follows.

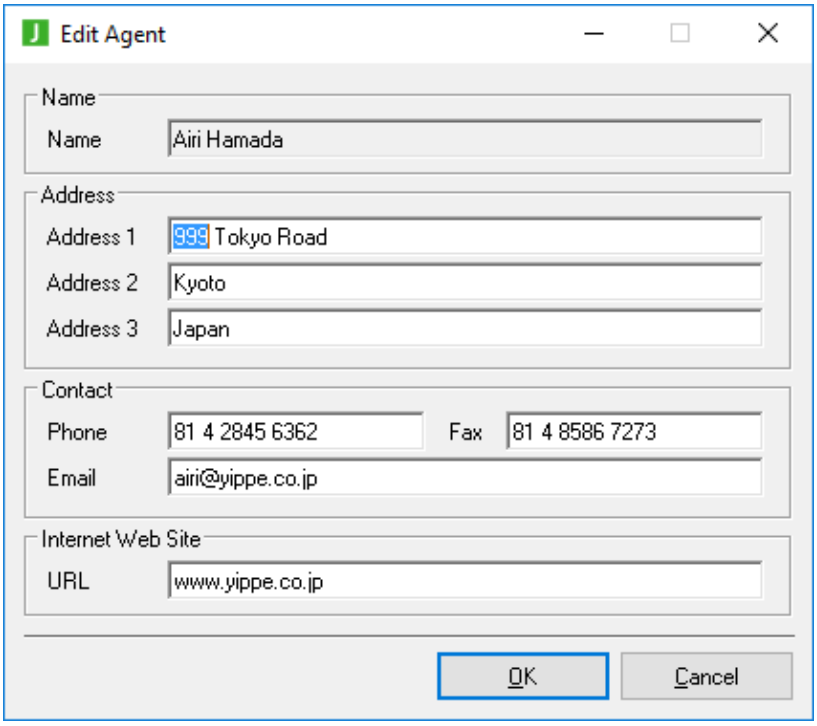


6. The fifth row shows agent **Airi Hamada** with an address **245 Tokyo Road**.

7. Leave the SQL Server Management Studio running.

8. Run the **Administration** program from the shortcut you created in the exercise on testing SDS functionality, and then log on as agent **Airi Hamada**.

9. Select the **Contact Details** command from the Edit menu and then change the address.



10. In SQL Server Management Studio, execute the query again.
11. Check that the address of agent **Airi Hamada** has been updated by RPS.
12. Close SQL Server Management Studio.

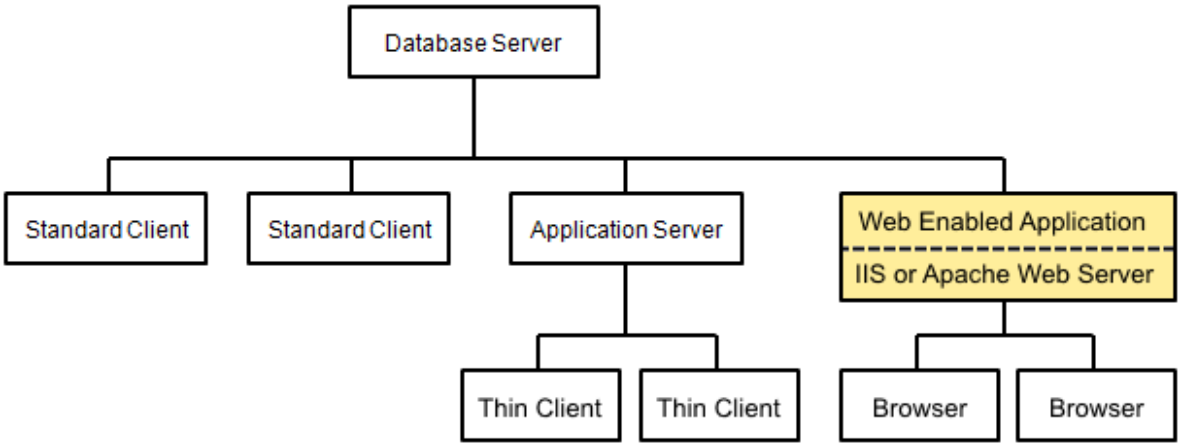
Module 16 Web Applications

This module covers the following topics.

Introduction

Any device that can run a Web browser can connect to a JADE web application. The application creates a session object with a unique session id for the web browser client, and includes the session id on every form that is sent to, and every reply that is received from a web browser.

When a request arrives from a web browser, the Microsoft Internet Information Server passes the request to the JADE web application, using **jadehttp.dll** and the TCP/IP connection information in the **jadehttp.ini** file.



The query string contains the name of the JADE web-enabled application.

```
http://localhost/jade/jadehttp.dll?WebShop
```

The JADE web application processes this request and generates an HTML page in response. Because all communications are asynchronous, the JADE client can monitor and display the system processing status when idle.

Windows provides standard IIS security for data access and Secure Sockets Layer for data transmission.

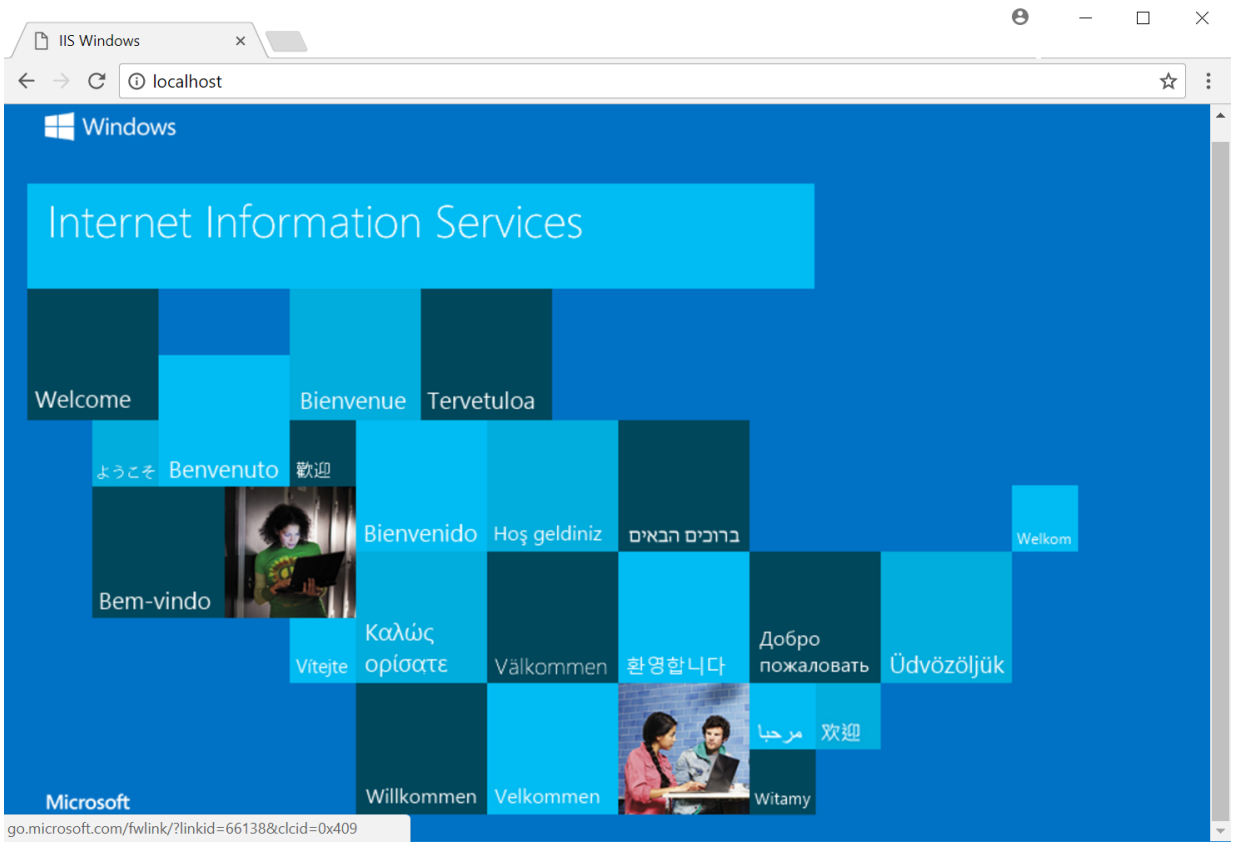
If an unhandled JADE exception occurs, it is logged on the web server PC, the operation is aborted, and the startup form is sent to the web browser.

The same architecture applies to all types of JADE web-enabled application.

- JADE forms, where the forms are designed in the JADE Painter
- HTML forms, where the forms are designed in an external HTML editor; for example, Dreamweaver
- Web services (SOAP-based and REST-based)

Installing IIS

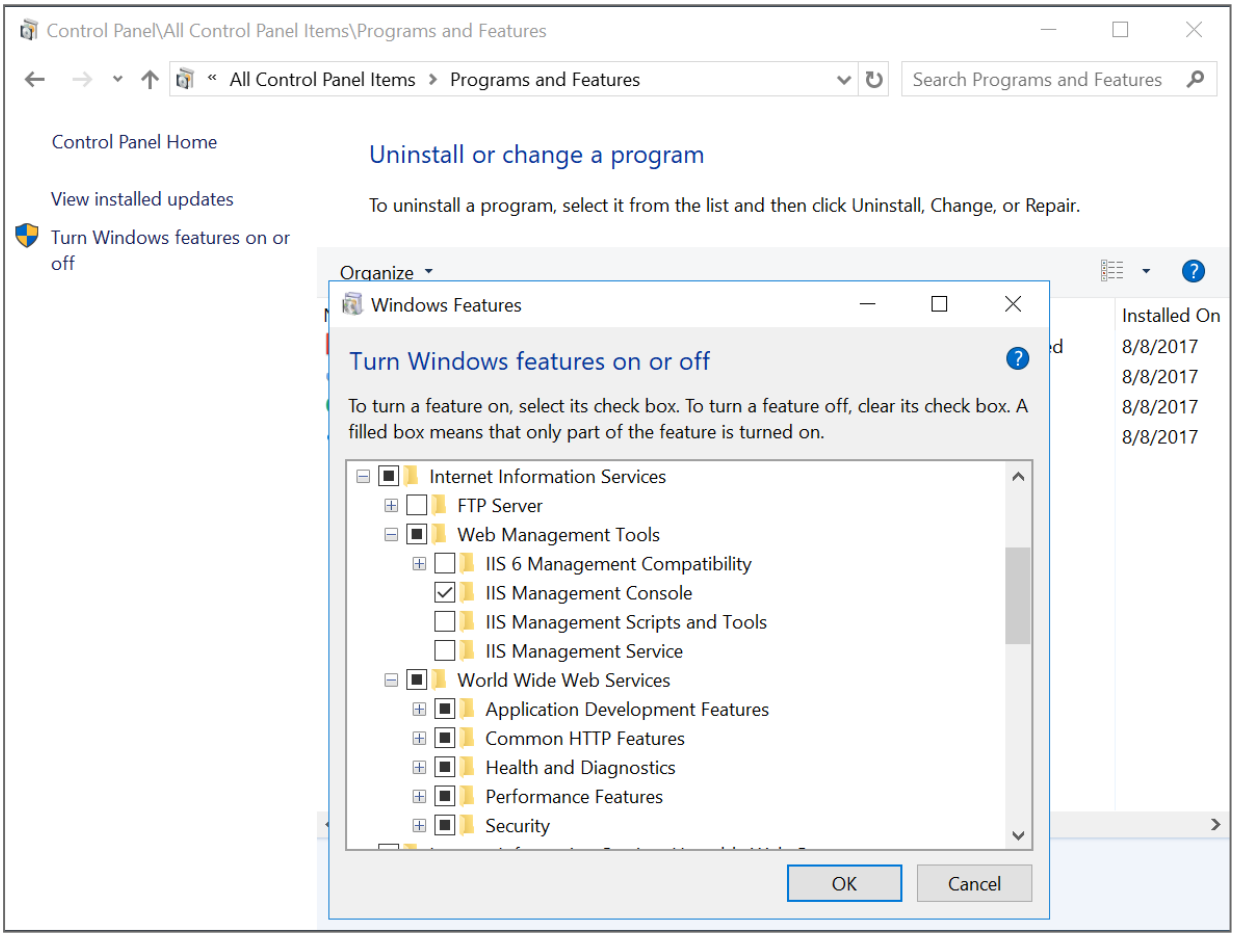
You can confirm that IIS has been installed and is running on your computer, by opening a browser and entering **localhost** as the URL.



JADE requires the following extensions that are not part of the standard Microsoft Information Internet Services (IIS) installation.

- Common Gateway Interface (CGI)
- Internet Server Application Programming Interface (ISAPI)

You can install these components from Control Panel, by selecting **Programs and Features** and then clicking on the **Turn Windows features on or off** hyperlink. Check the **CGI** and **ISAPI Extensions** check boxes and then click the **OK** button.

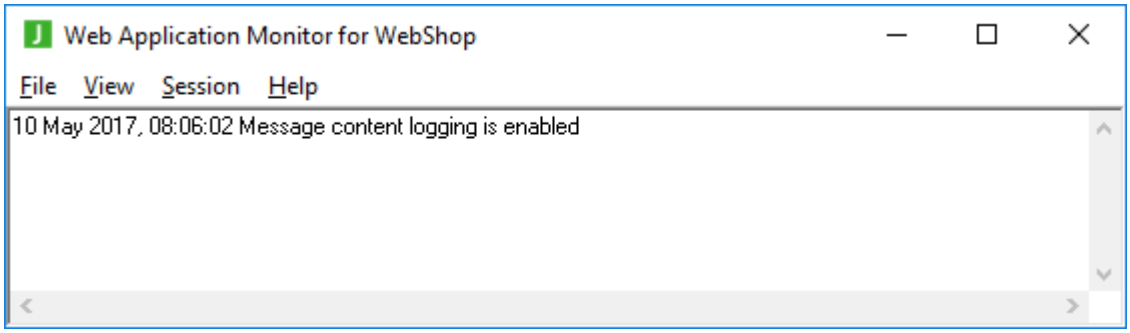


Web Application Monitor

The shortcut to run the **WebShop** application in the **ErewhonInvestmentsViewSchema** schema is as follows.

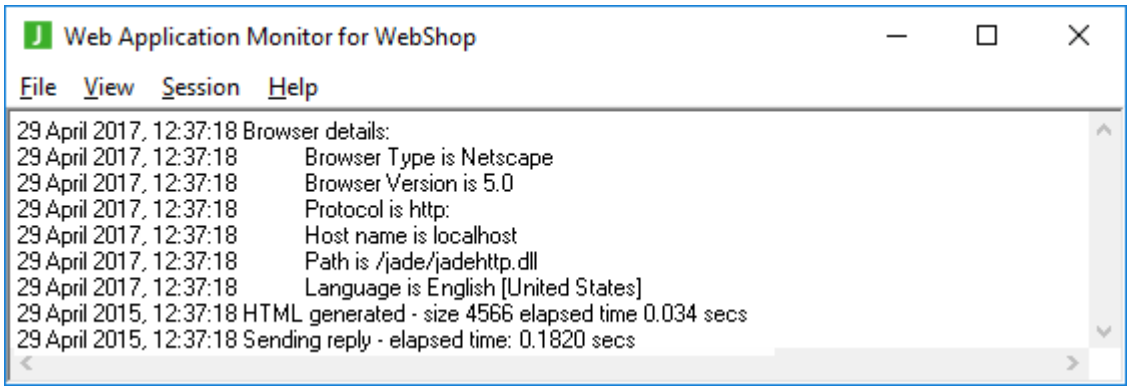
```
C:\JadeClient\bin\jade.exe path=C:\Erewhon\system
                           ini=C:\JadeClient\bin\jade.ini
                           schema=ErewhonInvestmentsViewSchema
                           app=WebShop
```

When the **WebShop** application runs, a monitor window is displayed.



The monitor displays information about the requests that have been passed on from the web server and the responses that have been generated. Currently no requests have been made.

The following diagram shows details of the processing of a request.



The **WebShop** application could run without the overhead of displaying the monitor. Typically, the monitor is displayed during development but not for a production system.

Processing a Request

When a request is received by IIS and the URL specifies it is to be handled by JADE, the request is processed by the **jadehttp.dll** library. This library handles the communication between IIS and JADE.

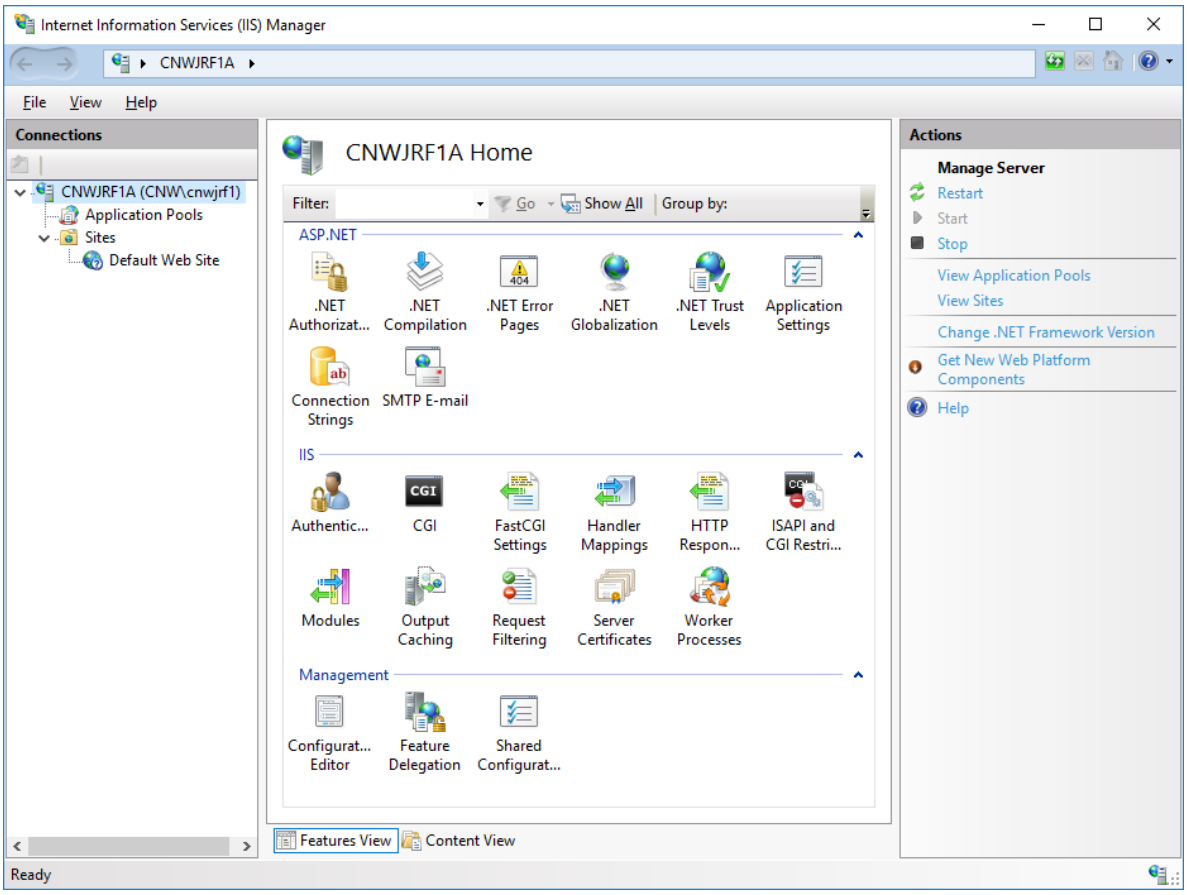
The TCP/IP information for IIS to connect to JADE is contained in the **jadehttp.ini** initialization file.

The JADE web-enabled application could be protected behind a firewall by moving the **jadehttp.dll** file from the **bin** folder to a location that is accessible by IIS outside the firewall.

IIS Manager

The IIS Manager program is used to define applications pools, applications, and virtual directories to be used by a JADE web-enabled application.

If IIS Manager is installed on your device, you can run it from the Administrative Tools grouping in Control Panel.



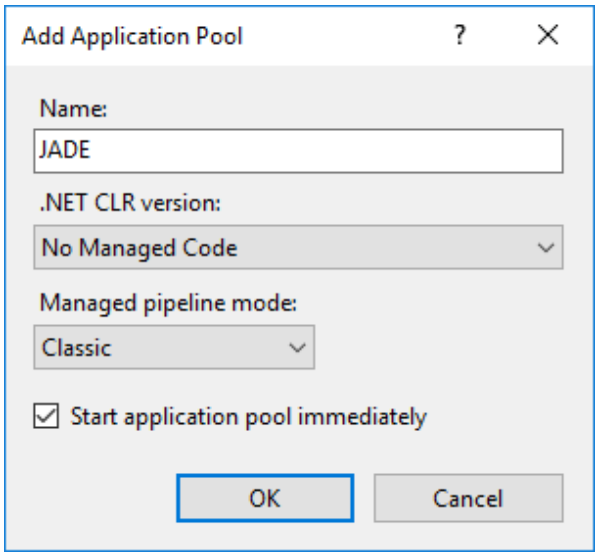
If IIS Manager is not installed, do so by selecting **Programs and Features** from Control Panel, clicking on the **Turn Windows features** hyperlink, checking the **IIS Management Service** check box, and then click the **OK** button.

Adding an Application Pool

An IIS web site is a container for applications for virtual directories. An application runs in an application pool to isolate it from applications in other pools.

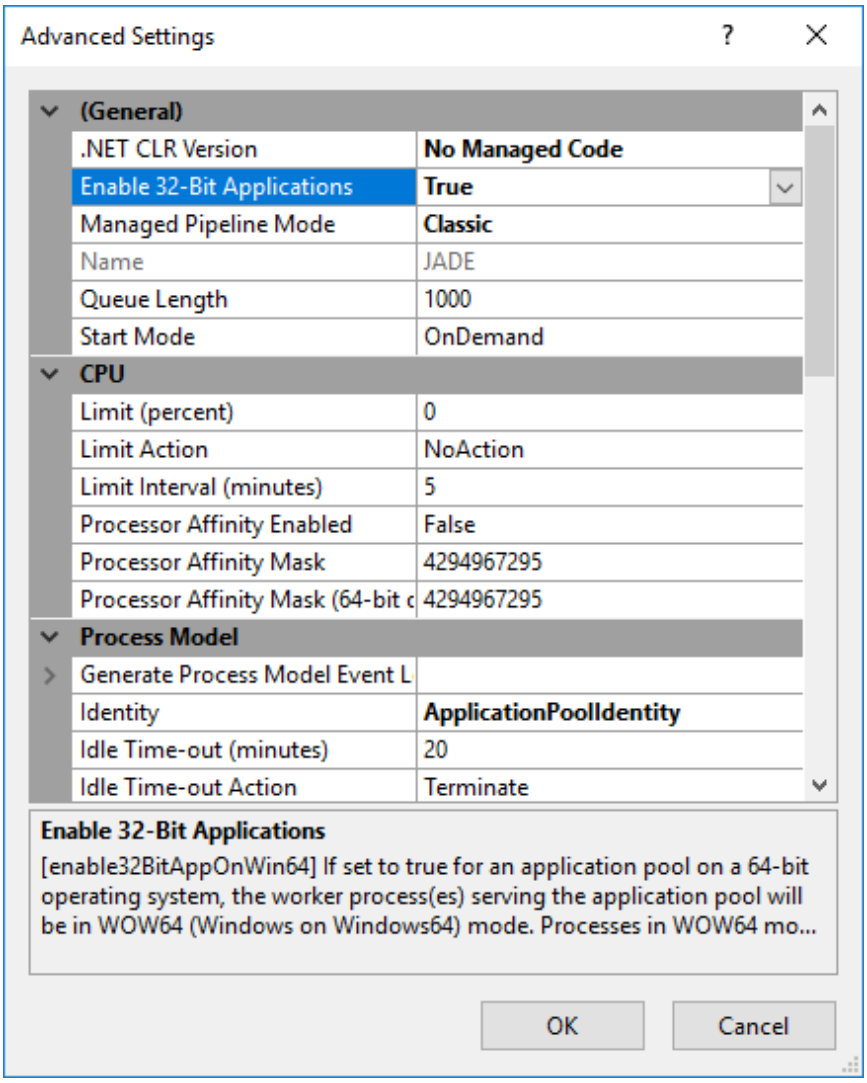
A JADE web-enabled application executes **jadehttp.dll**, which is non-managed code (that is, it is not a .NET DLL). An application pool for non-managed code must be added before you add the JADE application.

To add an application pool, run the IIS Manager, right-click on **Application Pools** in the **Connections** panel, and then select **Add Application Pool**.



Enter a name for the pool and then specify that it is not managed code and that it uses the **Classic** pipeline mode.

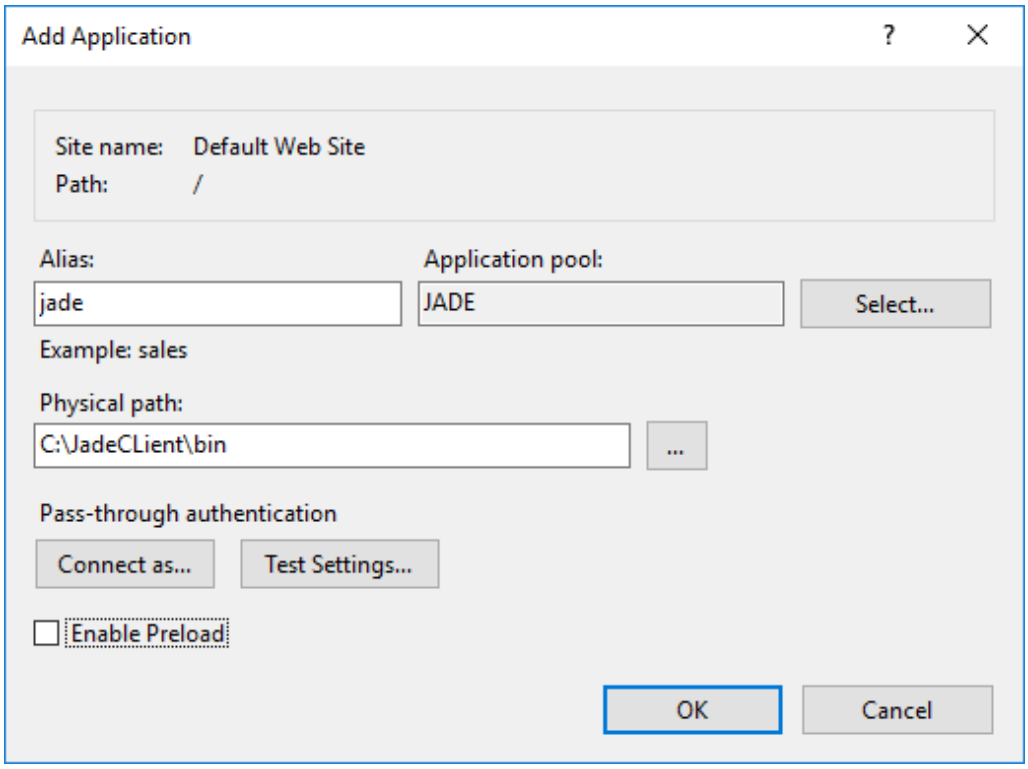
If you are using a 32-bit version of **jadehttp.dll**, right-click on the application pool, select **Advanced Settings**, and then set **Enable 32-Bit Applications** to **True**.



Adding an Application

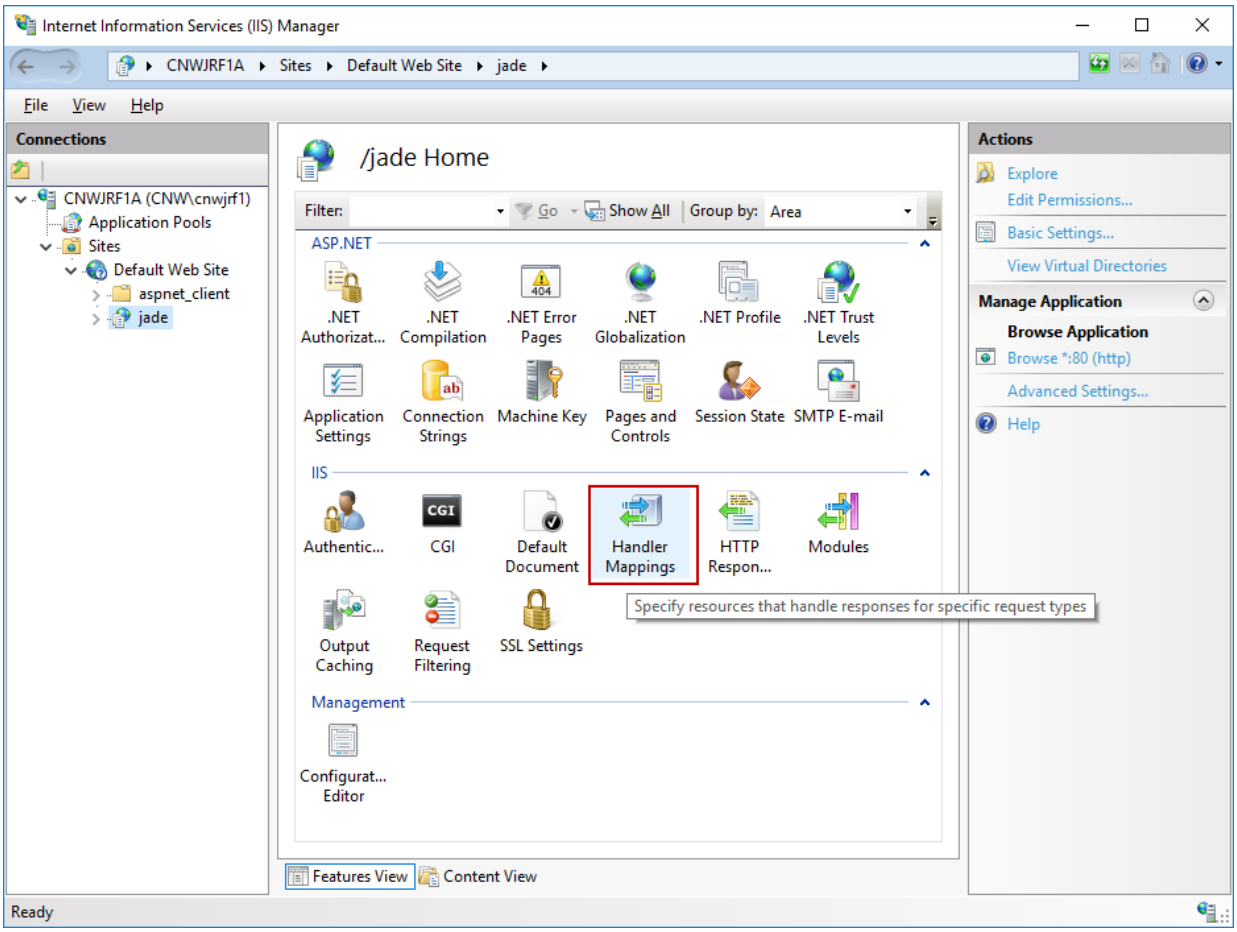
The application is the IIS reference to the folder containing **jadehttp.dll**.

To add an application pool, run the IIS Manager, right-click on **Default Web Site** in the **Connections** panel, and then select **Add Application**.

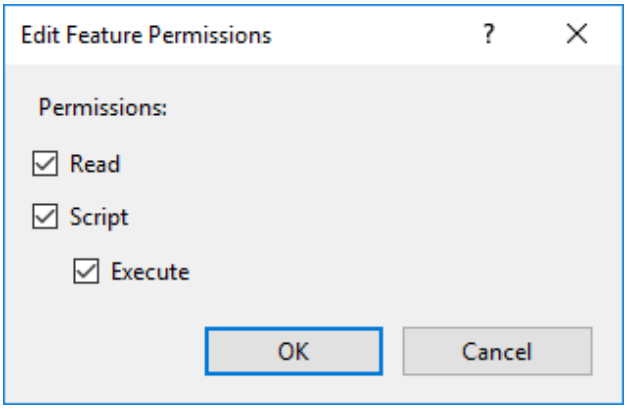


Enter an alias, which will be part of the URL to access a JADE web-enabled application. Select the application pool that you created previously, specify the folder containing **jadehttp.dll** as the **Physical path**, and then click the **OK** button.

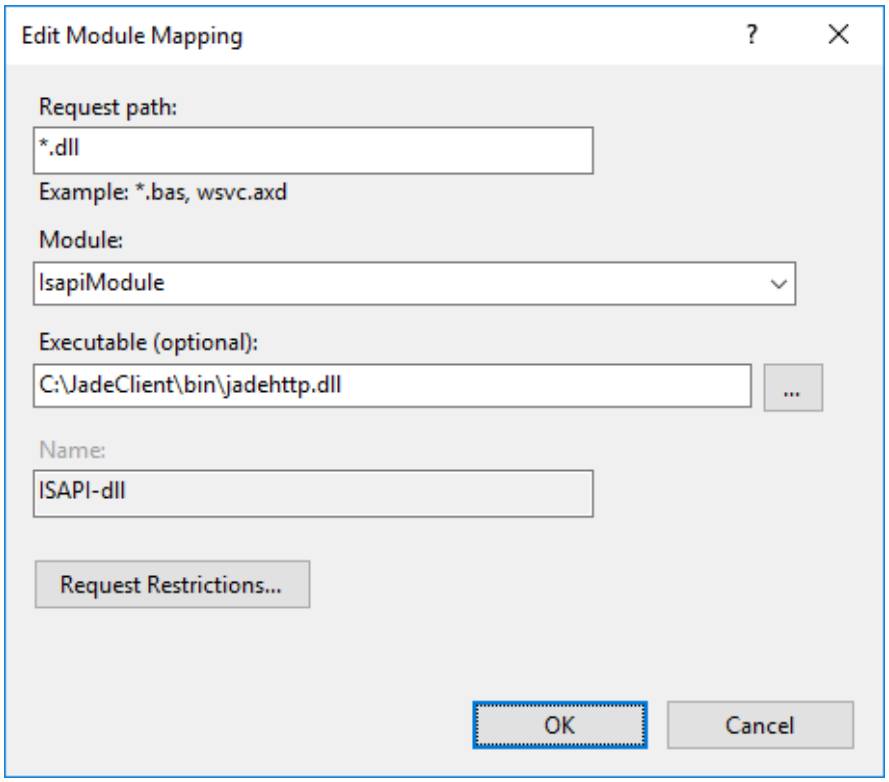
To set permissions for the application, select the application in the **Connections** panel and then double-click the **Handler Mappings** icon in the central panel.



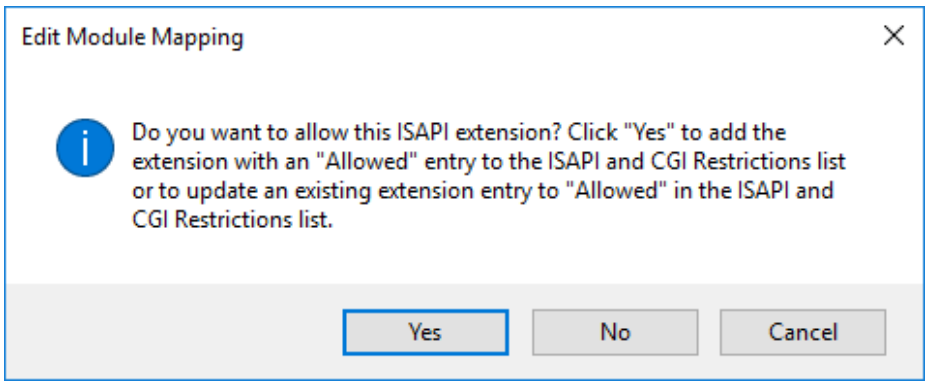
Right-click the **CGI-exe** handler mapping and then select **Edit Feature Permissions**. Enable all options, as shown in the following diagram.



Right-click the **ISAPI-dll** handler mapping and then select **Edit**. In the **Physical path** text box, enter the path of the folder containing the **jadehttp.dll** file.



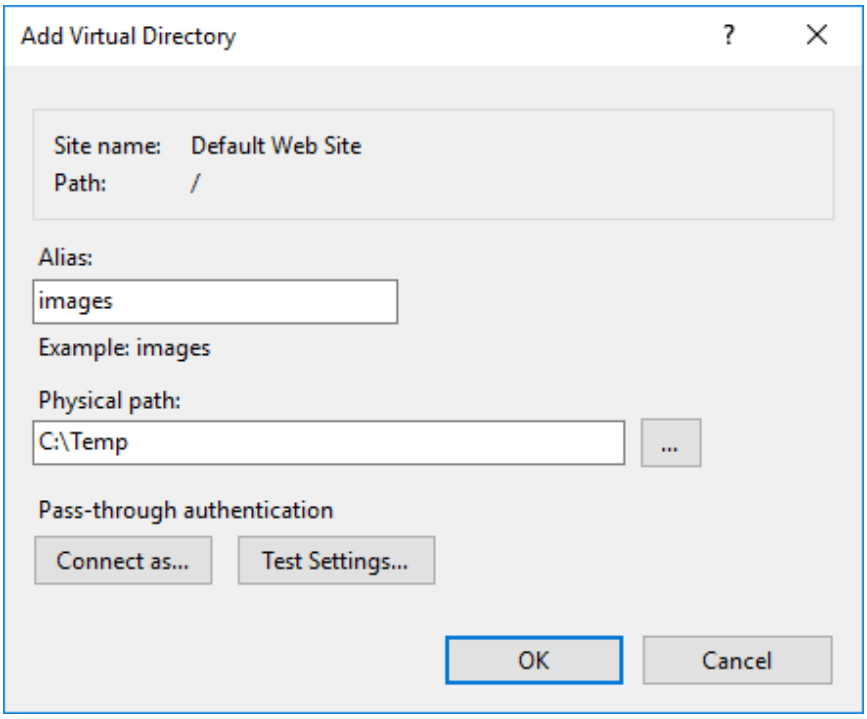
If the following dialog is displayed, click the **Yes** button.



Adding a Virtual Directory

When a form in the application contains graphics, the generated HTML file will have links to image files that must be in a folder accessible to the server. The **WebShop** application is defined to use the **C:\Temp** folder as the **images** folder.

To add a virtual directory, select the **Default Web Site** in the **Connections** panel, right-click, and then select **Add Virtual Directory**. In the Add Virtual Directory dialog, enter **images** as the alias and **C:\Temp** for the physical path.

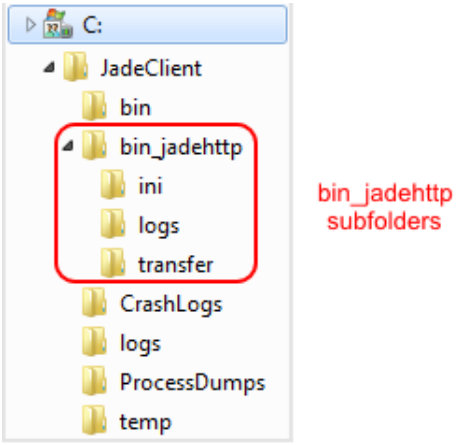


IIS jadehttp.ini File

The **jadehttp.ini** file is used by **jadehttp.dll** to establish a connection between the web server and the JADE web-enabled application. The simplest way to create this file in the correct location is to use your browser to attempt to connect to the web-enabled application.

The initialization file should be located in a parallel folder to the folder containing **jadehttp.dll**. The simplest way to create this file is to enter the URL **localhost/jade/jadehttp.dll?WebShop** in a web browser.

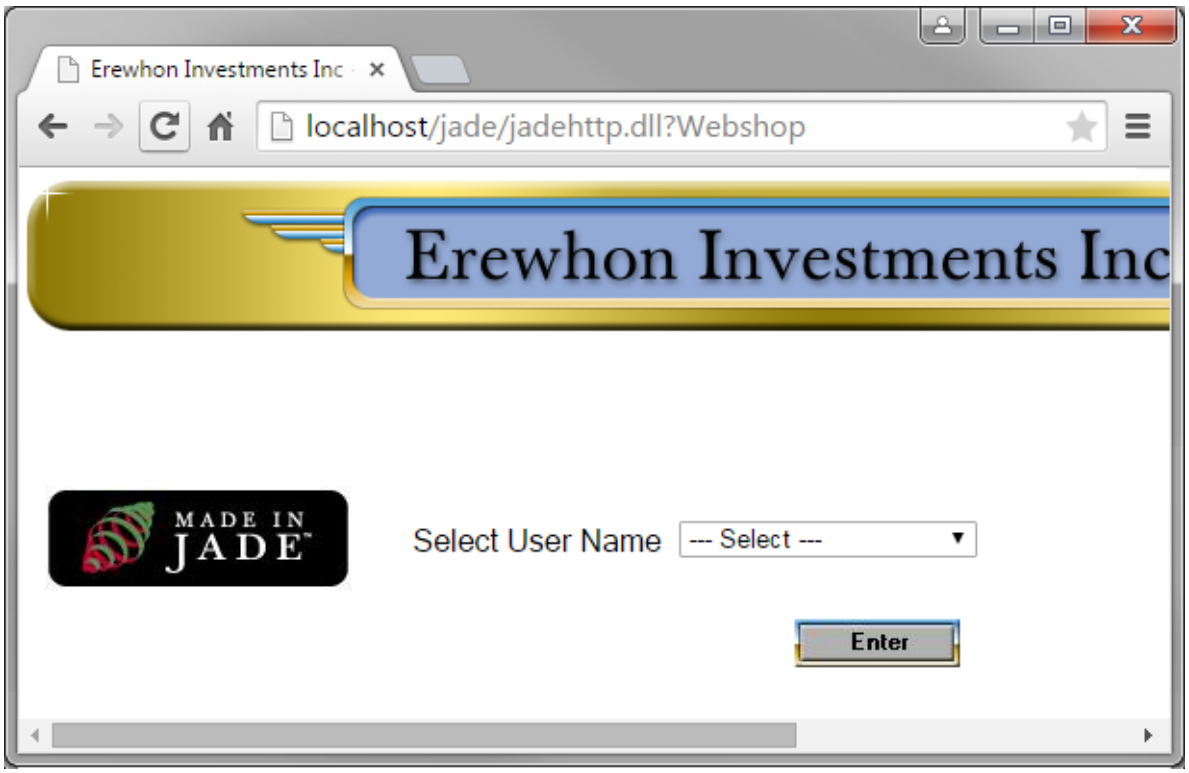
The attempt to connect (even though it fails) creates a parallel folder to the one containing **jadehttp.dll**. The parallel folder has **_jadehttp** appended to the folder containing **jadehttp.dll**.



To enable the **WebShop** application to be accessed, use Notepad to add the following section to the **C:\JadeClient\bin_jadehttp\ini\jadehttp.ini** file.

```
[WebShop]
ApplicationType=WebEnabledForms
TcpConnection=localhost
TcpPort=6107
ConnectionGroup=Everyone
```

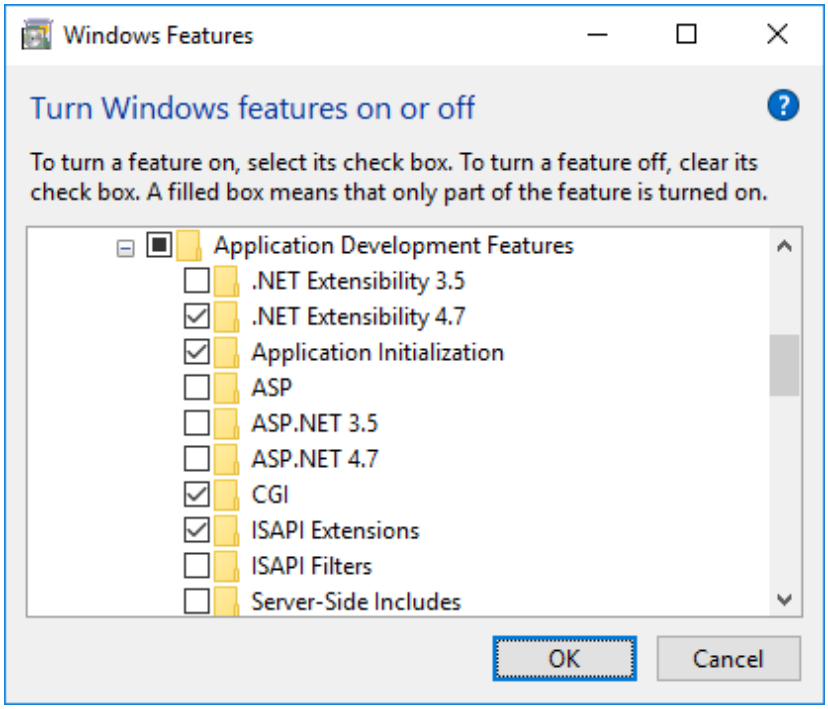
When the URL is retried, the **WebShop** log-on form is displayed.



Exercise 16.1 – Installing IIS Components

In this exercise, you will install the CGI and ISAPI components of IIS.

1. Select **Programs and Features** from Control Panel.
2. Click the **Turn Windows features on or off** hyperlink on the left.
3. Expand **Internet Information Services**, then **World Wide Web Services**, and then **Application Development Features**.
4. Check the **CGI** and **ISAPI Extensions** boxes and then click the **OK** button.

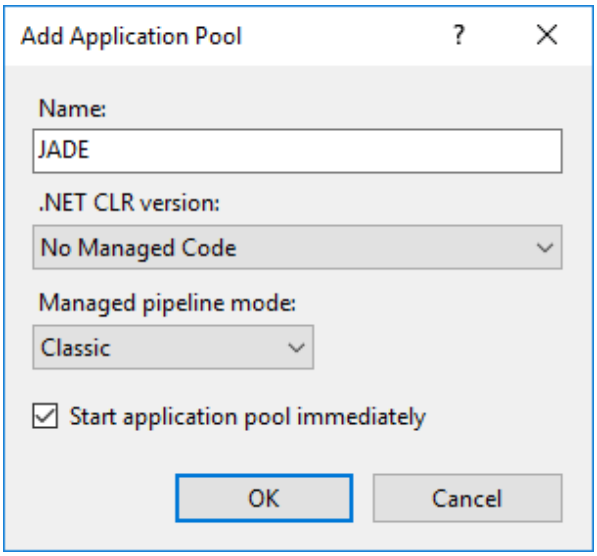


Exercise 16.2 – Adding an Application Pool

In this exercise, you will add an application pool that will be used in the next exercise for the **WebShop** application.

1. Select **Administrative Tools** from Control Panel.
2. Double-click the **Internet Information Services (IIS) Manager** program.
3. In the **Connections** panel on the left, select **Application Pools**.
4. Right-click and then select **Add Application Pool** from the popup menu.

5. Enter **JADE** as the name of the pool, configure it to use unmanaged (non-.NET) code, and then set the **Managed pipeline mode** field to **Classic**, as shown in the following diagram.

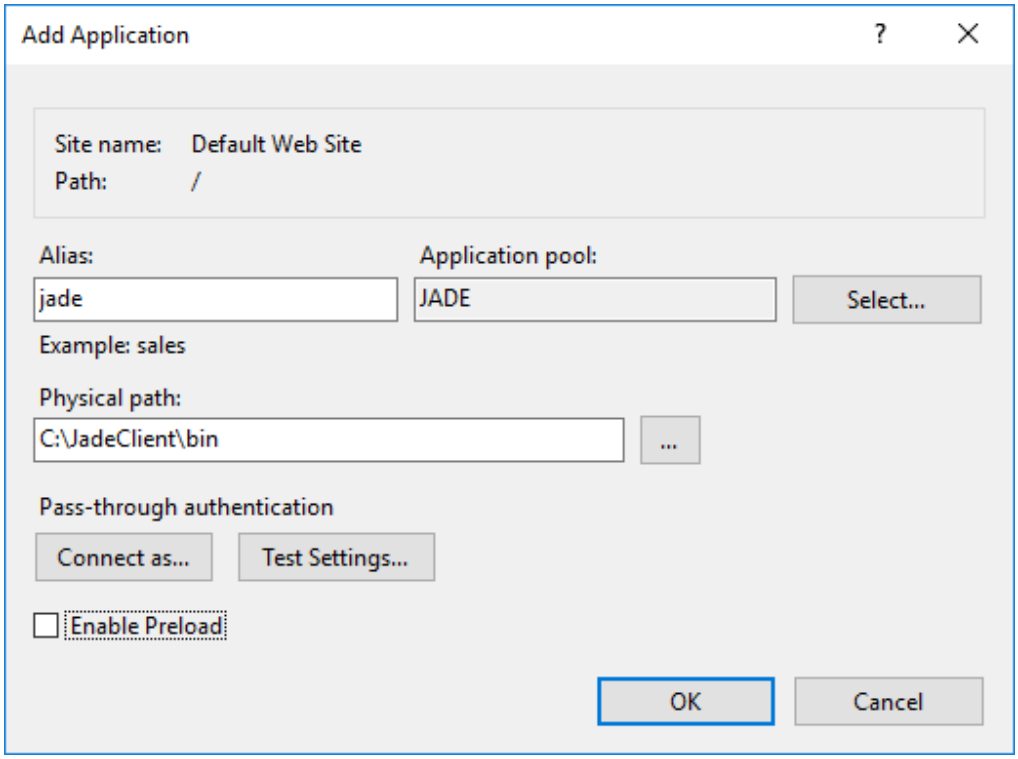


Exercise 16.3 – Adding an Application

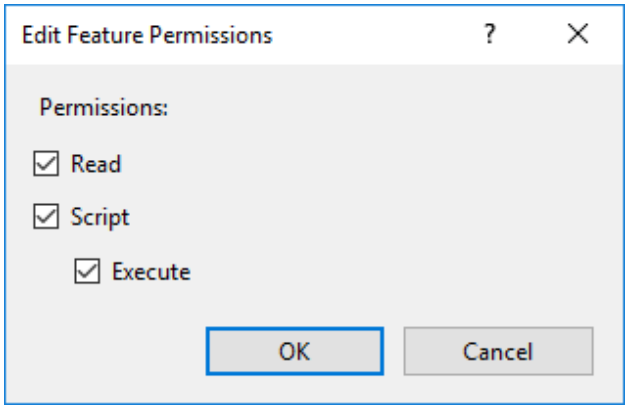
In this exercise, you will add and configure the **jadehttp.dll** application.

1. Select the **Default Web Site** in the **Connections** panel.
2. Right-click and then select the **Add Application** command from the popup menu.
3. Enter **jade** in the **Alias** text box and then select the **JADE** application pool that you created previously.

4. Enter the path of the folder containing **jadehttp.dll** in the **Physical path** text box and then click the **OK** button.

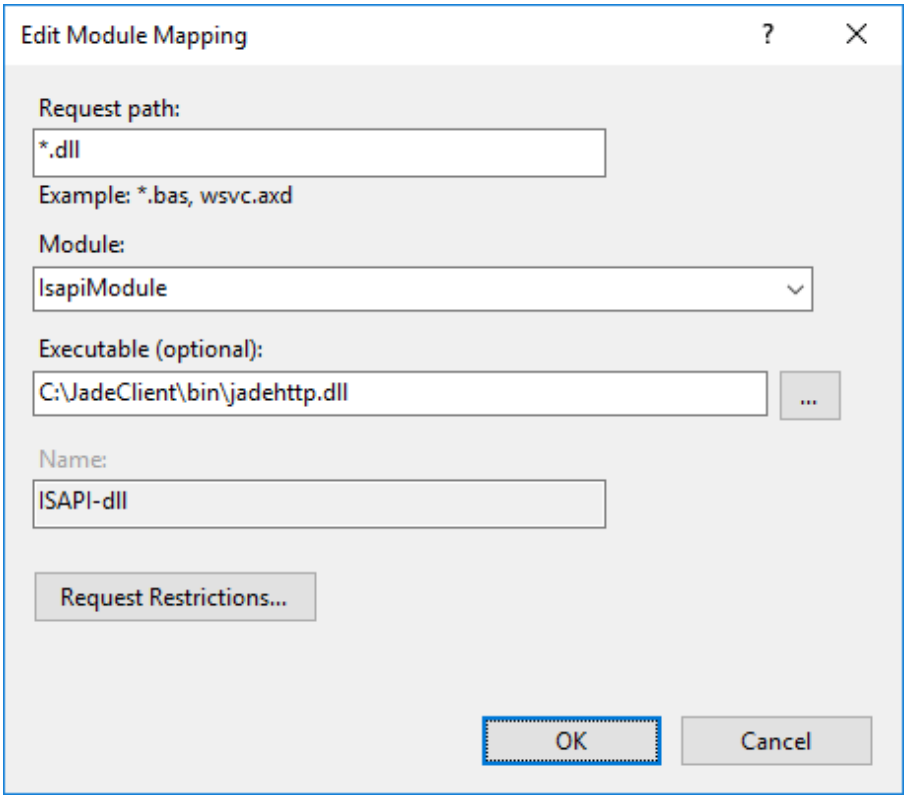


5. Select the application in the **Connections** panel.
6. Double-click the **Handler Mappings** icon in the central panel.
7. Right-click the **CGI-exe** handler mapping and then select the **Edit Feature Permissions** command.
8. Enable all options and then click the **OK** button.

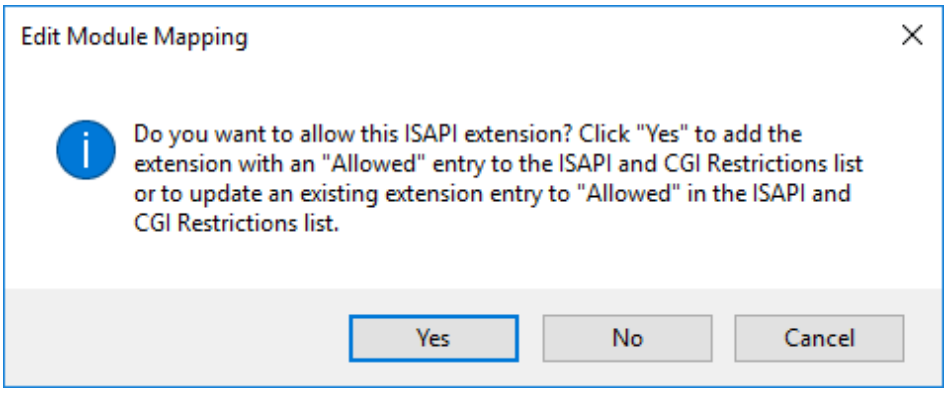


9. Right-click the **ISAPI-dll** handler mapping and then select the **Edit** command from the popup menu.

10. In the **Executable** text box, enter the path and file name of the **jadehttp.dll** file.



11. If the following dialog is displayed, click the **Yes** button.

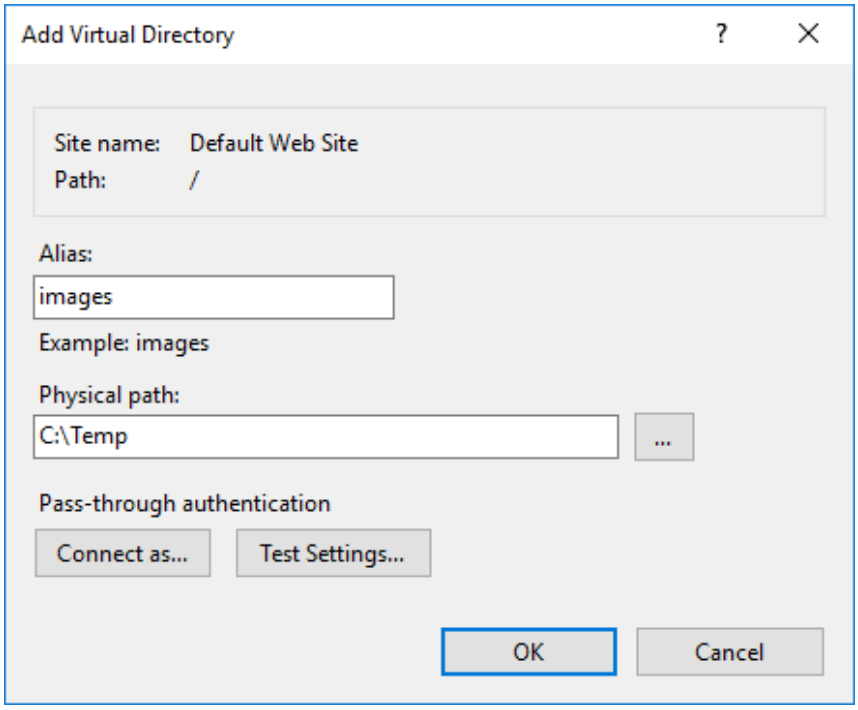


Exercise 16.4 – Adding a Virtual Directory

In this exercise, you will add a virtual directory for the images that are used in the **WebShop** application.

1. Select the **Default Web Site** in the **Connections** panel.
2. Right-click and then select the **Add Virtual Directory** command.

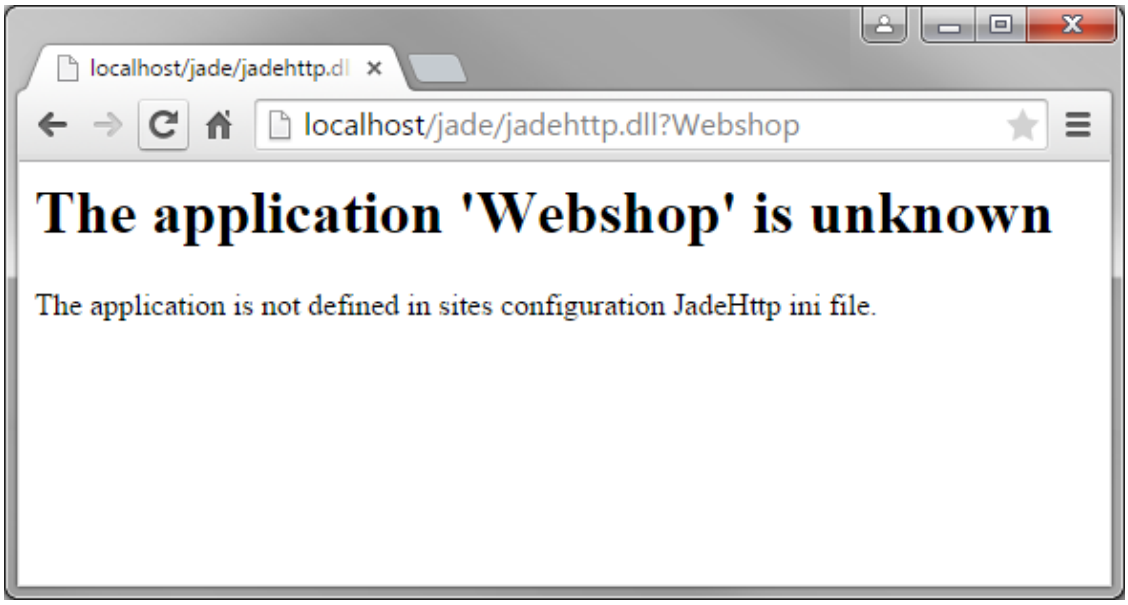
3. Enter **images** as the alias and **C:\Temp** for the physical path.



Exercise 16.5 – Editing the jadehttp Initialization File

In this exercise, you will create the **jadehttp.ini** file and then add a section for the **WebShop** application.

1. Enter the URL **localhost/jade/jadehttp.dll?WebShop** in a web browser.



2. Open the **C:\JadeClient\bin_jadehttp\ini\jadehttp.ini** file in Notepad.

3. Add the following section.

```
[WebShop]
ApplicationType=WebEnabledForms
TcpConnection=localhost
TcpPort=6107
ConnectionGroup=Everyone
```

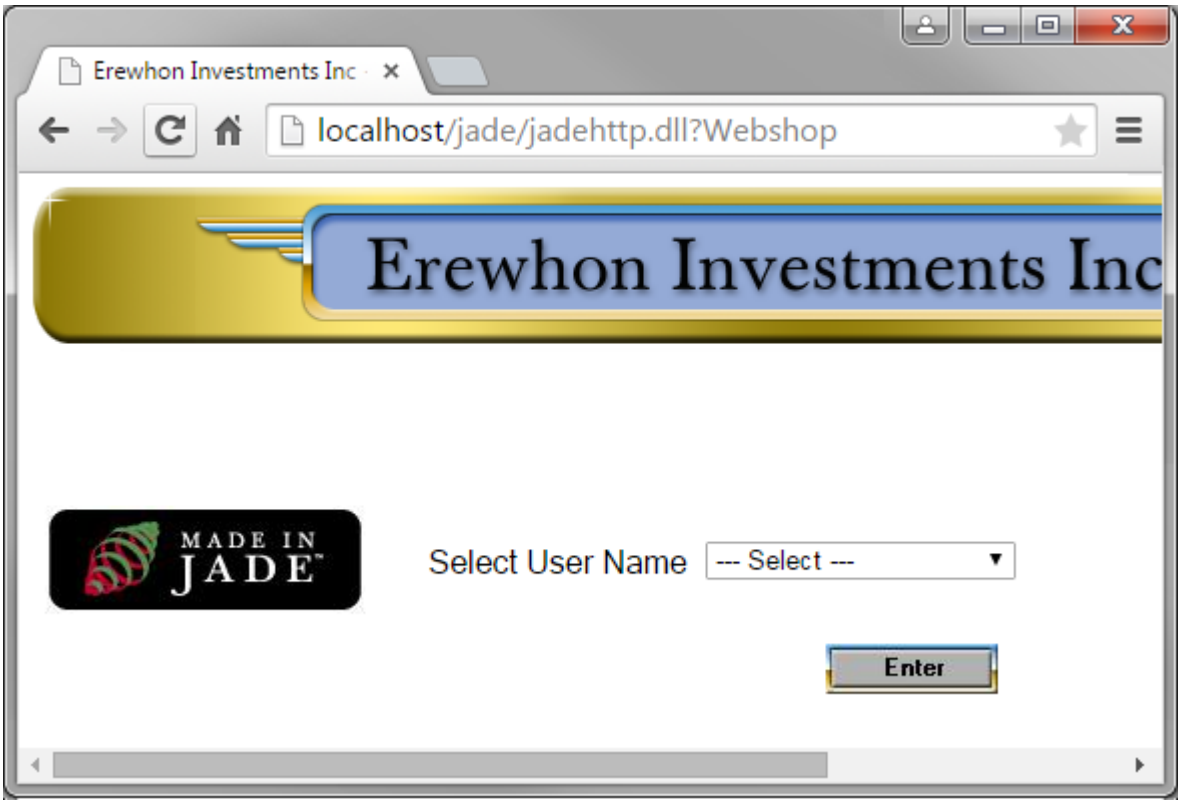
4. Save and then close the **jadehttp** initialization file.

5. Add the following desktop shortcut.

```
C:\JadeClient\bin\jade.exe path=C:\Erewhon\system
                           ini=C:\JadeClient\bin\jade.ini
                           schema=ErewhonInvestmentsViewSchema
                           app=WebShop
```

6. Run the **WebShop** application.

7. In your browser, when you refresh the URL, the **WebShop** logon form is displayed.



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