

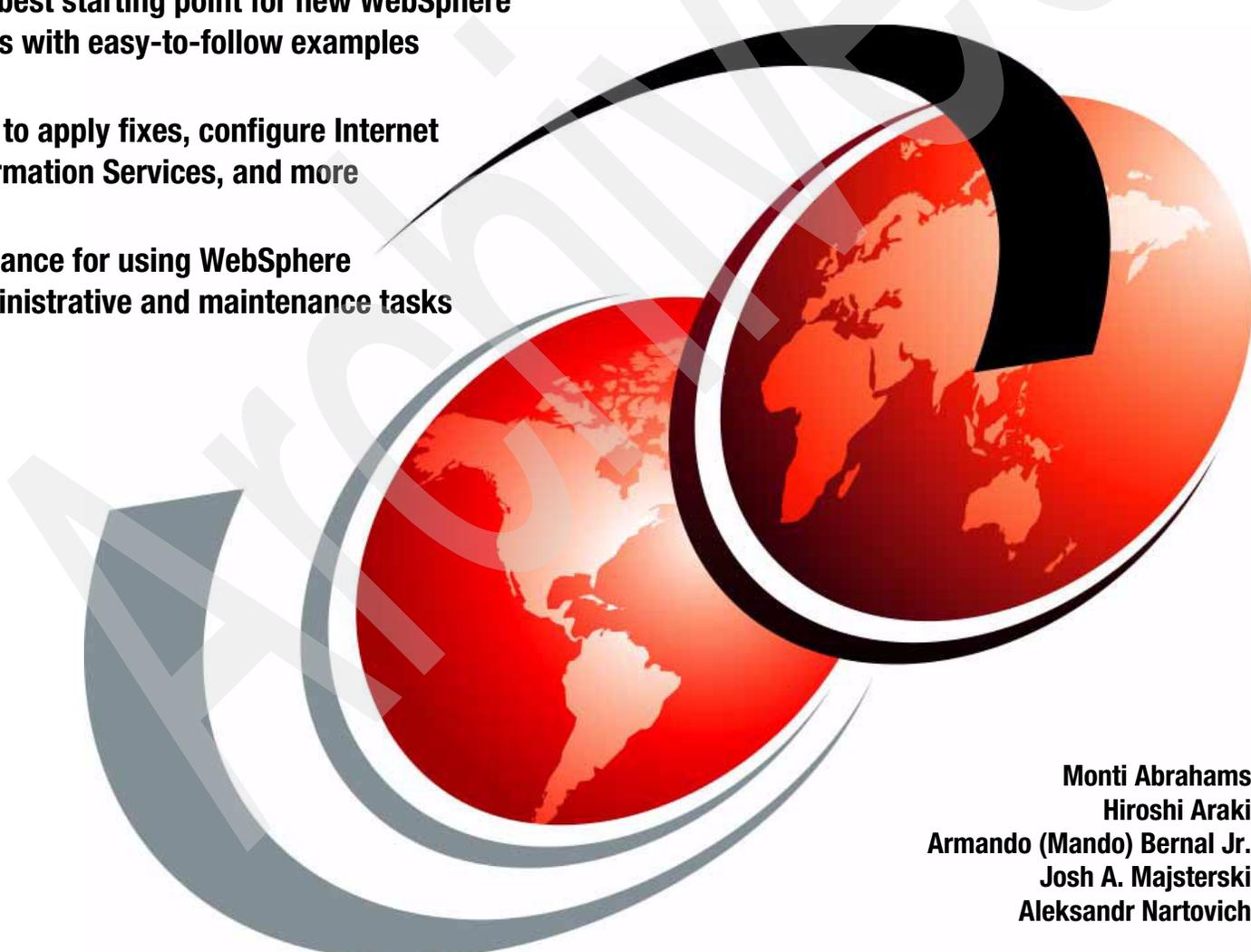
WebSphere Application Server V6 for OS/400

A Guide to Getting Started

The best starting point for new WebSphere users with easy-to-follow examples

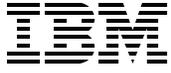
Tips to apply fixes, configure Internet Information Services, and more

Guidance for using WebSphere administrative and maintenance tasks



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Redbooks



International Technical Support Organization

**WebSphere Application Server V6.0 for OS/400:
A Guide to Getting Started**

June 2006

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Note: Before using this information and the product it supports, read the information in “Notices” on page vii.

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Preface

This IBM® Redbook helps you get started with IBM WebSphere® Application Server V6 for the IBM eServer™ iSeries™. Designed for new WebSphere users, this book presents the WebSphere architecture, administration, and maintenance topics in an easy-to-follow format. It answers many of the common questions that new users tend to have about starting to use WebSphere Application Server.

By reading this book, you will be able to:

- ▶ Install WebSphere Application Server on iSeries
- ▶ Correctly apply the latest WebSphere fixes
- ▶ Use the most typical WebSphere administrative and maintenance tasks

While this redbook is written for new WebSphere users, some of the topics will be of interest to experienced users. Such topics include configuration of the Internet Information Services server and the WebSphere Application Server.

Note: This book was under development when IBM released IBM i5/OS® V5R4. The new release comes with the new names of the system itself and some of the products. For this reason, you might see a mixture of terms that are both pre- and post-i5/OS V5R4.

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Exploring J2EE and WebSphere Application Server

This chapter provides an introduction and overview of both the Java 2 Platform, Enterprise Edition (J2EE™) and WebSphere Application Server. The objective is to give you a better understanding of the J2EE architecture and to help you become more comfortable and familiar with the various related terms and concepts. In addition, this chapter briefly touches on the programming language, known as *Java*, that completes this relationship.

Although this book is tailored for new users of this technology, it is beneficial for seasoned users as well. It provides a different perspective and outlook on the sometimes intimidating and confusing technologies of J2EE and WebSphere Application Server.

1.1 Overview of Java

Before you begin the journey towards exploring J2EE, you must first understand the language, known as *Java*, that J2EE is built upon. Java is both an object-oriented programming language and a platform developed by Sun™ Microsystems™ in the early 1990s. It was initially named OAK. However as the programming language began to gain popularity and evolved throughout the years, it later adopted the name of “Java” and soon became the preferred programming language for the Internet.

Several of Java’s characteristics, which make it so popular among application developers, are its easy to use architecture, design model of object orientation, organization of classes in packages, and platform independence. In simpler terms, it allows you to write software and applications on one platform and run it on another, which is one of Java’s many appealing characteristics to application developers.

When a Java program (file extension *.java*) is created and then compiled, it translates the program into what is known as *Java bytecodes* (file extension *.class*). This bytecode is then interpreted by the Java virtual machine (JVM™).

The Java platform consist of two key components that are needed to run Java on any platform. They are the JVM and the Java application programming interface (API). The *Java API* is a group of libraries of related classes and interfaces, known as *packages*.

It is also important to point out that Java is the technology that powers WebSphere Application Server. Java is the underlying programming language that is working hard behind the scenes.

For further information regarding Java, refer to the following Web address:

<http://java.sun.com/>

1.2 Exploring J2EE

This section gives you a glimpse into using J2EE and different perspectives for doing so. In helping you to understand how to use Java, we use a metaphor to guide you through the discussion. In no way does this section give you a complete description of J2EE, because there is too much information to cover in this book.

To better understand the concepts and terms of this technology, we selected the analogy of preparing a meal, cooking it, and then serving it to help you relate to the process and architecture for using Java, just on different platforms. Figure 1-1 illustrates the similarities between the analogy and using J2EE.

With that said, on today’s menu, we have the world famous and widely adopted J2EE special.

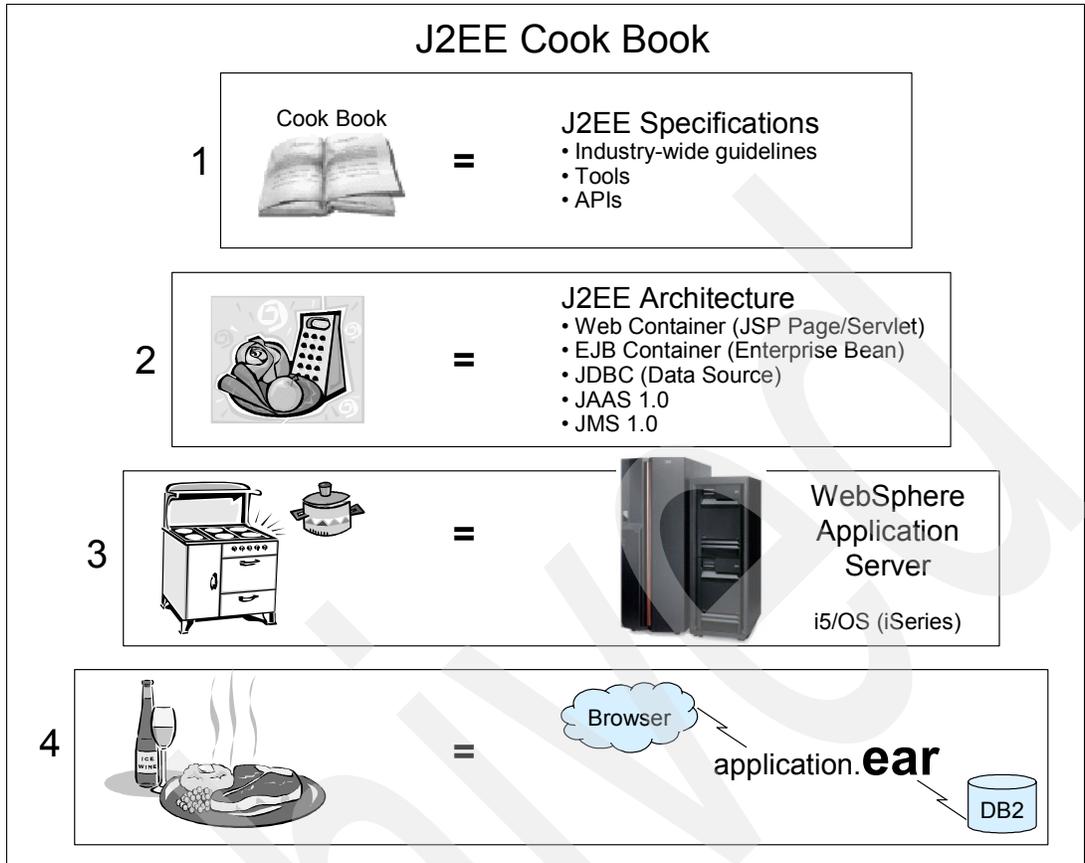


Figure 1-1 J2EE and meal preparation analogy

1.2.1 Step 1: Determining the client's needs

Let's say that your family and friends are coming over to your house to help celebrate a special occasion, and you want to cook something delicious for them to enjoy. You open your grandmother's cookbook, which contains your family's favorite recipes, and find a recipe for chicken and vegetables covered with a special sauce. You know that most of your guests would enjoy this dish, so you choose this recipe for this occasion.

Similarly, an application developer must do the same to create and install a J2EE application. The objective is the same as for the cook because the application developer must try to satisfy the client's needs. The developer must create a unique application for the business clients to address a specific business need or function. In this case, the application developer refers to a Java cookbook, known as *J2EE specifications*.

You must understand what is involved to prepare this meal. You review the recipe in great detail to understand the steps that are involved, the ingredients that are needed, and the tools and resources required to cook this meal. This preparation will ensure that the recipe is a success.

As with cooking, the application developer must understand their client and the client's business needs to ensure proper design of an application model to fulfill the business need or function. The application developer does this by meeting with the client and listening to and understanding their desires and goals for the business and ultimately the application.

1.2.2 Step 2: Planning, preparation, and selecting the necessary tools

In preparing the chicken and vegetable dish, you gather the ingredients and utensils for cooking, which are key to preparing a delicious meal. In this step, you plan what to use and where to find what you need. For example, you might determine the type of vegetables to use and slice them as necessary. You also determine which kitchen utensils and appliances to use.

Similarly the application developer begins planning and preparing by referring to the J2EE specifications and selecting an architecture and platform. The developer determines the tools and resources that are available and will be used in the process. For example, the developer might consider which programs (.class) are located in specific packages (that is java.sql) or which APIs to use for managing and communicating with other components, and so on.

The application developer then builds the application using various ingredients and selects a middle-tier application, such as WebSphere Application Server, to efficiently and effectively manage these components. The middle-tier application simulates the environment and server that will host the application. In our cooking analogy, this environment is the kitchen appliance, most likely the oven, that you use to cook the meal and keep it warm.

1.2.3 Step 3: Implementing and managing the application

At this point in our analogy, you have prepared your vegetables and chicken and placed them in the main baking dish along with the special sauce. You place the dish into the preheated oven so that all the flavors of the ingredients blend together for a flavorful meal. As the food begins to bake, you might have to adjust the oven temperature to ensure a proper outcome.

For the application developer, this is similar to deploying an enterprise archive (.ear) file to WebSphere Application Server running with predefined parameters. Later the developer might have to make adjustments to find the best possible runtime environment for the application.

1.2.4 Step 4: Monitoring and maintaining the application

The final step is to perform periodic checks on the dish in the oven using such utensils as a spoon, a thermometer, and a potholder to ensure that it does not under cook or over cook, but is just right.

Similarly an application developer or administrator runs performance monitoring tools and performs other health checks. Such tools are available as a standard feature in the new release of WebSphere Application Server to ensure that the application is running at the best possible level and is meeting the client's expectations.

Now it is time to serve your guests the main dish. For the application developer, this means that after tuning the application to perform to its potential, the newly created J2EE application is ready to be deployed to the production environment and the on demand world.

1.2.5 J2EE additional information

Although we focus only on J2EE in this chapter, it necessary to identify the other editions that make up the Java 2 platform:

- ▶ Java 2 Platform, Micro Edition (J2ME™)
- ▶ Java 2 Platform, Standard Edition (J2SE™)
- ▶ Java 2 Platform, Enterprise Edition (J2EE)

J2EE in simple terms is a set of specifications and practices, which together allow you to develop, deploy, and manage multi-tier server-based applications.

To take it one step further and simplify this definition, J2EE is basically layers of Java code organized into groups, called *packages*, that have similar functionality and a set of APIs that makes it easier to create applications. It is also a platform that is supplied with tools for creating a complete, secure, and stable environment, while making development more effective and easier. It has proven to be a stable foundation for such Web application environments as WebSphere Application Server.

The stability is all accomplished through the standardization and acceptance of J2EE by those who implement it in their environments. J2EE specifications are developed by experts from various communities in a collaborative effort rather than open-source developers. Through this collaborative effort, specifications are governed by well respected corporations that are adopted industry-wide, making them compatible, portable, and easy to distribute J2EE applications.

We hope this journey into exploring J2EE has given you a totally different perspective than you had before. Hopefully you have a better understanding of J2EE and all the hype that surrounds it.

Note: WebSphere Application Server Version 6 implements the J2EE 1.4 specification, meaning that it conforms to its standards.

For further information regarding J2EE, refer to the following Web address:

<http://java.sun.com/j2ee/>

1.3 Introduction to WebSphere Application Server

IBM WebSphere Application Server is a family of products that consists of the leading software for on demand applications that are designed to meet a wide range of client requirements. This suite of products is available in three packages that completes the WebSphere Application Server for iSeries family of products:

- ▶ IBM WebSphere Application Server - Express V6, referred to as *Express*
- ▶ IBM WebSphere Application Server V6, referred to as *Base*
- ▶ IBM WebSphere Application Server Network Deployment, referred to as *Network Deployment (ND)*

Note: For the remainder of this book, when you see WebSphere Application Server, we are specifically referring to WebSphere Application Server - Express V6.

WebSphere Application Server is the implementation by IBM of J2EE. It conforms to the J2EE 1.4 specifications. Any Web applications that are written to the J2EE standards can be installed and deployed to any of the servers in the WebSphere Application Server family.

To help you better understand the WebSphere Application Server architecture, in the following sections, we outline the various components that make up an application server. Figure 1-2 illustrates the various components that comprise a WebSphere Application Server.

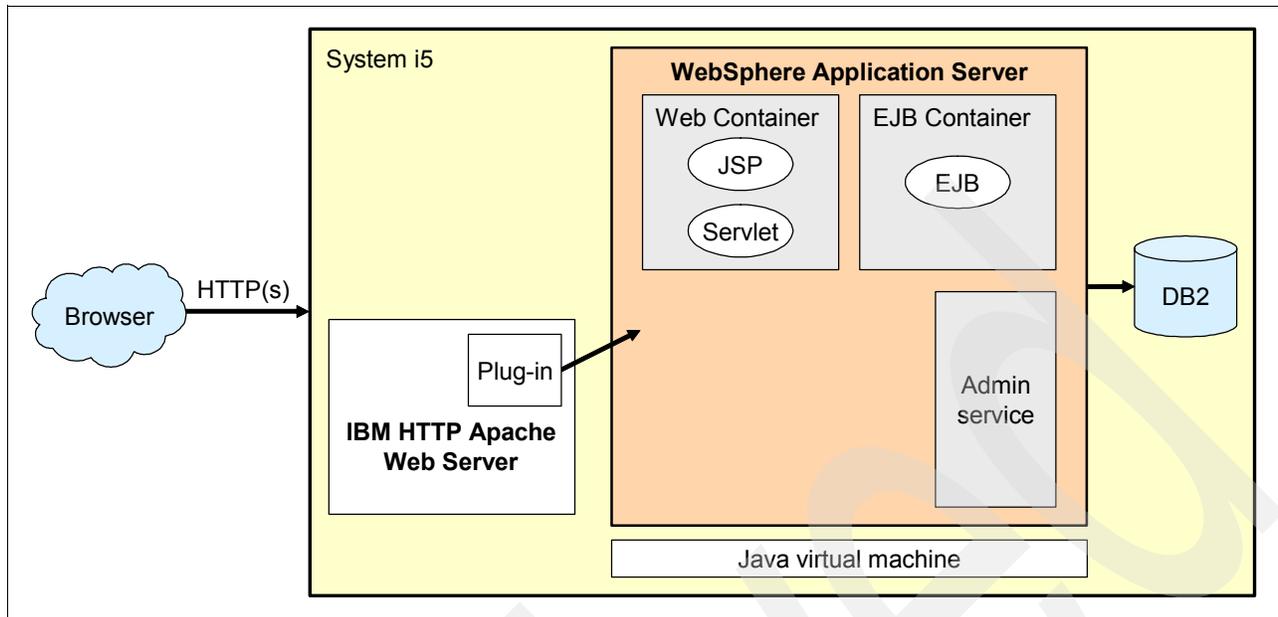


Figure 1-2 WebSphere Application Server runtime environment

Application server

At the root of the WebSphere Application Server family of products, whether it be Express, Base, or Network Deployment, is the *application server*. The application server acts as the heart or vital organ that pumps life into these various components and keeps them functioning and processing.

The WebSphere Application Server provides the runtime environment for the enterprise application. It provides a “mini-environment”, where the application servers run in a JVM. Therefore, the application server functions as its own entity. An application server runs one or more J2EE applications and provides the services required to run those applications. With the Base and Express versions of WebSphere Application Server, you are limited to a stand-alone application server configuration.

An application server that runs in its own JVM consists of containers and a number of services that specialize in executing the specific Java application components. The JVM provides a runtime environment for the Java programs to run in. On the iSeries server, the JVM is included as part of i5/OS.

Note: A new 32-bit JVM has been introduced in V5R4. The new JVM runs in the Portable Application Solutions Environment (PASE) environment.

For further information regarding WebSphere Application Server, see the WebSphere Application Server Information Center at:

<http://publib.boulder.ibm.com/infocenter/wsdoc400/index.jsp>

Containers

Another component of the application server is *containers*. The J2EE 1.4 specification defines the concept of containers as a service that provides a runtime environment for applications. Two types of containers are widely used in an application server configuration designed to handle a specific task:

- ▶ **Web container:** Processes HTTP requests, servlets, and JavaServer™ Pages™ (JSPs)
- ▶ **EJB™ container:** Supports Enterprise JavaBeans™ (EJB)

There is an additional container, known as the *application client container*, that runs on the client machine. However, the application client container does not play any role in the configuration that we are discussing in this chapter, and therefore, is not discussed further for the remainder of this section.

Application server services

A wide range of application server services are provided via WebSphere Application Server. A few of the most popular services are listed here:

- ▶ J2EE Connector Architecture services
- ▶ Transaction cache service
- ▶ Dynamic cache service
- ▶ Message listener service
- ▶ Object Request Broker service
- ▶ Administrative service (Java Management Extensions)
- ▶ Diagnostic trace service
- ▶ Debugging service
- ▶ Name service (Java Naming Directory Interface)
- ▶ Performance Monitoring Interface Service (PMI)
- ▶ Security service (Java Authentication and Authorization Service (JAAS) and Java 2 Security)
- ▶ Service Integration Bus service

WebSphere resources

To support a certain function in your application, you might have to define a WebSphere resource. There are several types of the WebSphere resources that you can configure for your application:

- ▶ *JDBC™ provider:* This resource allows you to configure database access from your application. WebSphere Application Server supports multiple databases. You select the type of database (DB2 Universal Database, Cloudscape™, Oracle, Sybase, and so on) that you want to access by configuring a JDBC resource.
- ▶ *JMS provider:* A JMS provider enables messaging based on the Java Messaging Service (JMS). JMS is the J2EE mechanism to enable the exchange of messages between applications.
- ▶ *Mail provider:* You can configure a mail provider to enable your WebSphere application to send and receive e-mail messages. WebSphere Application Server supports multiple protocols, including Simple Mail Transfer Protocol (SMTP), Internet Message Access Protocol (IMAP), and Post Office Protocol (POP3).

There several more resources that you can configure in WebSphere Application Server.

Administration

The WebSphere Administrative Console is a browser-based interface that provides configuration, operation, and administrative capability. It allows you to start and stop an application, deploy an application, configure resources, and implement security measures.

There is an additional administrative interface on System i5™, called *Web Administration for i5/OS*. This interface has been designed with the new WebSphere user in mind. It contains the subset of functions available in the WebSphere Administrative Console, but provides excellent integration of WebSphere administration with other products and services on System i5, such as IBM HTTP Server (powered by Apache).

Security

Security in WebSphere Application Server is implemented using a layered approach (see Figure 1-3). Security at the operating system level protects WebSphere configuration files and authenticates users when the operating system user registry is used for authentication.

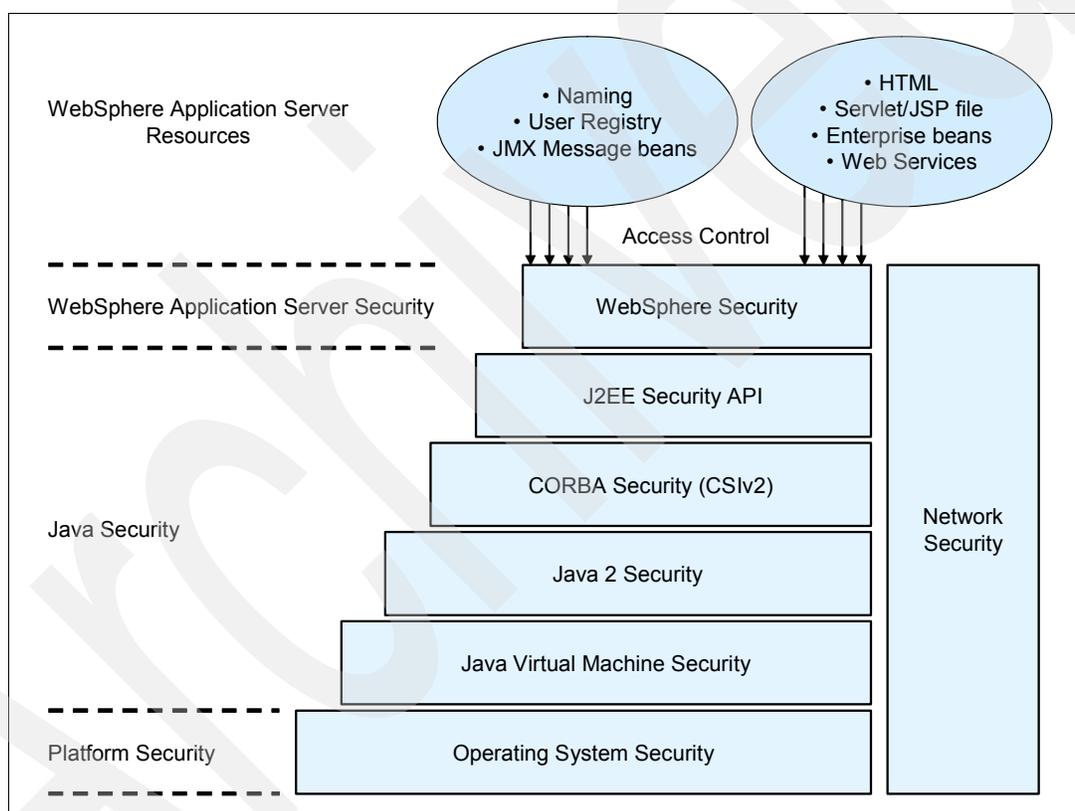


Figure 1-3 Layers of the WebSphere Application Server security architecture

Each layer in this architecture relies on the layers underneath. When a client accesses a secure application in the WebSphere environment, multiple layers are involved. As an application developer or administrator, you decide which layers of the architecture to enable.

For more information about WebSphere security, read the *WebSphere Application Server for OS/400: Securing applications and their environment* manual on the Web at:

<http://publib.boulder.ibm.com/infocenter/wsdoc400/v6r0/topic/com.ibm.websphere.iseries.doc/info/ae/ae/sec.pdf>

Planning for WebSphere Application Server installation

IBM WebSphere Application Server V6.0 for OS/400 is shipped as an OS/400 licensed program product (LPP). Before you install it, familiarize yourself with the functional capabilities of each of the WebSphere Application Server V6.0 for OS/400 editions. Doing so ensures that you obtain and implement the functionality that you require. For a complete functional comparison, refer to the following Web address:

http://www.ibm.com/servers/eserver/series/software/websphere/wsappserver/product/was_60_comparison_table.html

Then for detailed information about the available product options and to learn how to obtain the software, refer to the following Web address:

<http://www.ibm.com/servers/eserver/series/software/websphere/wsappserver/news/package.html>

This chapter provides information that will assist you in planning and preparing your environment for a successful WebSphere Application Server - Express V6 implementation. We focus on server hardware sizing and provide you with information about specific software requirements.

Note: Between the time this redbook was written and its final publication, the IBM eServer i5 name changed to *IBM System i5*. The Web tools presented in this chapter have been updated to reflect the latest name change as you will find when using the tools on the Web.

2.1 Server sizing

The System i5 platform is perfectly positioned to handle integrated workloads, such as Web services, WebSphere Application Server, and database services, and provides excellent throughput and response times. Therefore, it is important that your System i5 model is adequately sized and configured to accommodate your particular WebSphere workload requirements.

To ensure that you obtain the best performance and throughput from your System i5 model, it is essential that you perform a sizing estimate to determine the hardware configuration that you require to run your WebSphere Application Server applications.

2.1.1 IBM Systems Workload Estimator

IBM Systems Workload Estimator (Workload Estimator) for System i5 is an easy-to-use server sizing and configuration tool. It is a Web-enabled tool that is designed to assist you in determining the computer resources required to run WebSphere, as well as other workload requirements that you might have, including Domino®, Java, HTTP, and traditional workloads. It uses your input criteria to propose a System i5 solution that satisfies your workload-specific capacity requirements within your CPU and hard disk drive utilization objectives.

IBM Systems Workload Estimator consists of two components, namely a *client interface*, which runs in a Web browser on your PC, and a *server program*, which runs on a Web server. To run the Workload Estimator directly on the Internet, you select the **Run IBM Systems Workload Estimator** link on the IBM Systems Workload Estimator Web site at the following address:

<http://www-912.ibm.com/supporthome.nsf/document/16533356>

Alternatively, you can download the software by clicking the **Download the IBM Systems Workload Estimator** option from this Web site and then install and configure a Web server on your local PC to run Workload Estimator in offline mode. Refer to Appendix A, “Installing Workload Estimator” on page 181, for detailed information about how to download, install, and configure Workload Estimator so that you can use it in offline mode.

You also have the ability to use the online version of Workload Estimator in conjunction with IBM Performance Management for System i5 (PM for System i5) to project and predict the workload requirements for your existing System i platform. You can find more information about PM for System i5 on the Web at:

<http://www.ibm.com/servers/eserver/series/pm/>

Figure 2-1 shows the available options on the IBM Systems Workload Estimator Web site.

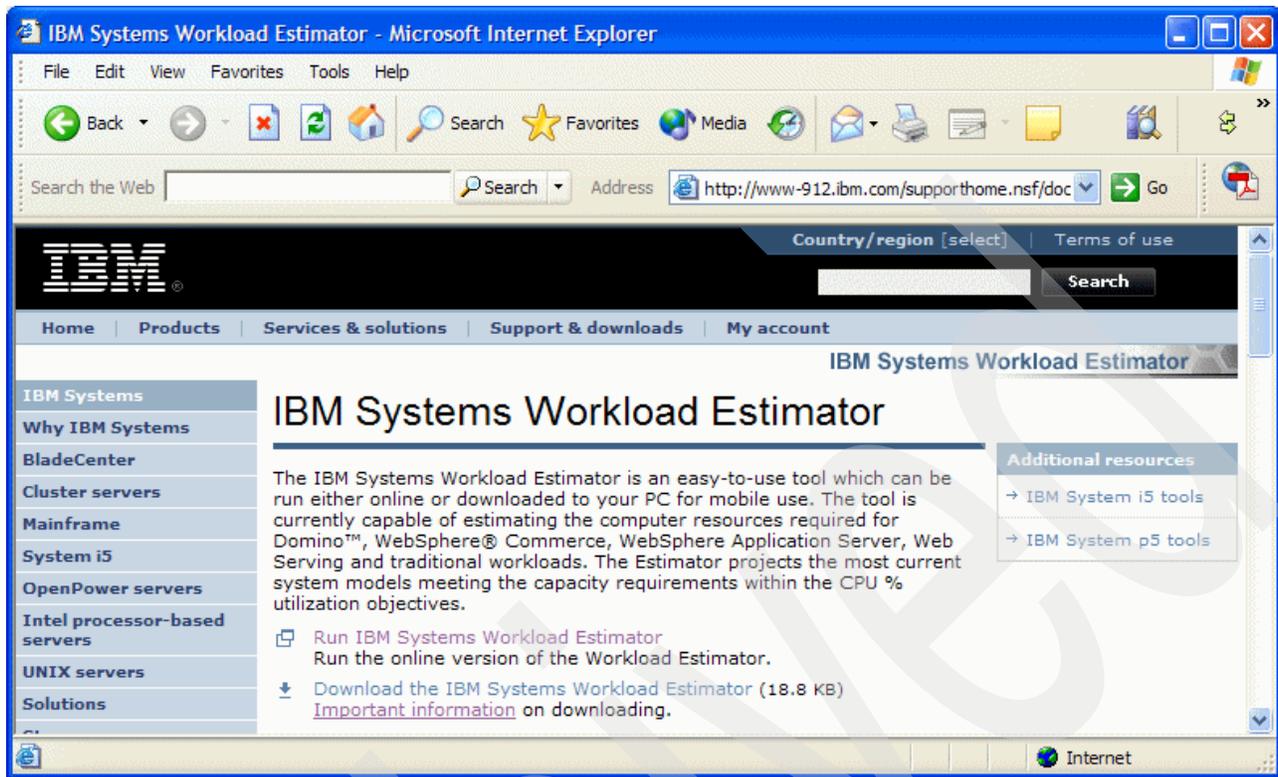


Figure 2-1 Workload Estimator Web site options

In the sections that follow, we use the online version of the Workload Estimator tool.

Determining server sizing requirements with Workload Estimator

In this section, we take you through an example of how you can use Workload Estimator to guide you in making informed decisions about your server hardware requirements to accommodate your WebSphere Application Server V6 workload.

To determine your server sizing requirements, complete the following steps:

1. Click the **Run IBM Systems Workload Estimator** link (see Figure 2-1).
2. On the License Agreement page (Figure 2-2), read the agreement. Then at the bottom of this page, click **I Accept**.

Country/region [select] | Terms of use

Home | Products | Services & solutions | Support & downloads | My account
Version: 2006.2.update.1 25-May-06 www-912
IBM Systems Workload Estimator

IBM servers

About IBM eServer

POWER-processor based servers

Blade servers

Intel processor-based servers

UNIX servers

Midrange servers

Mainframe servers

Linux servers

Cluster servers

Solutions

Storage

Support

Developers

Education

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Warranty info

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License Agreement

The IBM Systems Workload Estimator (Workload Estimator) and related materials are provided by International Business Machines Corporation (IBM) as a service to you and may be used for informational purposes only. Use of the Workload Estimator is restricted to the purpose of helping you predict a possible IBM eServer model processor, interactive feature (where it applies), memory and disk resources for a given workload. All representations of processor utilization, throughput, response time, memory, disk, and other performance data in the Workload Estimator are estimates and averages based on certain assumptions and conditions. No representation is made that these throughputs and their corresponding response times or other performance data will be accurate or achieved in any given IBM eServer installation environment. They are based on specific configurations and run time environments. Customer results will vary. Any configuration recommended by the Workload Estimator should be tested and verified. By accepting this information or using the Workload Estimator you agree to the terms and conditions contained herein. If you do not agree with such terms and conditions, please do not review or use the provided materials and return the materials to IBM.

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You agree to comply with applicable export laws and regulations.

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Help

General Information

What's New in 2006.2.update.1

Tutorials

Basic Walkthrough (290 KB)

Detailed Walkthrough (835 KB)

Options Walkthrough (131 KB)

Save and Reuse (458 KB)

Consolidation (257 KB)

Measured Workload Integration (741 KB)

Logical Partitioning (233 KB)

Disk Group Applet (73 KB)

Developer User Guide (2823 KB)

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Figure 2-2 Workload Estimator license agreement page

3. In the User Demographic Information page, enter your user credentials and click **Continue**.

Note: If your browser is configured to accept cookies, you are only prompted to accept the License Agreement and to enter your user credentials the first time you run Workload Estimator. Subsequent runs of Workload Estimator proceed directly to the Web page shown in Figure 2-3, unless the cookie expires or you manually delete the cookie.

4. From the page shown in Figure 2-3, specify your server hardware preferences and enter your workload requirements. Under the Workload Selection tab, next to *Workload*, click **Add**.

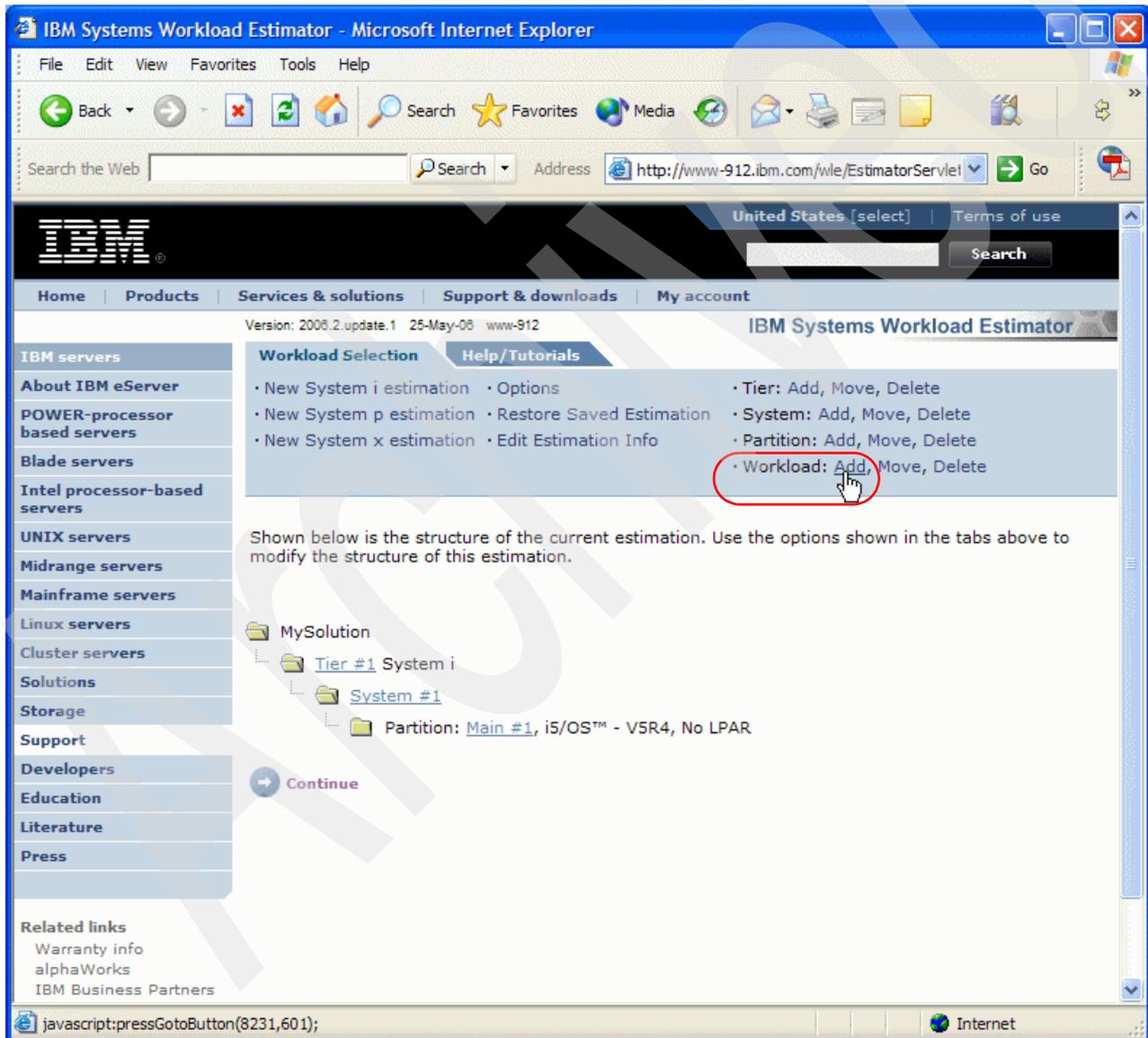


Figure 2-3 Workload Estimator workload requirements

5. On the Workload Selection Add Workloads page, in the directory structure, next to Add Workload, select **WebSphere** from the drop-down list. Then, click **Go**. You see that the WebSphere Application Server workload is added as *WebSphere #1*.
If you have any additional workload requirements, you can add these now from the drop-down list as you did for the first workload. After you add all your required workloads, click **Return**.
6. On the refreshed page, click **Continue** to define your WebSphere Application Server environment.
7. On the first WebSphere #1 WebSphere Workload Definition page, specify the correct WebSphere Application Server version. Then select the appropriate DBCS and RAID support to suit your environment. In this example, we choose the default settings for DBCS and RAID. Then click **Continue**.
8. On the next page, specify your workload definitions as shown in Figure 2-4. It is important that you specify this information as accurately as possible in order to obtain the best sizing estimate. The following list provides an overview of some of the application characteristics that you might have to specify:
 - *Static Web pages*: This is the average number of static Web pages that are served during a visit to your Web site. Static pages include HTML documents, graphics and any other static content that are delivered through the Web server.
 - *Servlet chaining*: This refers to the use of multiple servlets or JavaServer Pages (JSPs) to process a single HTTP request. One servlet might do some computation or other type of work before passing the request on to another component. This architecture is especially common when you use JSPs. For example, a servlet might perform some type of computation before forwarding the request to a JSP™, which in turn formats the result of the computation.
 - *WebSphere Security*: Specify whether you intend to enable global security in the Administrative Console. Workload Estimator takes into account only the overhead associated with enabling security and does not cater to the fact that authentication might be done by the application. The effects of using Java 2 Security is also not taken into account.

Important: If you specify *yes* for both WebSphere Security and HTTP Server Administration functionality, the overall CPU utilization is increased by approximately 20 percent. If you select HTTP Server Administration functionality without specifying WebSphere Security, the application CPU utilization increases.

If you are not familiar with, or do not have access to, all the information about the application's characteristics, we strongly recommend that you discuss and obtain this information from your application developers or the independent software vendors (ISVs) who are responsible for creating and maintaining your applications.

You can also examine the application directory structure to determine which of these features are contained in the application. If your application is already installed and running in WebSphere Application Server - Express V6, you can use the IBM Tivoli® Performance Viewer tool to analyze your application and determine which features and methods are being used in the application. You can find more information about Tivoli Performance Viewer at the WebSphere Application Server Information Center at the following Web address:

http://publib.boulder.ibm.com/infocenter/wsdoc400/topic/com.ibm.websphere.iseries.doc/inf/ae/ae/cprf_tpv.html

Click **Continue** at the bottom of the page.



Figure 2-4 Workload definitions

9. On the next page, specify your application's transactional throughput as shown in Figure 2-5 on page 17. On this page, you specify the following values:
 - *Visits per hour*: This is the amount of work that is being done with your application. If you are defining a Web-based application, this value represents a user's entire session at your Web site. If you are not describing a Web-based application, then you might want to define this value in terms of the number of concurrent users of the application. Alternatively, you can equate this value to a user transaction.
 - *JSPs served per visit*: JSPs are often used to format data that is obtained from other programs, such as Java servlets. This value is the average number of JSPs that are used during a visit to your Web site. In the unlikely event that your JSPs access data from other applications, you should size those other applications separately, for example in a Java workload.
 - *Java servlets executed per visit*: Servlets form the basis for server-side Java Web processing. These are Java programs that are often used to process HTML from data and return a response. They are frequently used to interact with JSPs and Enterprise

JavaBeans (EJBs). If your servlets access data from other applications on the system, you should size those other applications separately.

- *EJB session beans accessed per visit*: Session beans are typically used to represent the logic in a transaction. Some applications might also use session beans for database access.
- *EJB entity beans accessed per visit*: Entity beans are used primarily for accessing data. The data is typically stored in a database, although other implementations are also possible. Workload Estimator assumes that these entity beans do not contain a significant amount of computational logic. In most applications, the computations are done in other components, such as session beans. If you have a significant amount of computations in your entity beans, you might have to choose a slightly larger system than the one that Workload Estimator recommends.

Note: Workload Estimator does not account for Container Managed Relationships (CMR). CMR is new for EJB 2.0, and you must account for the extra overhead of these relationships. You do this by increasing the number of EJB entity beans accessed per visit to accurately represent the number of database rows that are being queried by calls to the entity beans that use CMR.

- *Message-driven beans (MDBs) accessed per visit*: A *message-driven bean* is an enterprise bean that allows Java 2 Platform, Enterprise Edition (J2EE) applications to process messages asynchronously. It normally acts as a Java Message Service (JMS) message listener, which is similar to an event listener except that it receives JMS messages instead of events. The messages might be sent by any J2EE component, for example an application client, or another enterprise bean, or a Web component. The messages can also originate from a JMS application or another system that does not use J2EE technology.
- *Persistent/Nonpersistent messaging mixture*: *Persistent messages* are written to disk and can be recovered in the event of a failure. *Nonpersistent messages* are not written to disk and cannot be recovered in the event of a failure. To specify this mixture, use your mouse to move the sliding bar to set the percentage of persistent and the percentage of nonpersistent messages that your workload uses.
- *Point-to-Point/Pub-Sub messaging mixture*: *Pub-Sub messaging* is intended for use in one-to-many or many-to-many broadcast of messages. *Point-to-Point messaging* is intended for one-to-one message communication.

In the Pub-Sub model, a messaging client sends a message through a virtual channel, called a *topic*, to messaging clients that subscribe to this topic. Every consumer automatically receives a copy of every message without having to request or poll the topic for new messages.

The Point-to-Point model allows the message clients to send and receive messages through a virtual channel known as a *queue*.

To specify your mix of Point-to-Point/Pub-Sub messages, use your mouse pointer to move the sliding bar to set the required percentage mix.

After you specify all the necessary values, click **Advanced Configuration** to specify more detailed settings. Otherwise, click **Continue**.

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Version: 2006.2.update.1 30-May-06 www-912

IBM Systems Workload Estimator

Workload Selection | Workload Definition | Help/Tutorials

WebSphere #1

Partition Name: Main #1
i5/OS™ - V5R4
No LPAR

WebSphere Workload Definition

A visit is a group of transactions from a given user.

1. How many visits per hour are anticipated during the **busiest** hour of the day?

In a typical visit, how many of the following operations will occur:

2. Java Server Pages (JSPs) served?

3. Java Servlets executed?

4. EJB Session Beans accessed?

5. EJB Entity Beans accessed?

6. Message Driven Beans accessed?

7. Peristent/Non-Persistent messaging mixture

0% 100 %
non-Persist 50% Persist 50%

8. Point-to-Point/Pub-Sub messaging mixture:

0% 100 %
Pnt-Pnt 50% Pub-Sub 50%

Select *Advanced Configuration* button below to perform optional advanced configurations options.

← Back → **Advanced Configuration** → Continue

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Figure 2-5 Specifying the details for transactional throughput

10. On the Advanced Configuration page, specify additional information about the complexity of some of your application components. The example in Figure 2-6 shows the default settings of this page. After you make the necessary changes, click **Continue**.



Figure 2-6 Options on the Advanced Configuration page

Finally you see the Selected System page, which shows the server sizing results and recommendations Figure 2-7. Workload Estimator recommends the System i5 model, memory, and disk requirements to meet your workload and performance expectations. This information gives you an indication of the server requirements needed to support your current workload-specific requirements, as well as the recommended server upgrade path, based on the growth factors that you have specified.

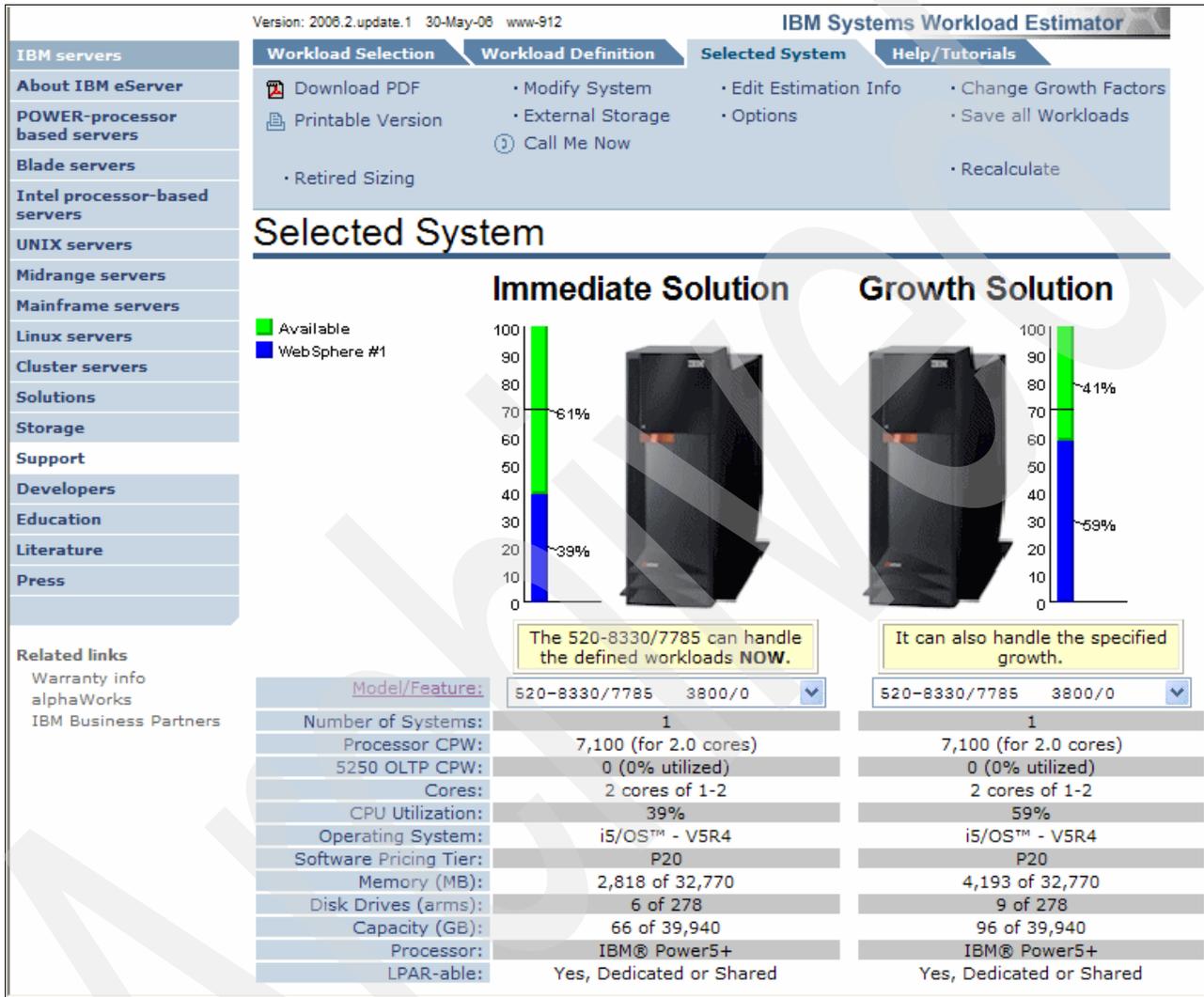


Figure 2-7 Workload Estimator server sizing estimate

Remember that the output of a sizing or capacity planning tool is only a part of the total sizing or capacity planning process. It is important that all stakeholders agree on the workload expectations and workload growth, including the potential increase in the number of users, transactions, and amount of data that will be processed and stored. In addition, the application developers must provide sufficient information to characterize each application's workload characteristics, multiple workload dependencies, and potential impact on each other.

You can revisit and modify any of the Workload Estimator input parameters until you are satisfied that the input information is a representative view of your required workload.

Detailed explanations of the input parameters and workload information that are required by Workload Estimator is outside the scope of publication. Therefore we strongly recommend

that you read and familiarize yourself with the tutorials and help text that are published on the Help/Tutorials tabs on the Workload Estimator input panes.

These publications contain in-depth information that help you to define your server sizing requirements. For added assistance, Workload Estimator also contains hyperlinks to additional online help resources on most of the input panes.

When you have verified your server hardware requirements and are satisfied that your System i model will be able to accommodate your workload, you can start preparing to install your WebSphere Application Server - Express V6 software.

2.2 Pre-installation considerations

You can save yourself much time and frustration by carefully planning your installation steps. This way you will also ensure that you have not overlooked anything, which ultimately translates into a faster and smoother implementation of WebSphere Application Server - Express V6.

Tip: The publication *WebSphere Application Server for OS/400 Installation Version 6* contains valuable, detailed information that can assist you in implementing WebSphere Application Server. You can download the complete document from the Web at:

<http://publib.boulder.ibm.com/infocenter/wsdoc400/topic/com.ibm.websphere.iseries.doc/info/ae/ae/install.pdf>

We recommend that you read this publication in conjunction with this redbook.

In the sections that follow, we discuss some of the WebSphere Application Server software requirements and focus on a few items to assist you in planning the installation of WebSphere Application Server - Express V6.

2.2.1 Order your software

WebSphere Application Server - Express V6 is automatically included with OS/400 V5R3 and i5/OS V5R4. Therefore, no additional software or license keys are required to install and use WebSphere Application Server - Express V6.

In addition, IBM Passport Advantage® provides you with an easy-to-use and secure Web facility to order and download IBM software directly to your server. You can access IBM Passport Advantage at the following Web address:

http://www-306.ibm.com/software/howtobuy/passportadvantage/pao_customers.htm

For more information about the available product options and how to obtain the software, see the following Web address:

<http://www.ibm.com/servers/eserver/series/software/websphere/wsappserver/news/package.html>

2.2.2 Check for prior product installations

Before you start installing your WebSphere Application Server software, determine if any other WebSphere Application Server software is currently installed on your server. In particular, see if WebSphere Application Server - Express V6 is already installed.

You can verify whether WebSphere Application Server - Express V6 is installed by using the iSeries Navigator interface, as shown in Figure 2-8. Expand **Configuration and Service** → **Software** → **Installed Products**. In the right pane, search for the product ID *5733W60*.

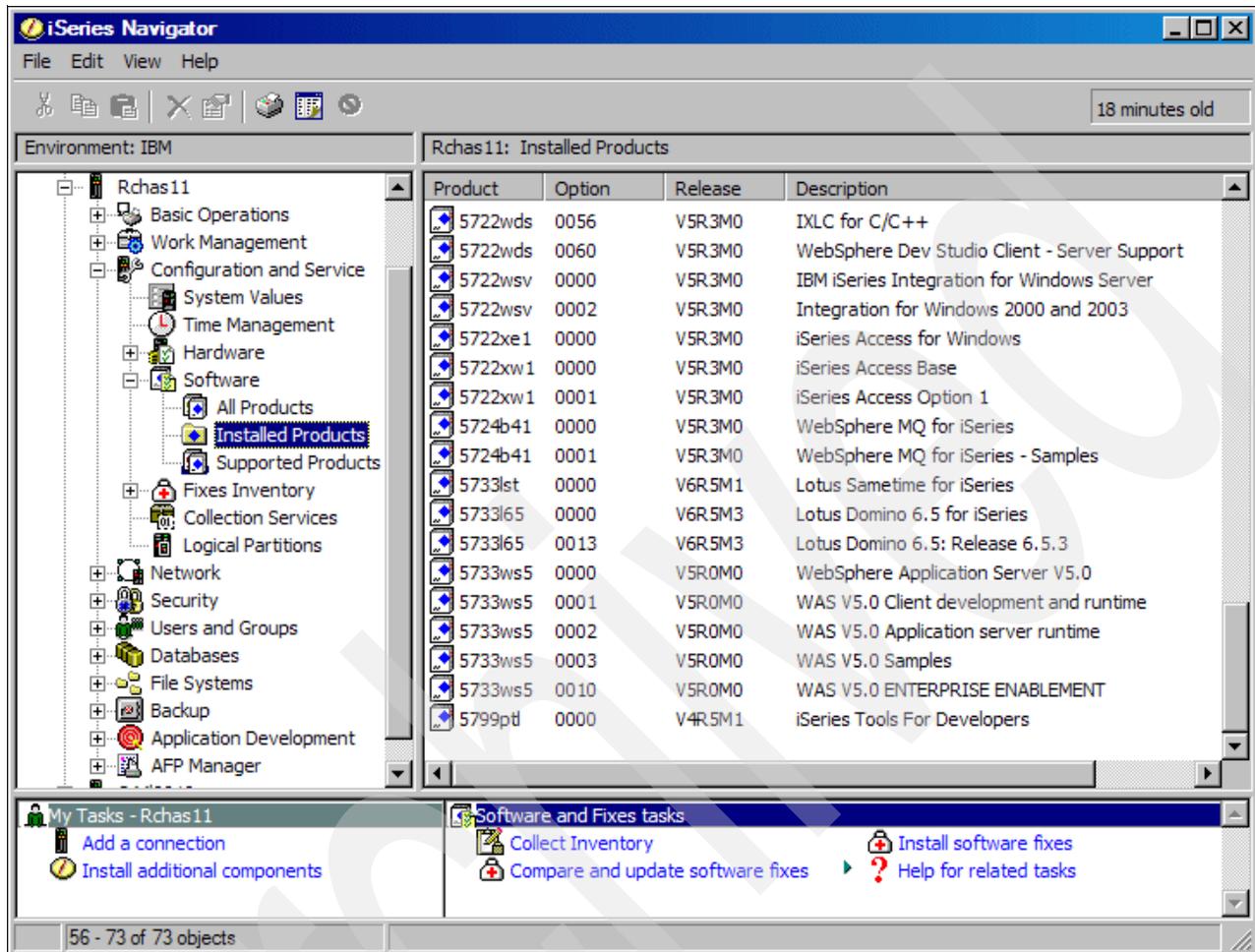


Figure 2-8 Determine installed WebSphere components

You can also use the Display Software Resources (DSPSFWRSC) OS/400 command to obtain this information.

There are a number of reasons why you want to determine which WebSphere products are already installed on your server, for example:

- ▶ Only certain supported WebSphere Application Server for iSeries products can coexist with each other. You can obtain detailed information about WebSphere product coexistence on the Web at:
 - <http://www.ibm.com/servers/eserver/iserries/software/websphere/wsappserver/product/coexist50.html>
- ▶ WebSphere Application Server V6 and WebSphere Application Server - Express V6 share the same product installation directory and therefore *cannot* coexist. The product installation directory is the System i5 integrated file system directory /QIBM/ProdData/WebSphere/AppServer/V6/Base.
- ▶ WebSphere Application Server V6 is an upgrade from the WebSphere Application Server - Express V6 product. Consider an example where you previously installed WebSphere Application Server - Express V6, and at some later point in time, you install the

WebSphere Application Server V6 product. In this case, the installation process overlays the license information for WebSphere Application Server V6 and updates the product version data to indicate that the installation is now a WebSphere Application Server V6 installation, as opposed to a WebSphere Application Server - Express V6 installation.

- ▶ Each WebSphere Application Server product uses several communication ports (IP ports). Your new WebSphere Application Server installation can potentially result in IP port conflicts with some of the other installed products. For a detailed listing of the WebSphere Application Server IP port assignments, refer to the “Administration reference” section in the WebSphere Information Center at the following Web address:

<http://publib.boulder.ibm.com/infocenter/wsdoc400/v6r0/index.jsp?topic=/com.ibm.websphere.iseries.doc/info/ae/ae/adminref.htm>

You can use the iSeries Navigator interface to view the IP ports that are currently in use on your server as shown in the example in Figure 2-9.

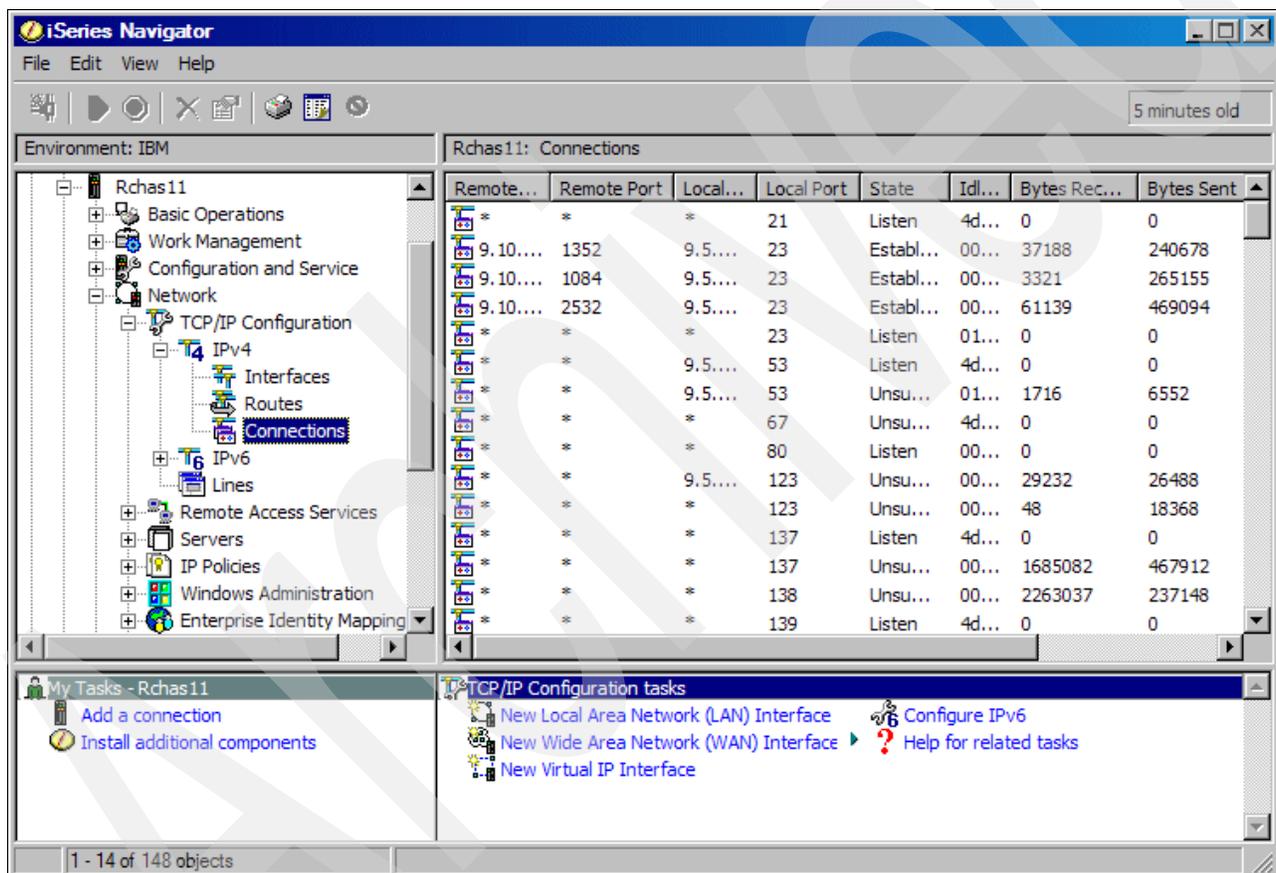


Figure 2-9 Active IP ports information

You can also obtain this information by running the following OS/400 command:

```
NETSTAT OPTION(*CNN)
```

2.2.3 Determine the functionality that you require

The WebSphere Application Server V6.0 for OS/400 product suite consists of multiple editions, each with varying degrees of functionality and complexity. Therefore you should determine and decide the WebSphere Application Server functionality and features that you

require so that you can install the product and components that suit your particular requirements.

A complete functional comparison of the WebSphere Application Server V6.0 for OS/400 edition is available on the Web at the following address:

http://www.ibm.com/servers/eserver/series/software/websphere/wsappserver/product/was_60_comparison_table.html

Three WebSphere Application Server editions available on System i5: Express, Base, and Network Deployment.

The Express and Base editions are functionally identical. They support a stand-alone application server. You can run this server on any number of CPUs. However, we do not recommend this configuration for a high availability solution.

The Network Deployment edition has been designed to support distributed, highly scalable, and highly available solutions. You can create a WebSphere Application Server configuration that spans multiple physical systems. We recommend this edition for medium and large companies to support the business-critical applications.

By default, the installation process installs all WebSphere Application Server components, including:

- ▶ *WebSphere Application Server samples gallery*: This is a set of small, generic samples that shows you how to perform common enterprise application tasks. For example, it demonstrates the use of session and entity enterprise beans, Java Database Connectivity (JDBC) access, connection pooling, Java Mail, message-driven beans, and other Web techniques.
- ▶ *Web server plug-in*: This component enables you to access WebSphere Application Server via remote HTTP servers.

For added security, we recommend that you run WebSphere Application Server V6 and your Web server on separate physical servers. This allows you to protect your enterprise applications and data by configuring a firewall between these servers. Figure 2-10 shows a simplified remote Web server configuration.

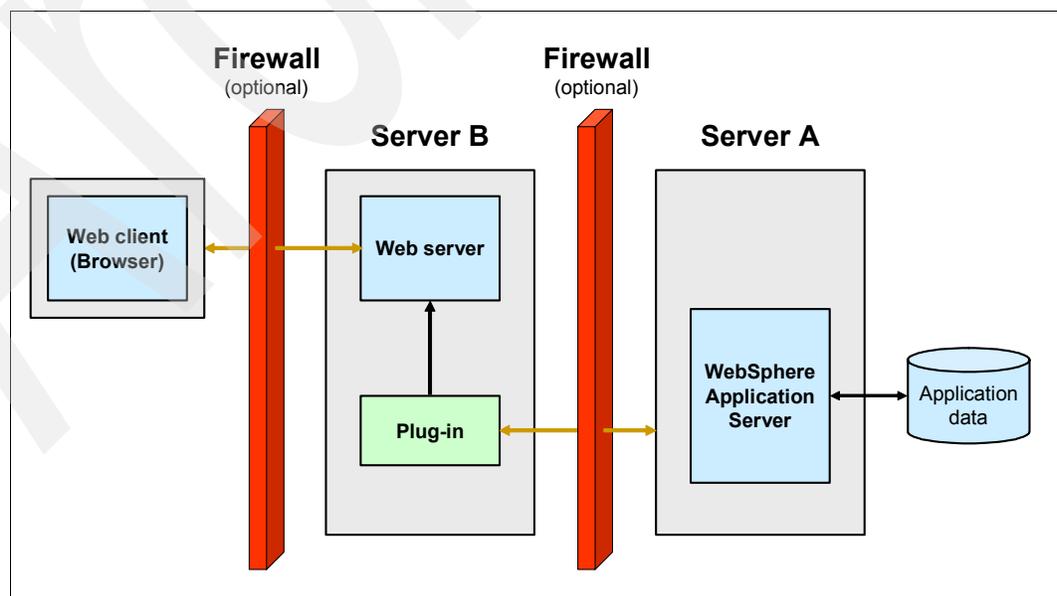


Figure 2-10 Remote Web server configuration

As you can see in Figure 2-10, you only have to implement WebSphere Application Server V6 on one server, Server A. On the Web server side, Server B, you install and configure the Web server plug-in. All HTTP requests between the Web server and WebSphere Application Server V6 are then managed and routed through the Web server plug-in.

There are distinct advantages in deploying a Web server plug-in to provide communication between your Web server and WebSphere Application Server V6, including:

- A standard communication protocol that is recognized by most firewall products
- Security through the use of HTTPS
- The use of an Extensible Markup Language (XML)-based configuration file for easy deployment on the Web server

In a local Web server configuration, the Web server and WebSphere Application Server V6 resides on the same physical server. You should only use this type of configuration in an environment where security is not a concern, for example your development and test environments.

- ▶ *Application client*: This component provides the client application development and runtime environment. For example, it allows you to compile your client application code and run J2EE client applications.

You can decide which of these components you want to install, depending on your requirements. For more information about WebSphere Application Server installable components, refer to the “Verify iSeries prerequisites” section under the “Installation” section of the WebSphere Information Center; go to:

<http://publib.boulder.ibm.com/infocenter/wsdoc400/v6r0/index.jsp?topic=/com.ibm.websphere.iSeries.doc/info/ae/ae/prqsvr.htm>

2.2.4 Verify your workstation capabilities

If you are planning to use your workstation only to administer WebSphere Application Server, then the only requirement is that your workstation must be capable of running either of the following supported Web browsers:

- ▶ Mozilla Firefox Version 1.x
- ▶ Microsoft® Internet Explorer Version 5.5 Service Pack 2 (or higher)

If you plan to develop and deploy your own J2EE applications on WebSphere Application Server V6, then you typically also install an application development tool. WebSphere Development Studio Client is the IBM tool that supports building the WebSphere applications running on System i5.

The development tools have additional hardware, software, and communications requirements. For a complete list of the workstation requirements, refer to the “Verify workstation prerequisites” section, under the “Installation” section of the WebSphere Information Center at the following Web address:

<http://publib.boulder.ibm.com/infocenter/wsdoc400/v6r0/index.jsp?topic=/com.ibm.websphere.iSeries.doc/info/ae/ae/prqwk.htm>

2.2.5 Check your System i5 software

To successfully install and run WebSphere Application Server - Express V6, ensure that you install all the required System i5 software, including:

- ▶ OS/400 V5R2, i5/OS V5R3 or V5R4
- ▶ IBM Developer Kit for Java, Version 1.4 (5722JV1 option 6)

- ▶ Qshell (5722SS1 Option 30)
You require this software in order to run your installation scripts, as well as other scripts in WebSphere Application Server V6.
- ▶ Host Servers (5722SS1 Option 12)
You require this software to install WebSphere Application Server V6.
- ▶ Optional: Cryptographic Access Provider 128-bit for iSeries (5722AC3)
You need this software if you enable security features in your WebSphere Application Server environment.

You can verify whether you already have all the required software installed by using the iSeries Navigator interface as shown in Figure 2-11.

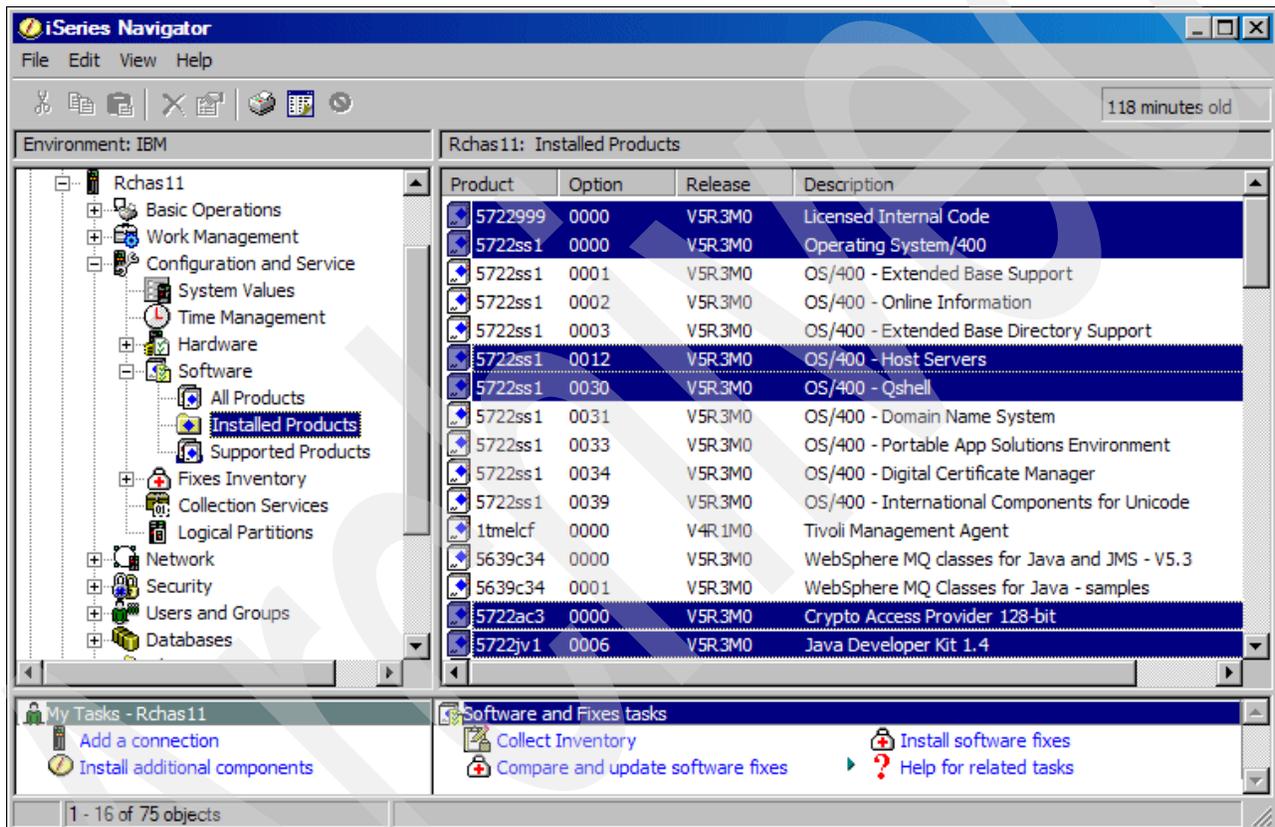


Figure 2-11 Required System i5 software

You might also use the DSPSFWRSC OS/400 command to display the details about your installed software.

Depending on your requirements and which WebSphere Application Server V6 components you have decided to install, you might have to install additional System i5 software, including:

- ▶ An HTTP server
We recommend that you install a supported HTTP server if you are planning to use servlets and JSP files. WebSphere Application Server V6 supports any of the following HTTP servers on System i5:
 - IBM HTTP Server (powered by Apache), product number 5722-DG1
 - Lotus® Domino for AS/400 R5, product number 5769-LNT

- Lotus Domino for iSeries 6.0, Product 5733-LD6
- Lotus Domino for iSeries 6.5, Product 5733-L65
- ▶ OS/400 Digital Certificate Manager
 - If you plan to use a proxy server to transport your HTTP requests and content securely through the Secure Sockets Layer (SSL) protocol, you must install OS/400 Digital Certificate Manager, product number 5722-SS1, Option 34.
- ▶ DB2 Query Manager and SQL Development Kit for iSeries, product number 5722-ST1
 - This product assists you in developing your own client applications.

2.2.6 Install your System i5 program temporary fixes

Program temporary fixes (PTFs) address and fix known problems, add new functionality, and keep your server operating efficiently by providing changes and updates to your software, Licensed Internal Code, or machine code. We strongly recommend that you download and implement the latest available group PTFs before you install your WebSphere Application Server V6 software, including:

- ▶ OS/400 Cumulative PTF package
- ▶ DB2 Universal Database for iSeries
- ▶ Java
- ▶ IBM HTTP Server

Important: You must always ensure that you install the relevant OS/400 software product before you install the related group PTF package. For example, ensure that you install IBM Developer Kit for Java 1.4 (5722-JV1, Option 6) before you install the Java group PTF package.

You can view and download the latest available group PTFs at the Fix Central Web site at the following Web address:

<http://www.ibm.com/eserver/support/fixes/fixcentral/main/iseries>

If you require any cumulative PTF packages or individual PTFs in preparation for your WebSphere Application Server - Express V6 implementation, you can also download these items directly to your System i5 model through Fix Central. For more detailed information about how to order and download PTFs from Fix Central, refer to Appendix C, “Downloading PTFs using Fix Central” on page 207.

For a list of the latest available PTFs for WebSphere Application Server V6.0 for OS/400, refer to the following WebSphere Application Server Web address:

<http://www.ibm.com/servers/eserver/iseries/software/websphere/wsappserver/services/service.html>

Now that you have completed your pre-installation checklist and are satisfied that you have all the required OS/400 software and PTFs installed, you are ready to start installing your WebSphere Application Server - Express V6 software.



Installing WebSphere Application Server

In this chapter, we discuss the installation of WebSphere Application Server - Express V6. We provide you with information to help you prepare for a trouble-free installation and show you the necessary steps to install WebSphere Application Server - Express V6 successfully.

To alleviate some of the more common problems that customers often encounter when first starting WebSphere Application Server - Express V6, we also provide detailed information about tasks that you should perform after you install the software.

3.1 Installation options

There are three different methods or options that you can choose from to install WebSphere Application Server - Express V6 on your iSeries server:

- ▶ Graphical user interface (GUI) installation from your PC workstation
- ▶ Silent installation using your PC workstation
- ▶ Silent installation directly from your iSeries server

The GUI installation takes slightly longer to complete than the other methods, but it provides you with an interactive, step-by-step approach for installing WebSphere Application Server - Express V6. The silent installation methods require that you prepare and configure your installation requirements beforehand and type these into a response file. The installation program then runs a background process that reads the information contained in the response file to perform the installation.

In the sections that follow, we focus on the GUI installation method because it is more intuitive and allows you to graphically see and follow each stage of the installation process on your PC as it occurs. You can find more detailed information about how to use the silent installation methods in Appendix B, “Silent installation methods” on page 195.

3.2 Preparing for the installation

Before you proceed with the installation of WebSphere Application Server - Express V6, you must complete the following pre-installation tasks:

1. Start the iSeries host server jobs, by using the following OS/400 command:

```
STRHOSTSVR SERVER(*ALL)
```

If the host server jobs are not active, the installation will fail.

Note: It is possible that for security reasons, your iSeries host server jobs might not generally be active. Therefore, if you manually start the host server jobs, ensure that the host server jobs are ended again after you have completed the installation of WebSphere Application Server - Express V6. You can end the host server jobs by using the following OS/400 command:

```
ENDHOSTSVR SERVER(*ALL)
```

2. Make sure that you have a valid iSeries user ID and password.
3. Verify that your user ID has *ALLOBJ and *SECADM special authorities.

You cannot perform the installation if the user ID or password is invalid. Also the installation will fail if the user ID does not have the required special authorities.

To ensure that the user ID that you want to use for the installation of WebSphere Application Server - Express V6 is configured with the required authorities, follow these steps as illustrated in Figure 3-1:

- a. In iSeries Navigator, select the system name on which you are installing WebSphere Application Server - Express V6, which is **Rchas11** in this example. Then select **Users and Groups** → **All Users**.

Note: If you are not currently logged on to the iSeries server, iSeries Navigator prompts you to provide your user ID and password.

- b. In the right pane, right-click the user ID that you want to use for the installation and select **Properties**.
- c. Click the **Capabilities** button.
 - i. From the Privilege class list, select **Security officer**.
 - ii. Under System privileges, enable **Security administration**.
 - iii. Click **OK**.
- d. Click **OK** to save your changes.

Note: If your user ID does not allow you to perform this task, contact your system security administrator for assistance.

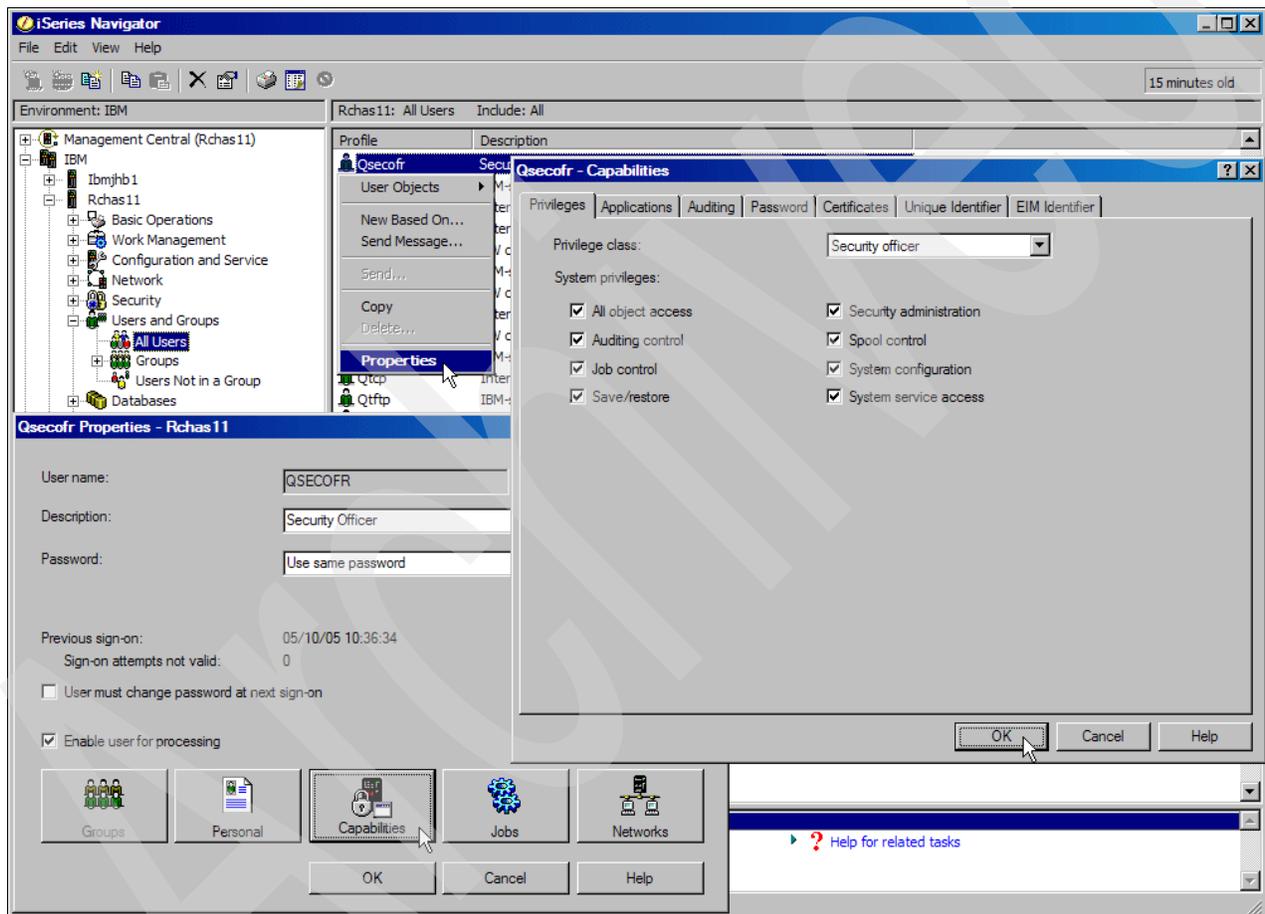


Figure 3-1 Validating iSeries user ID and special authorities

4. Ensure that TCP/IP is started on your iSeries server. Select **Network**, right-click **TCP/IP Configuration**, and select **Start** as shown in Figure 3-2. This starts the configured TCP/IP services.

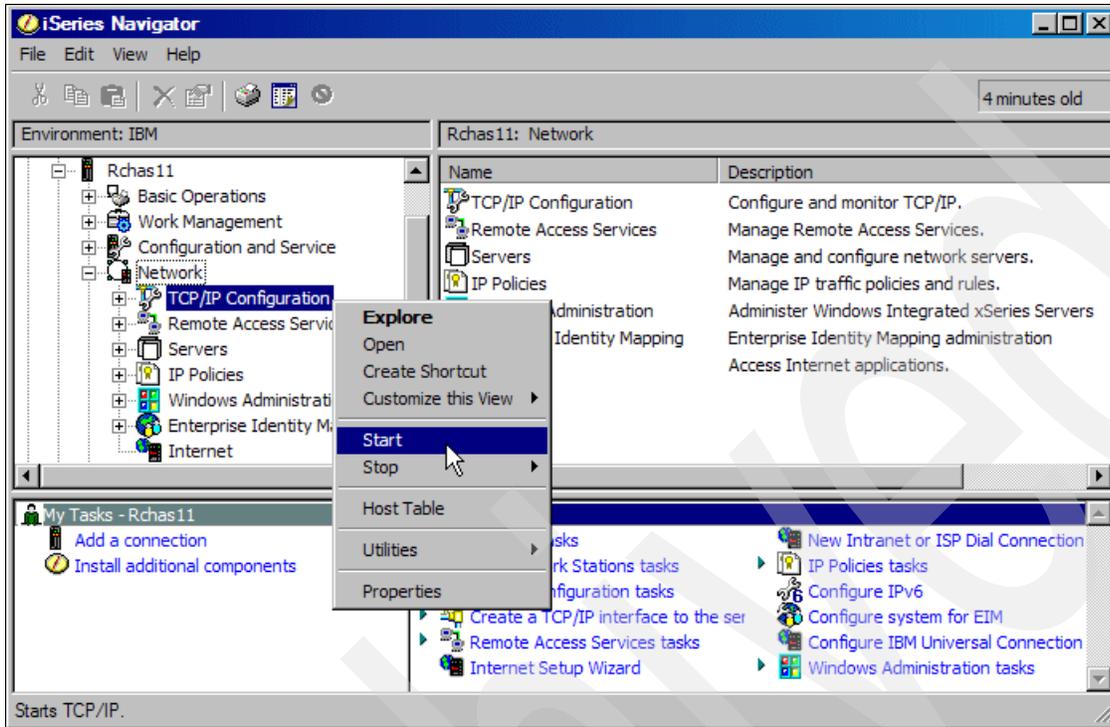


Figure 3-2 Starting iSeries TCP/IP services

If TCP/IP is already active, you see a message similar to the example shown in Figure 3-3. Click **OK** to continue.

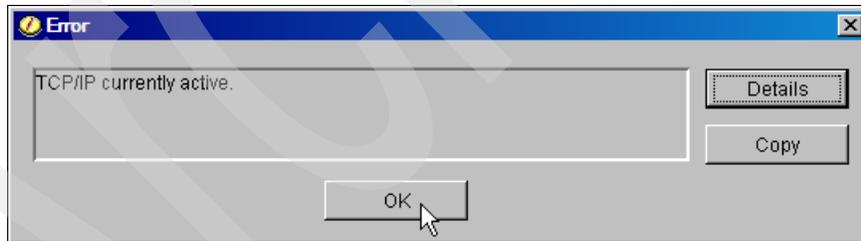


Figure 3-3 TCP/IP active message

You can also use the Start TCP/IP (STRTCP) OS/400 command to start the TCP/IP services on your iSeries.

5. Verify that you can communicate with your iSeries server from your PC workstation. The easiest way to verify this is to use the **ping** utility from your PC command line interface as shown by the example in Figure 3-4.

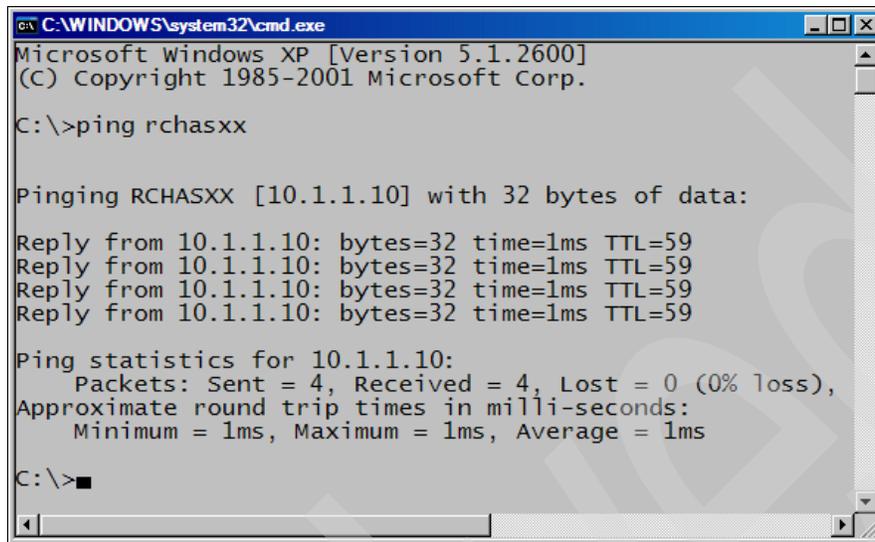


Figure 3-4 Verifying TCP/IP communications

After you complete these pre-installation tasks, you are ready to start with the installation of WebSphere Application Server - Express V6.

3.2.1 Using the GUI installation

WebSphere Application Server - Express V6 is installed using InstallShield. When you use the GUI installation method, the interactive program guides you through the installation options. You initiate the installation process from your PC workstation and specify your required installation options in each of the prompt screens.

In this section, we explain how install WebSphere Application Server - Express V6 by using the GUI installation method from a PC workstation that runs the Microsoft Windows® XP Professional operating system with Service Pack 2 installed.

To perform the installation, proceed as follows:

1. Insert the WebSphere Application Server 6.0 iSeries CD-ROM in the CD-ROM drive of your PC workstation.

Important: You might have received several different CD-ROM media with your WebSphere Application Server V6 software order. Make sure that you use the CD-ROM media labelled *WebSphere Application Server 6.0 iSeries* to perform your installation.

The InstallShield program should start automatically. If it does not start automatically, you can start it manually by running the **install.exe** program located in the /WAS directory of the CD-ROM. Figure 3-5 shows how you can use the Windows Explorer interface on your PC workstation to start this application.

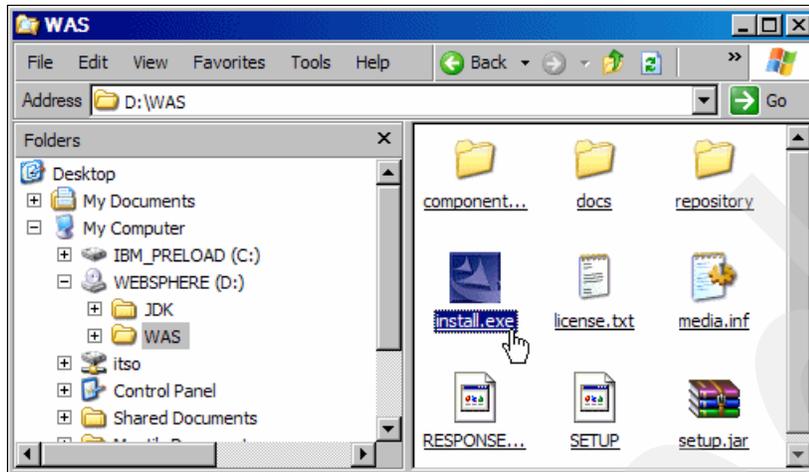


Figure 3-5 Start the InstallShield program

2. In the next window (Figure 3-6), enter the host name or TCP/IP address of the iSeries server on which you are installing WebSphere Application Server - Express V6. Also enter your iSeries user ID and password that you configured in 3.2, “Preparing for the installation” on page 28. Then click **OK**.

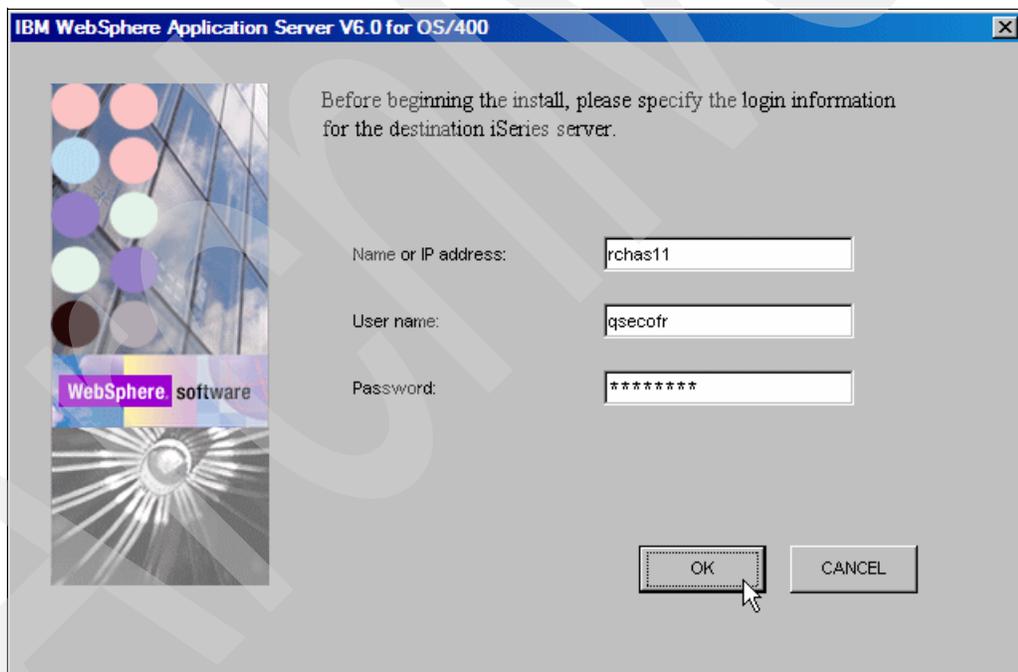


Figure 3-6 Series logon information

The installation process accesses your iSeries server. You cannot proceed with the installation if any of these parameters are invalid or if the iSeries server that you specify is not accessible.

Tip: Under rare circumstances and depending on your network settings, the installation might fail if you specify the TCP/IP address of your iSeries server. If you encounter this situation, then re-start the installation and specify the iSeries host name, instead of its TCP/IP address.

3. The Welcome panel (Figure 3-7) that opens shows information about Web sites that can assist you with installing, configuring, and using WebSphere Application Server V6. Click **Next** to continue.

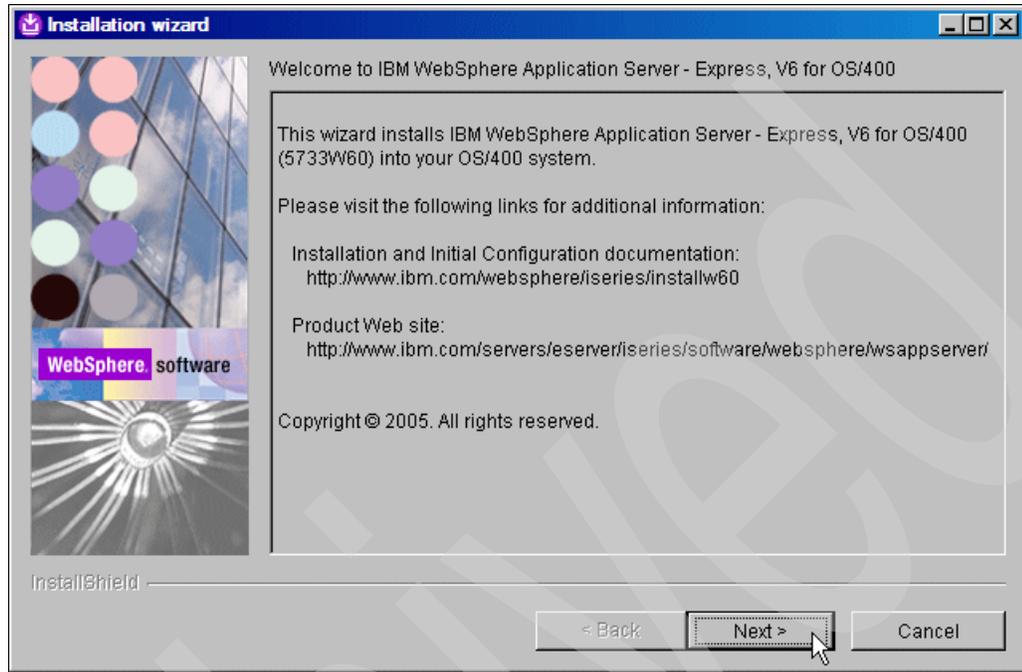


Figure 3-7 WebSphere Application Server - Express V6 Installation Welcome page

4. In the Software License Agreement panel (Figure 3-8) that opens, read the information carefully. Then, select **I accept the terms in the license agreement** and click **Next**.

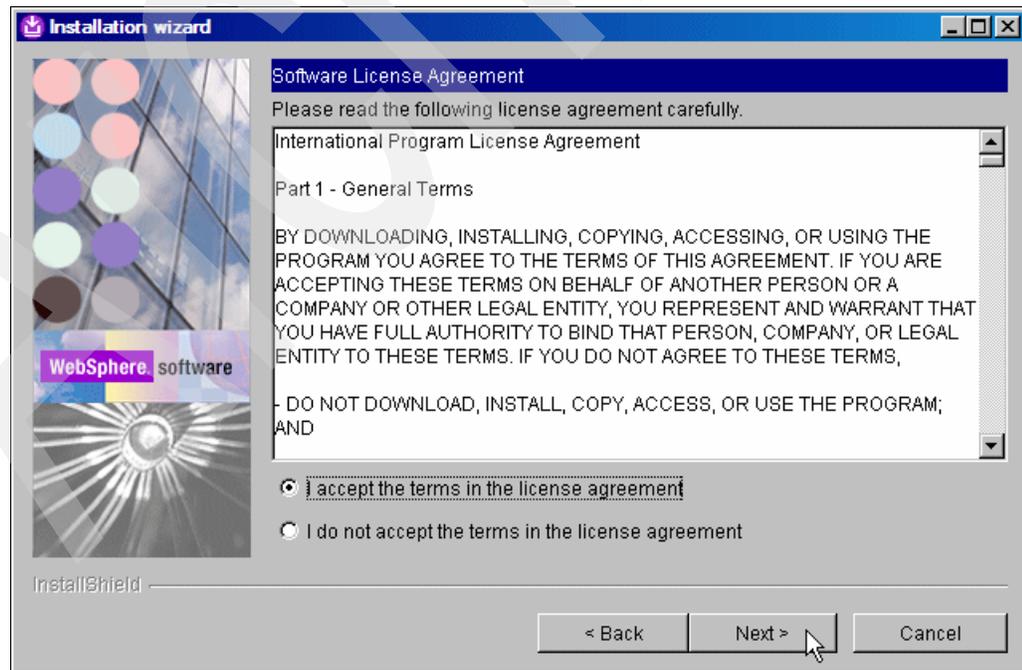


Figure 3-8 WebSphere Application Server software license agreement

5. The installation process checks your system to ensure that the prerequisites are met. When this process is completed, the System prerequisites check panel (Figure 3-9) opens.

If the system prerequisite check is unsuccessful, this window displays a list of the prerequisites that are not met. You must rectify these conditions and click **Back** to rerun the prerequisites check. Alternatively, you can terminate the installation process by selecting **Cancel**, and then rectify the reported conditions and start the installation from the beginning as shown in Figure 3-5 on page 32.

If the prerequisite check is successful, click **Next**.

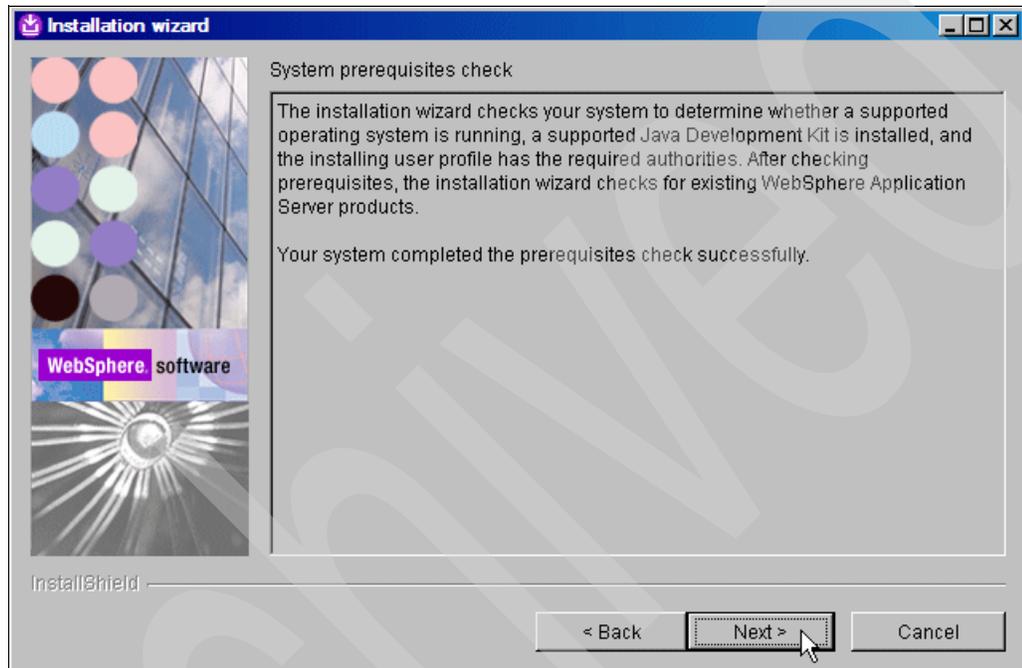


Figure 3-9 System prerequisites check panel

6. After a successful prerequisites check, the installation root directory panel (Figure 3-10) opens. It indicates the name of the iSeries integrated file system directory where WebSphere Application Server - Express V6 is installed.

This integrated file system directory path typically does not exist on your iSeries server. It is automatically created when you install either WebSphere Application Server - Express V6 or WebSphere Application Server V6.

You *cannot* change this default directory path during the installation process. We strongly recommend that you do not rename or modify this directory path after you complete the installation, because this causes WebSphere Application Server - Express V6 to malfunction.

Click **Next** to continue with the installation process.

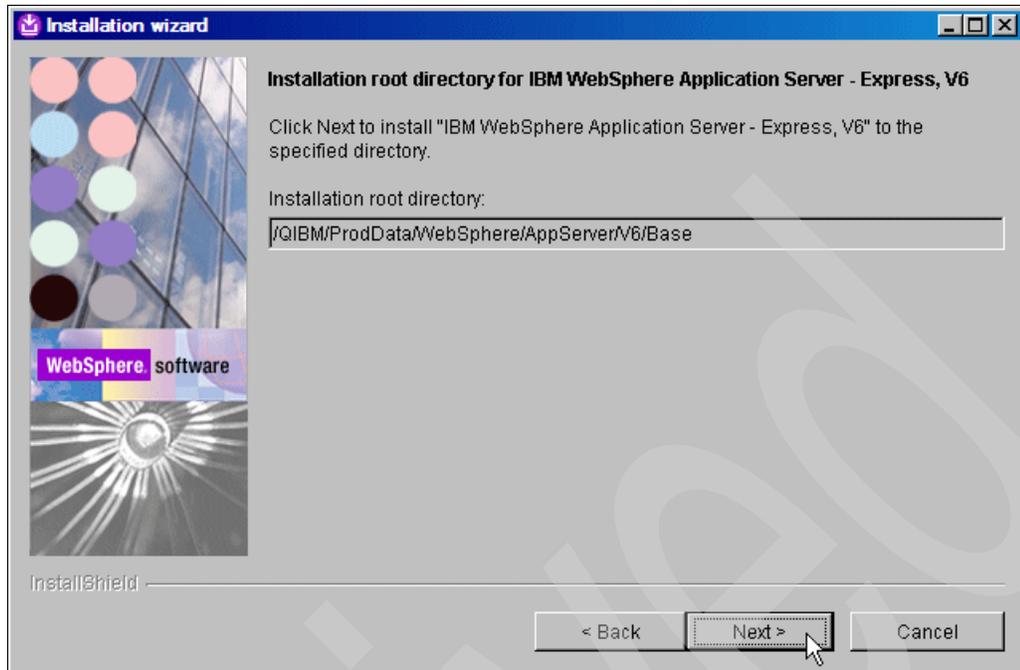


Figure 3-10 Installation root directory name

7. On the features to install panel (Figure 3-11), select the components that you want to install. By default, all options are selected. We suggest that you accept the default selection. Click **Next** to proceed.

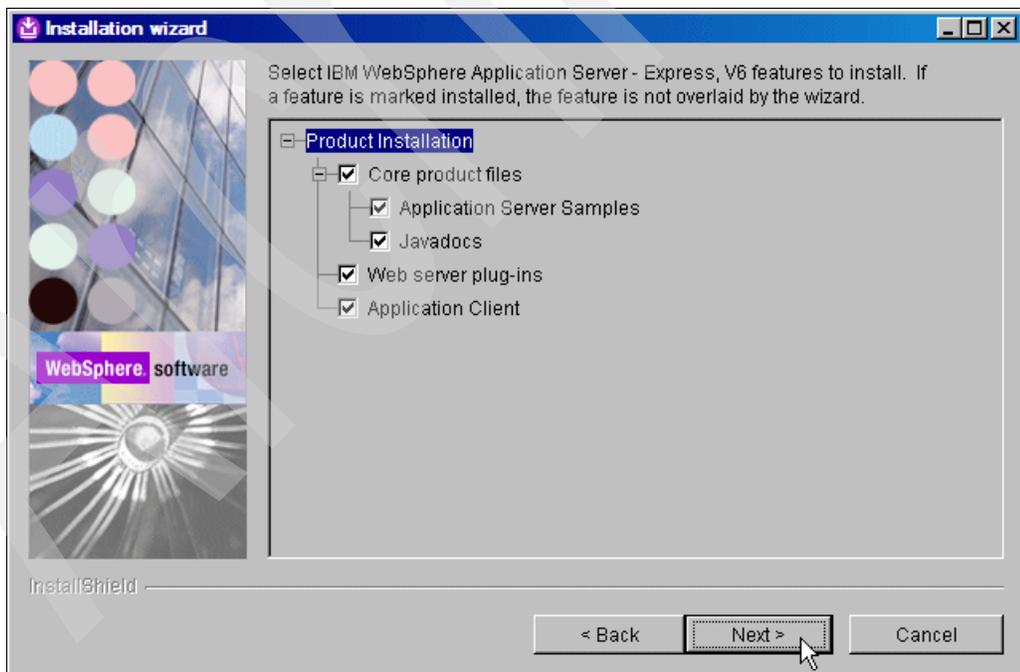


Figure 3-11 Installable components

Refer to 2.2.3, “Determine the functionality that you require” on page 22, for a discussion about the WebSphere Application Server - Express V6 installable components and functions.

8. The Installation summary panel (Figure 3-12) displays a summary of the installation options that you have specified on all the previous input panels. Review the information on this panel.

Click the **Back** button if there are any parameters that you must modify. If you are satisfied with the information on this panel, click **Next** to perform the installation of WebSphere Application Server - Express V6, based on these input parameters.

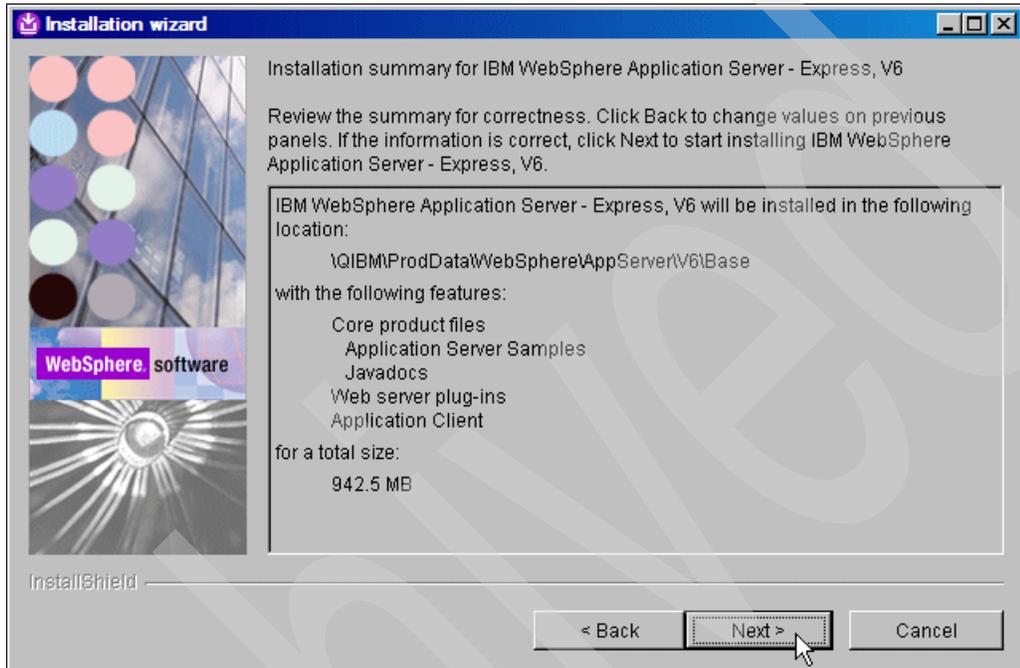


Figure 3-12 Installation summary

9. While the installation is in progress, you see a series of information windows similar to the example in Figure 3-13. These windows give you an indication of the installation progress and allow you to see which component of WebSphere Application Server - Express V6 is currently being installed.

Note: This process can take some time to complete. In our test environment, it took approximately 45 minutes. Depending on your hardware and server configuration, this process can take up to three hours to complete.

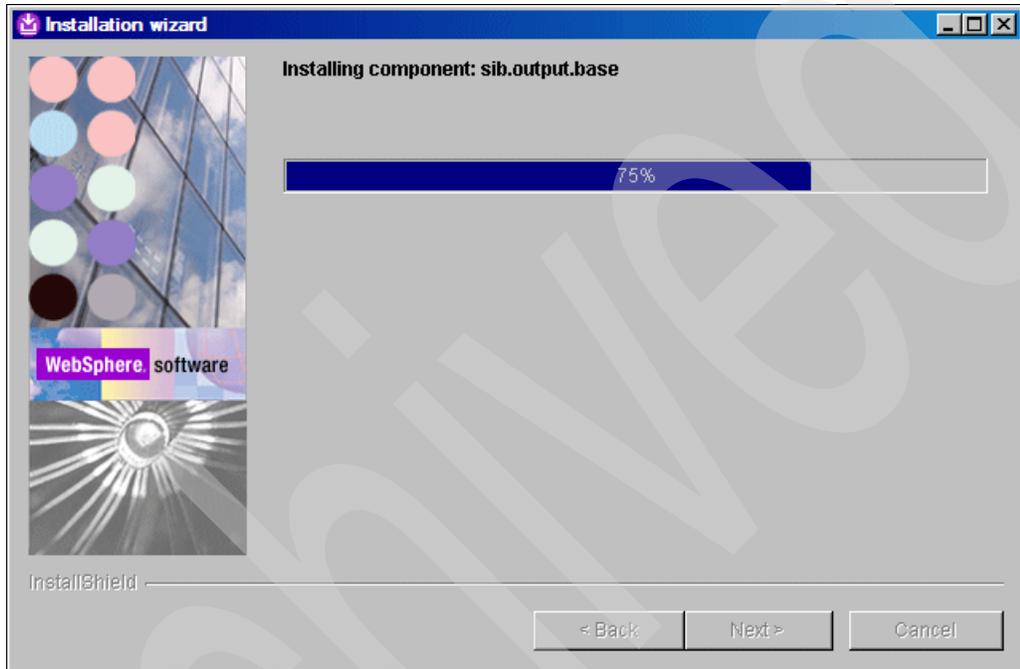


Figure 3-13 Installation progress

10. When the installation of WebSphere Application Server - Express V6 is complete, you see a panel (see the example in Figure 3-14) that indicates whether the installation completed successfully. Read the information on this panel carefully to ensure that the installation completed successfully. Click **Finish** to exit the installation GUI and to complete the installation process.

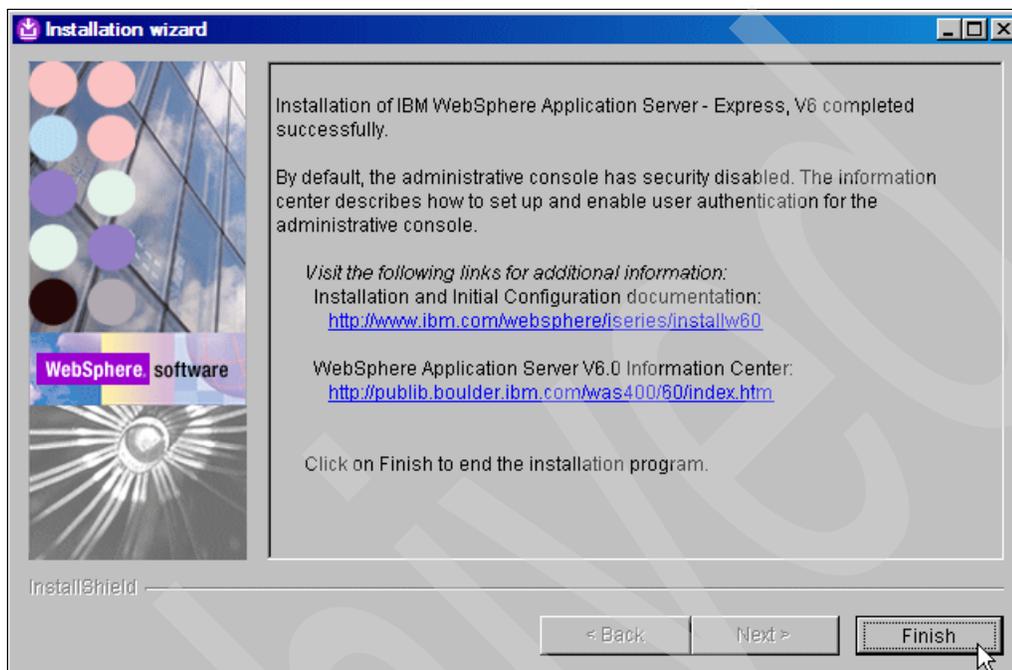


Figure 3-14 Installation completion

You have now successfully installed WebSphere Application Server - Express V6 on your iSeries server. Before you can start using your newly installed WebSphere Application Server - Express V6, there are a few post-installation steps that you must complete as explained in the following section.

3.3 Post-installation steps

In this section, we focus on important tasks that you must complete before you start using your newly installed WebSphere Application Server - Express V6. These tasks are required to ensure that you have a stable and error-free WebSphere Application Server - Express V6 environment.

3.3.1 Verifying the software installation

Before you proceed with any other post-installation tasks, check and confirm that you have installed the WebSphere Application Server - Express V6 software. Figure 3-15 shows how you can use iSeries Navigator to verify that the WebSphere Application Server V6 license program is installed.

Select ***your server name*** → **Configuration and Service** → **Software** → **Installed products**. In the right pane, under the Product column, you should see 5733w60 with both the *Base option (Option 000) and Option 001 installed.

You can also verify the installation by using the Display Software Resources (DSPSFWRSC) OS/400 command.

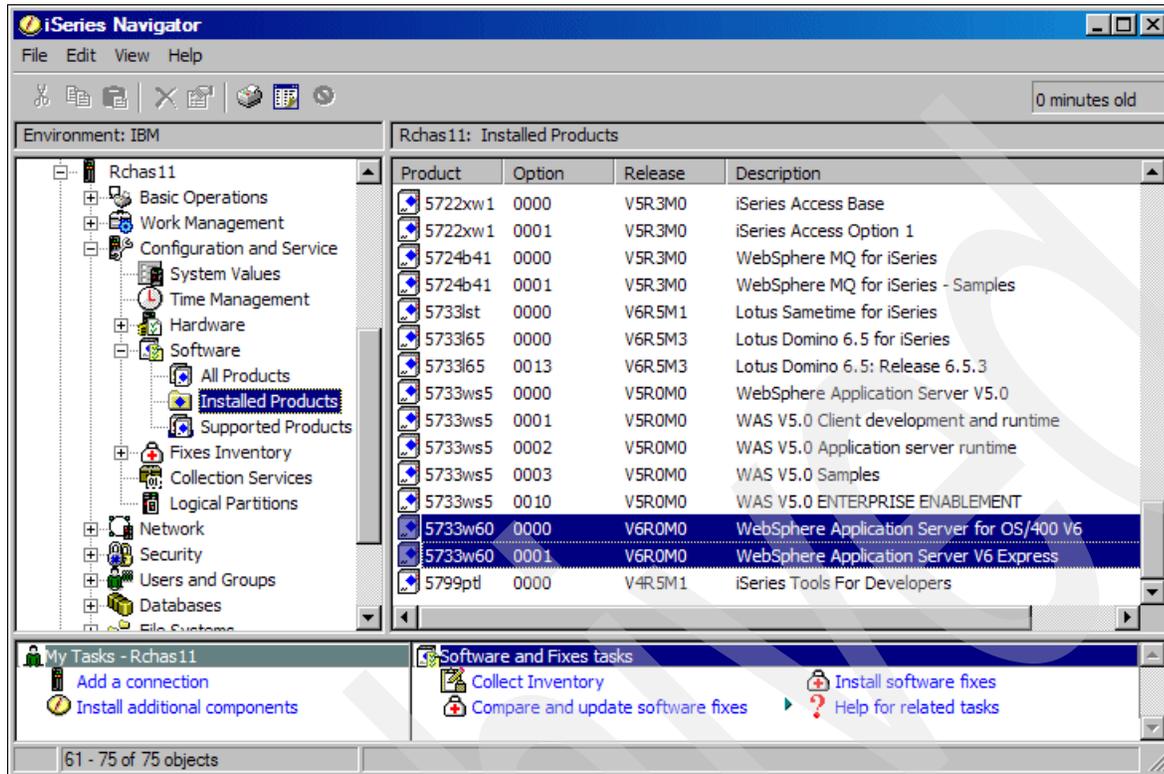


Figure 3-15 Verifying the WebSphere Application Server V6 installed products

3.3.2 Installing the WebSphere Application Server V6 group PTF

As we mention in 2.2.6, “Install your System i5 program temporary fixes” on page 26, the WebSphere Application Server V6.0 for OS/400 group PTF contains group PTFs for IBM Developer Kit for Java, DB2 Universal Database for iSeries, and IBM HTTP Server, which are not included in other group PTFs or cumulative PTF packages. Before you start your WebSphere Application Server - Express V6, download and install the latest available WebSphere Application Server V6 group PTF (SF99301).

Important: You must always ensure that you install the relevant OS/400 software product before you install the related group PTF package. If you have installed WebSphere Application Server V6 group PTF (SF99301) prior to installing the WebSphere Application Server - Express V6 product, we strongly recommend that you reinstall the latest available SF99301 group PTF now.

The PTFs contained in the group PTF (SF99301) package are required to ensure proper functionality of WebSphere Application Server V6. For a list of the latest available PTFs for WebSphere Application Server V6.0 for OS/400, refer to the following Web address:

<http://www.ibm.com/servers/eserver/series/software/websphere/wsappserver/services/service.html>

Note: The group PTF cover letter and installation instructions contain important information to help you implement your group PTF. Make sure that you read these documents and follow the installation instructions carefully.

Installing the WebSphere Application Server V6 fix pack

WebSphere Application Server V6 fixes are implemented by means of a *fix pack*, also sometimes referred to a *refresh pack*.

When you install the WebSphere Application Server V6 group PTF (SF99301), as mentioned in 3.3.2, “Installing the WebSphere Application Server V6 group PTF” on page 39, the fix pack and its related components are automatically created in the /QIBM/ProdData/WebSphere/AppServer/V6/Base/updateinstaller integrated file system directory.

Note: The fix pack itself resides in the /QIBM/ProdData/WebSphere/AppServer/V6/Base/updateinstaller/maintenance directory and is easily identifiable by its .pak file extension, for example 6.0.2-WS-WAS-OS400PPC64-FP0000001.pak.

Figure 3-16 shows the typical contents of the /QIBM/ProdData/WebSphere/AppServer/V6/Base/updateinstaller integrated file system directory after you install the SF99301 group PTF.

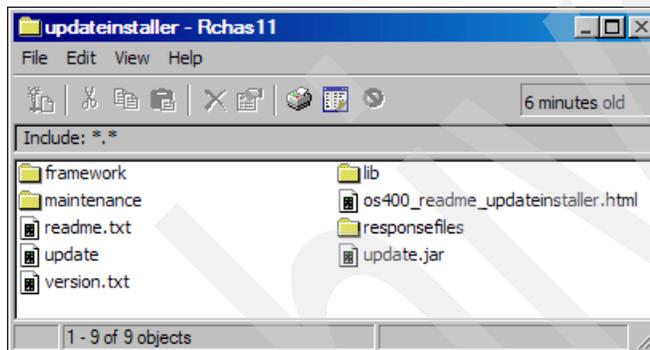


Figure 3-16 Contents of the fix pack integrated file system directory

You install the fix pack by running the IBM Update Installer for WebSphere Software program. This program runs the InstallShield program in silent mode, which means that you are not required to interactively respond to any input prompts.

Important: We recommend that you allocate maintenance time for this process.

To install the fix pack, complete the following steps:

1. Sign on to your iSeries server with a user ID that has *ALLOBJ special authority.
2. Verify that your WebSphere Application Server - Express V6 installation completed successfully and without any errors by viewing the *log.txt* installation log file in the /QIBM/ProdData/WebSphere/AppServer/V6/Base/logs integrated file system directory.
3. End all WebSphere Application Server V6 processes that might be active on your iSeries server. The easiest way to do this is to ensure that the OS/400 subsystem QWAS6 is not active. Figure 3-17 shows how you can use the iSeries Navigator interface to end this subsystem.
 - a. In the left pane, under your server name, select **Work Management** → **Subsystems** → **Active Subsystems**.
 - b. In the right pane, right-click your subsystem, **Qwas6** in this example, and select **Stop**.
 - c. In the Stop Subsystem window that opens, verify that the settings are as shown in Figure 3-17. Then click **Stop**.

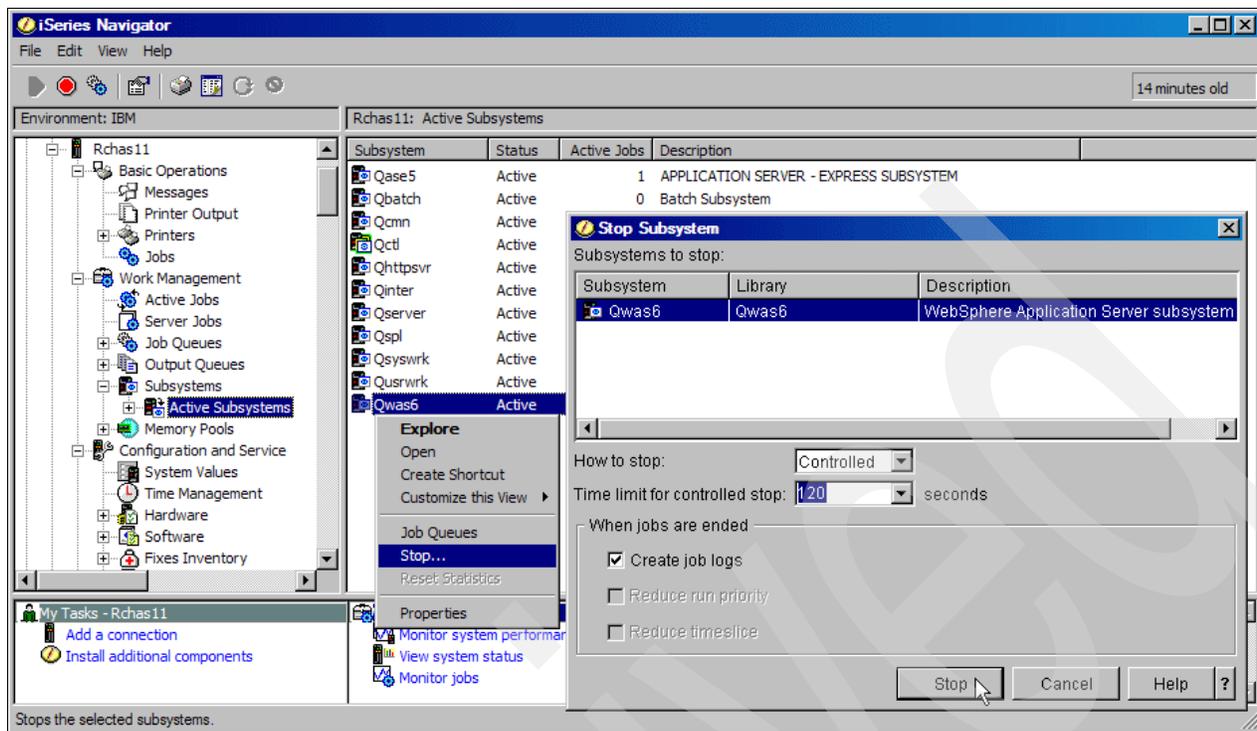


Figure 3-17 Ending the WebSphere Application Server V6 subsystem

You can also use the ENDSBS OS/400 command to end this subsystem, for example:

```
ENDSBS SBS(QWAS6) OPTION(*CNTRLD) DELAY(120)
```

You should adjust the time limit for a controlled end of the subsystem (delay) to suit your environment.

4. Start the host servers:

```
STRHOSTSVR *ALL
```

You use the End Host Server (ENDHOSTSVR) command to end the host servers after installing the fix pack.

5. Start the Qshell interface using the Start Qshell (STRQSH) OS/400 command.

6. Change your current directory:

```
cd /QIBM/ProdData/WebSphere/AppServer/V6/Base/updateinstaller
```

7. Run the following script:

```
update
```

Note: This process can take some time to complete. In our test environment, it took approximately 30 minutes. Depending on your hardware and server configuration, this process can take up 2 hours to complete (depending on your system model and additional workload running on the system). Do not exit Qshell or enter any other commands until the installation process has completed and the command prompt (dollar sign (\$)) is displayed.

Figure 3-18 shows an example of how you can run the update script, together with some of the information messages that are displayed during this process. It shows how to execute the update script without specifying any additional parameters and to use all the default installation settings to install the fix pack.

```
QSH Command Entry

$
$ /QIBM/ProdData/WebSphere/AppServer/V6/Base/updateinstaller/
$
update

GenericUnixFileServiceImpl returns compatibility: 4
(Oct 13, 2005 7:42:06 PM), UpdateInstaller,
com.ibm.wizard.platform.as400.IBMAS400RegistryServiceImpl, dbg.registry, reading VPD f
m/InstallShield/VitalProductData/vpd.properties
(Oct 13, 2005 7:42:30 PM), UpdateInstaller,
com.ibm.ws.install.ni.ismp.actions.ISMPLogFileAction, msg1, *****
(Oct 13, 2005 7:42:30 PM), UpdateInstaller,
com.ibm.ws.install.ni.ismp.actions.ISMPLogFileAction, msg1, Starting a new update inst
ler run
(Oct 13, 2005 7:42:30 PM), UpdateInstaller,
com.ibm.ws.install.ni.ismp.actions.ISMPLogFileAction, msg1, *****
(Oct 13, 2005 7:42:30 PM), UpdateInstaller,
com.ibm.ws.install.ni.ismp.actions.ISMPLogFileAction, msg1, Java Install Path: /QIBM/P
dData/Java400/jdk14
(Oct 13, 2005 7:42:30 PM), UpdateInstaller,
com.ibm.ws.install.ni.ismp.actions.ISMPLogFileAction, msg1, OS Name: OS/400
(Oct 13, 2005 7:42:30 PM), UpdateInstaller,
com.ibm.ws.install.ni.ismp.actions.ISMPLogFileAction, msg1, OS Architecture: PowerPC
(Oct 13, 2005 7:42:30 PM), UpdateInstaller,
com.ibm.ws.install.ni.ismp.actions.ISMPLogFileAction, msg1, OS Version: V5R3M0
```

Figure 3-18 Executing the update script in Qshell

Optional: If you do not explicitly specify the name of a fix pack, the update script installs the most recent fix pack (based on its date and time stamp) that currently exists in the /QIBM/ProdData/WebSphere/AppServer/V6/Base/updateinstaller/maintenance integrated file system directory. You must take this into consideration if you have downloaded more than one interim fix pack into this integrated file system directory.

For any reason, if you must install a specific fix pack from this integrated file system directory, specify the name of the fix pack that you want to install, for example:

```
update -W
maintenance.package="/QIBM/ProdData/WebSphere/AppServer/V6/Base/updateinstaller/maintenance/PQ20029.pak"
```

If you must override the default settings, you can modify the install.txt response file, which is located in integrated file system directory /QIBM/ProdData/WebSphere/AppServer/V6/Base/updateinstaller/responsefiles. Alternatively, you can create a new response file in an integrated file system directory of your choice and then execute the update script, specifying which response file you want to use.

For example, the following command runs the update script and uses a response file named myresponsefile.txt in the integrated file system directory /tmp:

```
update -options "/tmp/myresponsefile.txt"
```

For more information regarding response file options and other fix pack installation options, refer to the os400_readme_updateinstaller.html file in the /QIBM/ProdData/WebSphere/AppServer/V6/Base/updateinstaller/update integrated file system directory. You can use iSeries Navigator to copy this file to a local directory on your PC and use any supported Web browser to view the information.

- When the installation of the fix pack is complete, verify that the update process was successful. By default, the update process creates the *updatelog.txt* file in the */QIBM/ProdData/WebSphere/AppServer/V6/Base/logs/update/fix pack.install* directory, where *fix pack* corresponds to the name of the fix pack that you installed.

Figure 3-19 shows how you can use iSeries Navigator to access this integrated file system directory. The *updatelog.txt* file contains detailed information that you can use to determine whether the installation of the fix pack was successful. In the event of an installation failure, you can also use the information in this file to determine the cause of the failure and take the necessary corrective actions.

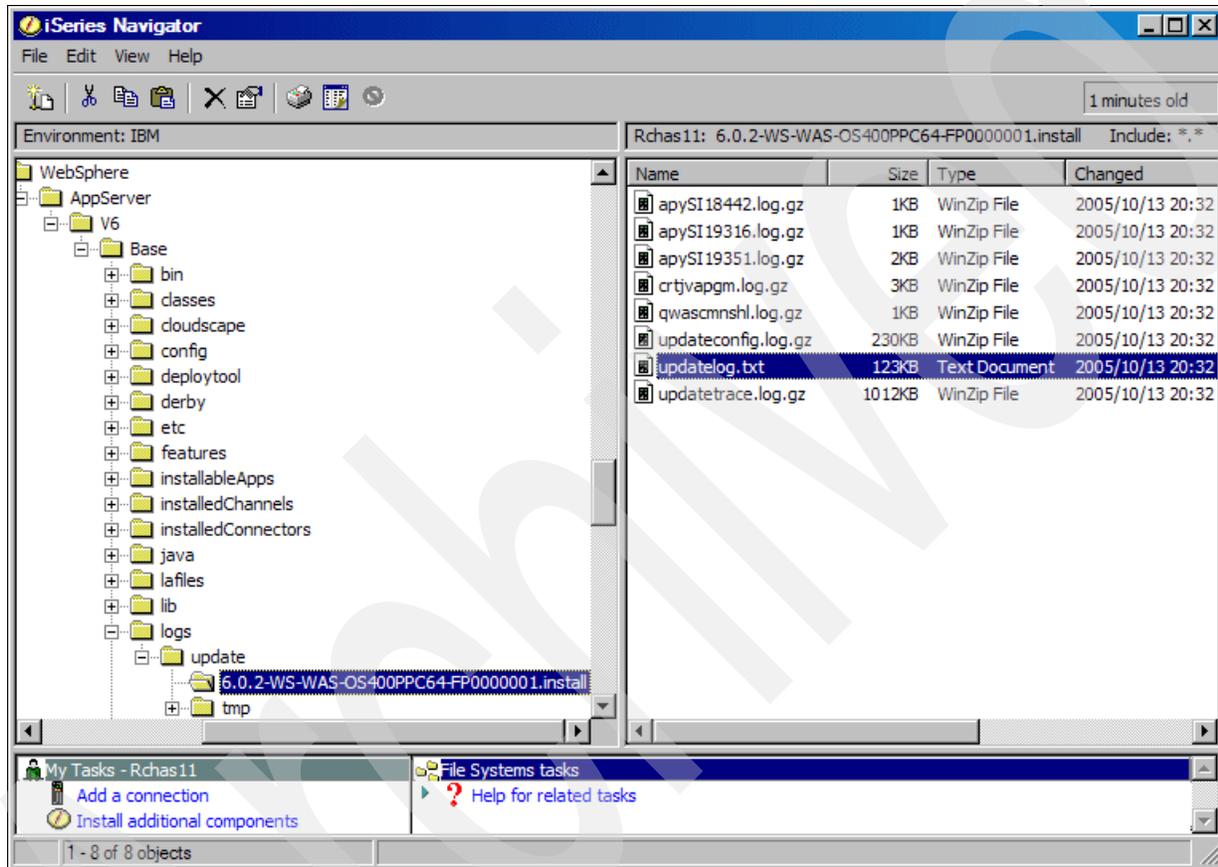


Figure 3-19 Fix pack installation logs directory

Figure 3-20 shows a view of the `updatelog.txt` file using iSeries Navigator.

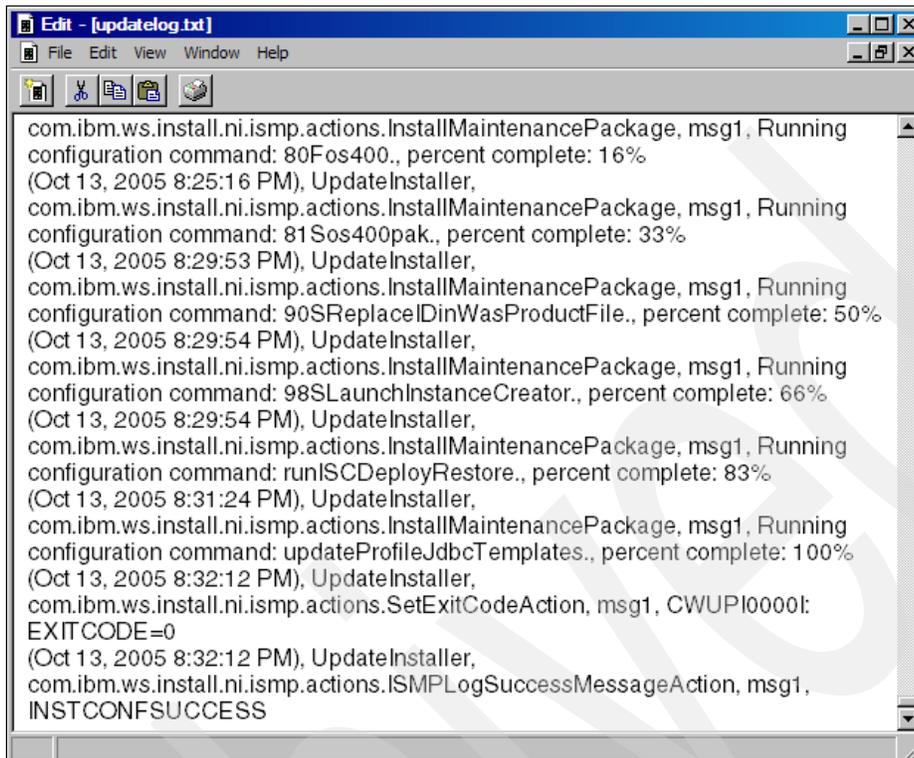


Figure 3-20 Fix pack installation log file

You can also view this file by using the Edit File (EDTF) OS/400 command, for example:

```
EDTF
STMF('/QIBM/ProdData/WebSphere/AppServer/V6/Base/logs/update/6.0.2-WS-WAS-OS400PPC64-FP0
000001.install/updatelog.txt')
```

Table 3-1 shows some of the fix pack installation indicators that you might encounter in the `update.txt` log file. These status indicators are typically written as the last entry in the file.

Table 3-1 Fix pack installation status

Status indicator	Description
INSTCONFSUCCESS	The current operation was successful.
INSTCONFPARTIALSUCCESS	The current operation was partially successful.
INSTCONFFAILED	The current operation failed.

If you encounter a failed or partially successful status indicator, you must analyze the `updatelog.txt` file further to determine the cause of the failure and take the necessary corrective action.

Tip: If the fix pack installation fails certain validation processes, the `updatelog.txt` is not created in the `/QIBM/ProdData/WebSphere/AppServer/V6/Base/logs/update/fix pack.install` directory. Therefore, if you are unable to locate the `update.txt` file in this directory, check the log files in the `/QIBM/ProdData/WebSphere/AppServer/V6/Base/logs/update/tmp` directory to determine the cause of the failure.

Additional interim fixes

In addition, interim fix packs are released approximately every six to eight weeks and are available from the WebSphere Application Server support Web site. These fix packs address and fix known problems, as well as provide new functionality to your WebSphere Application Server V6 installation. You can view and download the latest available fix packs from the following Web address:

<http://www.ibm.com/software/webservers/appserv/was/support>

We recommend that you download and install the interim fix packs regularly so that your system remains current with the latest available fixes for WebSphere Application Server V6.

Important: Make sure that the fix that you are installing has been tested on i5/OS. To verify this, on the fix page (see the example in Figure 3-21), you should see “OS/400” and the fix level for you WebSphere Application Server - Express V6 under Document information on the right.

The screenshot shows the IBM support page for fix PK17894. The main heading is "PK17894; 6.0.2.6: a _value tag is added in soap messages". The page is divided into several sections:

- Downloadable files:** A section for downloading the fix.
- Abstract:** A _value tag is added in SOAP messages.
- Download Description:** PK17894 resolves the following problem:
 - ERROR DESCRIPTION:** The Web Services Engine adds a _value tag to SOAP messages. No exceptions should appear (unless inter-operating with a non-WebSphere Application Server version 6.0 machine).
- LOCAL FIX:** None.
- PROBLEM SUMMARY:** WebSphere Application Server users of web services.
- USERS AFFECTED:** WebSphere Application Server users of web services.
- PROBLEM DESCRIPTION:** A _value tag is added in SOAP messages.
- RECOMMENDATION:** None.
- PROBLEM CONCLUSION:** Removed occurrence of _value in message.
- Prerequisites:** For 6.0.2.5, PK16954 and PK15625 is required to be installed first.

The right-hand sidebar, titled "Document information", provides additional details:

- Product categories:** Software, Application Servers, Distributed Application & Web Servers, WebSphere Application Server, Web Services (for example: SOAP or UDDI or WSGW or WSIF)
- Operating system(s):** AIX, HP-UX, Linux, Linux Red Hat - pSeries, Linux zSeries, OS/390, OS/400, Solaris, Windows, z/OS
- Software version:** 6.0.2.5, 6.0.2.6, 6.0.2.7
- Software edition:** Base
- Reference #:** 4011587
- IBM Group:** Software Group
- Modified date:** 2006-03-14

Figure 3-21 Fix page

3.3.3 Verifying TCP/IP port assignments

As we mention in 2.2.2, “Check for prior product installations” on page 20, each WebSphere Application Server product uses several communication ports (TCP/IP ports). You must ensure that the TCP/IP ports that are used by your WebSphere Application Server - Express V6 installation do not conflict with other installed products and applications running on your iSeries server.

For a detailed listing of the WebSphere Application Server TCP/IP port assignments, refer to the “Administration reference” section of the WebSphere Information Center at the following Web address:

<http://publib.boulder.ibm.com/infocenter/wsdoc400/v6r0/index.jsp?topic=/com.ibm.websphere.iseries.doc/info/ae/ae/adminref.htm>

Port validator tool

The port validator tool is a useful utility that you can use to determine whether you have any TCP/IP port conflicts between WebSphere Application Server and other products installed on your iSeries server. This utility is one of the tools available with the *servicetools* script. The *servicetools* script is located in the integrated file system directory /QIBM/ProdData/WebSphere/AppServer/V6/Base/bin.

To use the port validator tool:

1. Start the Qshell interpreter, using the STRQSH OS/400 command.
2. Change your current directory:

```
cd /QIBM/ProdData/WebSphere/AppServer/V6/Base/bin
```

3. Enter the following command string:

```
servicetools -products WAS60Express -portconflict
```

The tool displays information that indicates whether you have any TCP/IP port conflicts on your server. Figure 3-22 shows how to run this tool and some of the output information that you can expect to see.

```
QSH Command Entry

$
> cd /QIBM/ProdData/WebSphere/AppServer/V6/Base/bin
$
> servicetools -products WAS60Express -portconflict
PRTC2009I:  Checking port information.

CFGV7900I: Summary:
CFGV7901I:  Informational:
PRTC2008I:  No port conflicts were found in the configuration specified.
$

===>

F3=Exit  F6=Print F9=Retrieve F12=Disconnect
F13=Clear F17=Top  F18=Bottom F21=CL command entry
```

Figure 3-22 Running the port validator tool

You can find more information about the port validator tool at the following Web address:

<http://publib.boulder.ibm.com/infocenter/wsdoc400/topic/com.ibm.websphere.iseries.doc/info/ae/ae/qshportval.htm>

3.3.4 Configuring the software license information

WebSphere Application Server - Express V6 does not have any additional software licensing requirements on i5/OS V5R3 or V5R4. The product is automatically included with your i5/OS V5R3 or V5R4 software. You are entitled to install and deploy WebSphere Application Server - Express V6 across all the i5/OS processors of your iSeries server.

Some of the other WebSphere Application Server V6 product options, for example WebSphere Application Server Base V6 and WebSphere Application Server Network Deployment (ND) V6, have specific licensing requirements. You can find more information about the specific licensing requirements for these product options at the following Web address:

<http://www.ibm.com/servers/eserver/iseries/software/websphere/wsappserver/news/package.html>

This Web site also provides the licensing requirements for installing WebSphere Application Server - Express V6 on an OS/400 release other than V5R3 and V5R4.

Since WebSphere Application Server V6 is an OS/400 licensed program product, you should update the product usage limit before you start using WebSphere Application Server - Express V6. To set the WebSphere Application Server - Express V6 usage limit, complete the following steps:

1. Sign on to the iSeries server where you have installed WebSphere Application Server - Express V6. Enter a user ID that has *ALLOBJ and *SECADM special authorities.
2. Use the following Change License Information (CHGLICINF) OS/400 command to allow unlimited usage of the WebSphere Application Server - Express V6 product feature:
`CHGLICINF PRDID(5733W60) FEATURE(5101) USGLMT(*NOMAX) THRESHOLD(*CALC)`
3. Check the system operator's message queue for an inquiry message similar to the one shown in Figure 3-23 and respond to this message by typing G and pressing Enter.

```
The usage limit for product 5733W60, feature 5101 has been increased. (G)
Reply . . . G
```

Figure 3-23 Updating the product usage limit

This step finalizes the update of the product feature usage limit.

Note: If you do not update the product usage limit, you might receive warning messages in the system operator's message queue advising you that the product usage limit has been exceeded.

4. Verify that you have entered all the information correctly by using the Work with License Information (WRKLICINF) OS/400 command:

```
WRKLICINF PRDID(5733W60)
```

- You see a list of all the WebSphere Application Server V6 product features that you have currently installed, as shown in Figure 3-24. To view details about the license information of any particular product feature, type option 5 next to that feature and press Enter.

```

Work with License Information
RCHAS11
11/06/05 17:40:30
System serial number . . . . . : 65D9ABCD
Processor group . . . . . : P20

Type options, press Enter.
  1=Add license key  2=Change  5=Display detail  6=Print detail
  8=Work with license users ...

License
Opt Product Term Feature Description
5 5733W60 V6 5101 WebSphere Application Server V6 Express
5733W60 V6 5102 WebSphere Application Server V6 ("Base")

Parameters or command
===>
F3=Exit F5=Refresh F11=Display Usage Information F12=Cancel
F17=Position to F23=More options
Bottom

```

Figure 3-24 WRKLICINF OS/400 display

Figure 3-25 shows an example of the information that is displayed.

```

Display License Information
RCHAS11
11/06/05 17:40:32
Product ID . . . . . : 5733W60
License term . . . . . : V6
Feature . . . . . : 5101
Description . . . . . : WebSphere Application Server V6 Express

Compliance type . . . . . : *WARNING
Usage type . . . . . : *PROCESSOR

Usage limit . . . . . : *NOMAX
Last update . . . . . : 11/05/05 16:27:08

Threshold . . . . . : *NOMAX

Usage count . . . . . : .00

Peak Usage Information:
  Peak usage . . . . . : .00
  Last peak . . . . . : 00/00/00 00:00:00

More...
F3=Exit F5=Refresh F12=Cancel

```

Figure 3-25 Display License Information details

You are now ready to start using WebSphere Application Server - Express V6. Chapter 4, “Getting started with WebSphere” on page 51, provides details about how to start, manage, and use WebSphere Application Server - Express V6.

Archived



Getting started with WebSphere

In this chapter we introduce the IBM Web Administration for iSeries page and how to start working with your new WebSphere Application Server product. We cover commonly used areas of the interface as well as other parts that you should be familiarized with. This chapter teaches you basic tasks such as starting and stopping your server, viewing its status, and testing a sample application. It also helps you associate an IBM HTTP Server (powered by Apache) instance with your WebSphere instance and test the same application through Apache.

Note: If you receive error messages as you go through the steps in this section, look in the integrated file system directory `/QIBM/UserData/HTTPAdmin/admin/logs`. This directory contains the various logs for the HTTP Admin, which might assist you in resolving such error messages.

4.1 IBM Web Administration for iSeries

This section explains how to start the IBM Web Administration for iSeries page, as well as explains what has to be started and how to start the Admin HTTP server. If you know how to do this already, you can skip to 4.2, “Working with WebSphere” on page 53.

In order to work with the IBM Web Administration for iSeries page, you must start the Admin HTTP server, which handles all of the requests. To check that the server is up and running:

1. Start the 5250 session and sign on.
2. Enter the Work with Subsystem (WRKSBS) command to check if the QHTTSPVR subsystem is started. If you see QHTTSPVR in the list, you can continue.

Otherwise if you do not see QHTTSPVR in the list, start the subsystem with the following command:

```
STRSBS QHTTSPVR/QHTTSPVR
```

3. Use the following Work with Active Jobs (WRKACTJOB) command to make sure that the Admin HTTP server is up and running so we can connect to it:

```
WRKACTJOB SBS(QHTTSPVR)
```

4. In the Work with Active Jobs display that opens for the QHTTSPVR subsystem, you might see some Admin jobs under the subsystem (Figure 4-1). If you see the jobs, you are ready to continue.

If you do not see any Admin jobs, start them by using the Start TCP/IP Server (STRTCPSVR) command:

```
STRTCPSVR SERVER(*HTTP) HTTPSVR(*ADMIN)
```

Opt	Subsystem/Job	User	Type	CPU %	Function	Status
	QHTTSPVR	QSYS	SBS	.0		DEQW
	ADMIN	QTMHHTTP	BCH	.0	PGM-QZHBMAIN	SIGW
	ADMIN	QTMHHTTP	BCI	.0	PGM-QZSRLOG	SIGW
	ADMIN	QTMHHTTP	BCI	.0	PGM-QZSRHTTP	SIGW
	ADMIN	QTMHHTTP	BCI	.0	PGM-QYUNLANG	TIMW
	ADMIN	QTMHHTTP	BCI	.0	PGM-QZSRCGI	TIMW
	ADMIN	QTMHHTTP	BCI	.0	PGM-QYUNLANG	TIMW
	ADMIN	QTMHHTTP	BCI	.0	PGM-QYUNLANG	TIMW

Figure 4-1 Work with Active Jobs display

5. Enter the WRKACTJOB command again to check if you see the Admin jobs now.

When you see multiple Admin jobs (three or more is normal), try logging into the Web Administration for iSeries page. Enter the following URL, where *systemname* is either the IP address or host name of your system:

```
http://systemname:2001
```

When you are prompted for a user ID and password, enter your OS/400 ID and password.

Note: To create WebSphere servers, your profile must have *IOSYSCFG and *ALLOBJ. Since you are not creating instances at this point, *IOSYSCFG is sufficient.

6. From the iSeries Tasks page (Figure 4-2) that opens, select the **IBM Web Administration for iSeries** link. This link takes you to the main page where all of the WebSphere and HTTP server options are.



Figure 4-2 iSeries Tasks page showing the link to IBM Web Administration for iSeries

4.2 Working with WebSphere

In this section, we cover the basic functions that you must understand in order to work with the WebSphere Application Server product. All of the functions are done by using the default profile and its application server *server1*. Some terms that are used frequently in any discussion about WebSphere are:

- ▶ **Profile:** In previous WebSphere releases, this was known as an *instance*. It contains the Application Server.
- ▶ **Application server:** This is a job that appears in the QWAS6 subsystem and runs your applications.

- ▶ **HTTP server:** This is a front end job that takes requests from the browser. You can configure these jobs to work with WebSphere.

These terms are used frequently in the next few chapters. Understanding these terms will assist you in understanding the product.

4.2.1 Starting the application server

Unlike previous versions of WebSphere, starting WebSphere 6 does not require the subsystem to be started in a separate step. If the subsystem is stopped, WebSphere automatically starts it when a server tries to start.

To start the application server, go to the IBM Web Administration for iSeries page (Figure 4-3) and complete the following steps:

1. Select the **Manage** tab and then the **Application Servers** subtab.
2. From the Server drop-down list, select **default/server1 - V6.0.2.1**. You might see a different fix level for your installation of WebSphere Application Server.

Note: The version should reflect 6.0.2.1 or higher. To see the most current version that is available, go to the following Web address and select your operating system release. The WebSphere Group PTF section tells you the most current version:

<http://www.ibm.com/servers/eserver/iseries/software/websphere/wsappserver/services/service.html>

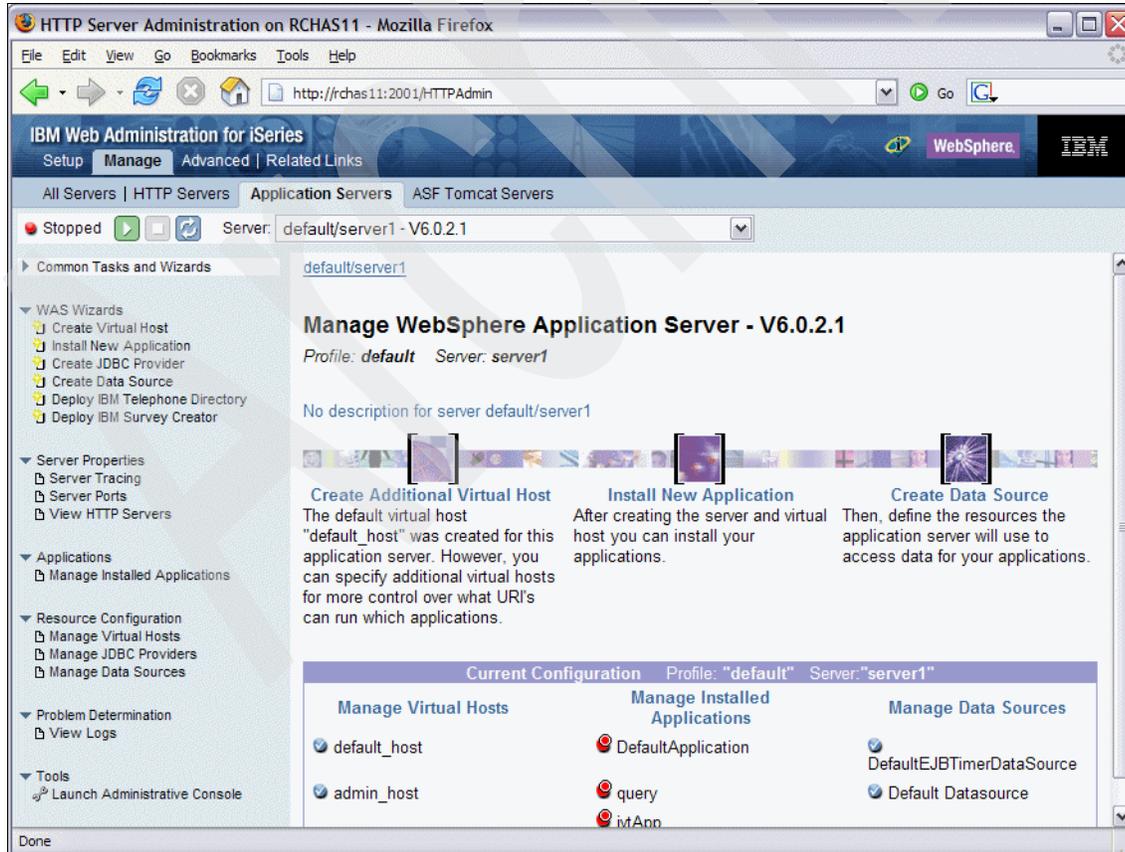


Figure 4-3 Working with server1

3. You can now start the server. Click the green arrow (▶) next to the server name as shown in Figure 4-4.



Figure 4-4 Status control bar

The status should change from Stopped to *Starting*. You should also be able to look in the QWAS6 subsystem on your green screen and see the server1 job there (see Figure 4-5).

Work with Active Jobs							RCHAS11
CPU %:	.1	Elapsed time:	00:00:02	Active jobs:	208	10/21/05 12:52:56	
Type options, press Enter.							
2=Change 3=Hold 4=End 5=Work with 6=Release 7=Display message							
8=Work with spooled files 13=Disconnect ...							
Opt	Subsystem/Job	User	Type	CPU %	Function	Status	
	QWAS6	QSYS	SBS	.0		DEQW	
	SERVER1	QEJBSVR	BCH	.0	PGM-QWASSTRSVR	JVAW	

Figure 4-5 Work with Active Jobs display

Since this is the first time that you start the server, it does some initialization and takes a little longer to start than normal.

There are two ways to check to see when the server is ready to be used. The first and easiest way is to monitor the status in Web Administration for iSeries and wait for it to change from *Starting* to *Running*. You might have to click the circular arrows (↻) button to update the status.

The other way is to work with the job on the green screen and look at the job log. You might only see one or two lines in the job log. If this is true, press F10 and then press F5 from time to time until you see the line “WebSphere application server server1 ready” as shown in Figure 4-6.

Display All Messages			
Job . . . :	SERVER1	User . . . :	QEJBSVR
		System:	RCHAS11
		Number . . . :	131234
>> CALL PGM(QWAS6/QWASSTRSVR) PARM('-profilePath' '/QIBM/UserData/WebSphere/A ppServer/V6/Base/profiles/default' '-server' 'server1')			
ACGDTA for 131234/QEJBSVR/SERVER1 not journaled; reason 1.			
Server starting with user profile QEJBSVR and JDK 1.4.2.08.			
WebSphere application server server1 ready.			

Figure 4-6 WebSphere Application Server in ready status

4.2.2 Testing the application server with the internal HTTP server

WebSphere Application Server has a built-in HTTP server that is available for use instead of a separate external HTTP server. The following steps explain how to test the application server using the built-in HTTP server. Using an IBM HTTP Server (powered by Apache) is explained in 4.3.1, “Associating the IBM HTTP Server (powered by Apache) with WebSphere” on page 59.

To test the application server, you must know on which port it is listening.

1. On the IBM Web Administration for iSeries (Figure 4-3 on page 54) page, in the left navigation frame, under Resource Configuration, click **Manage Virtual Hosts**.
2. In the Manage Virtual Host pane, you see a box with default_host and admin_host. Select the **default_host** radio button. Then several buttons appear.
3. Click **Properties** and you see the properties as shown in the example in Figure 4-7.

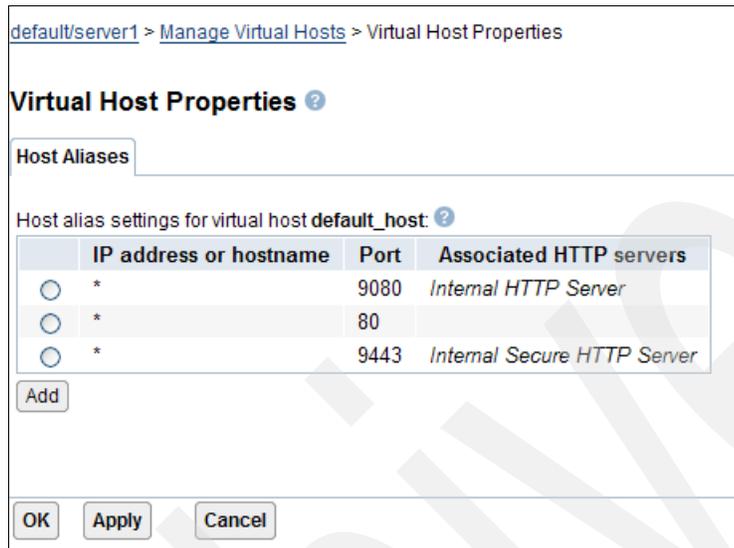


Figure 4-7 Virtual Hosts Properties pane

Virtual hosts

Virtual hosts are ways to separate your applications if you want them to run on different ports or HTTP servers. You configure the ports into the virtual hosts and then point your application to which virtual host you want it to work on. This way you can have application A accessible only on port 1234 and application B only accessible on port 5678. If you want your applications to both work on the same port, you point them to the same virtual host.

At the same time, your virtual host can have more than one host name and IP port combination. This is done for several reasons. One reason is that you might configure your application to be accessed through either the HTTP or HTTPS protocols. Each of these protocols is used with its own port number.

We get into more of the intricate details of working with virtual hosts in Chapter 5, “Working with applications” on page 63.

The three ports that server1 is configured with are:

- ▶ **9080:** This port is the internal HTTP server that you might use to access your applications.
- ▶ **80:** This port is created so we can associate an IBM HTTP Server (powered by Apache) at a later time.
- ▶ **9443:** This port is the internal SSL port.

Now that you know the ports, you can test the server. Open another Web browser window and enter the following URL, where *systemname* is either the IP address or host name of your iSeries:

```
http://systemname:9080/snoop
```

This runs the snoop servlet on the internal HTTP port as shown in Figure 4-8.



Figure 4-8 Snoop servlet

4.3 WebSphere Application Server and the IBM HTTP Server (powered by Apache)

To start having an IBM HTTP Server (powered by Apache) run pages with WebSphere, you have to tell the IBM HTTP Server (powered by Apache) that WebSphere exists on the system and that it should work with WebSphere. In this section, you associate the APACHEDFT server with server1 and then test the snoop application again. Refer to 6.2, “Creating an IBM HTTP Server (powered by Apache)” on page 80, which covers creating and working with your own IBM HTTP Server (powered by Apache).

Figure 4-9 shows the flow of a URL request going through an IBM HTTP Server (powered by Apache) compared to the flow of a request going through the internal WebSphere server.

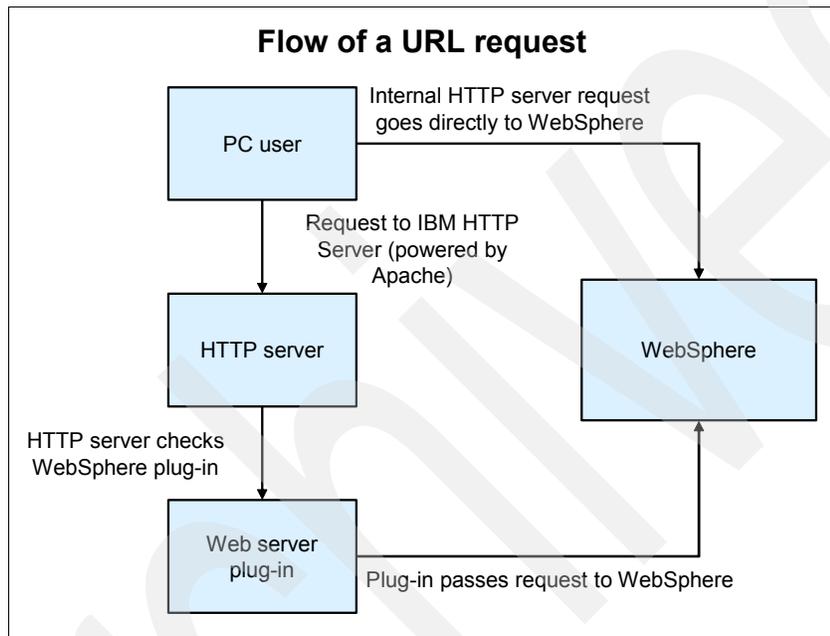


Figure 4-9 Request flow for WebSphere

The flow coming out of the right side of the PC user box is a direct request using the WebSphere port. This is what you did when you called the snoop servlet in Figure 4-8. The other request is one that goes to an HTTP server, in this case an IBM HTTP Server (powered by Apache). When the request for the snoop comes in, the IBM HTTP Server (powered by Apache) realizes it is a servlet and cannot respond to the servlet requests. The IBM HTTP Server (powered by Apache) sees that it is configured to work with WebSphere from its configuration file. It sends the request to WebSphere through the Web server plug-in to see if WebSphere can handle it. WebSphere gets the request and sees that it knows about the snoop servlet. It handles the request and sends the results back to the IBM HTTP Server (powered by Apache).

The *Web server plug-in* component is installed during WebSphere Application Server installation. It provides the communication between the WebSphere Application Server and HTTP server. For a further discussion, see 7.3, “Servers” on page 90.

4.3.1 Associating the IBM HTTP Server (powered by Apache) with WebSphere

To associate the APACHEDFT server with WebSphere, follow these steps:

1. Again go to the Web Administration for iSeries page.
2. Select the **Manage** tab and then the **HTTP Servers** subtab. From the Server drop-down list, select **APACHEDFT - Apache** (Figure 4-10).

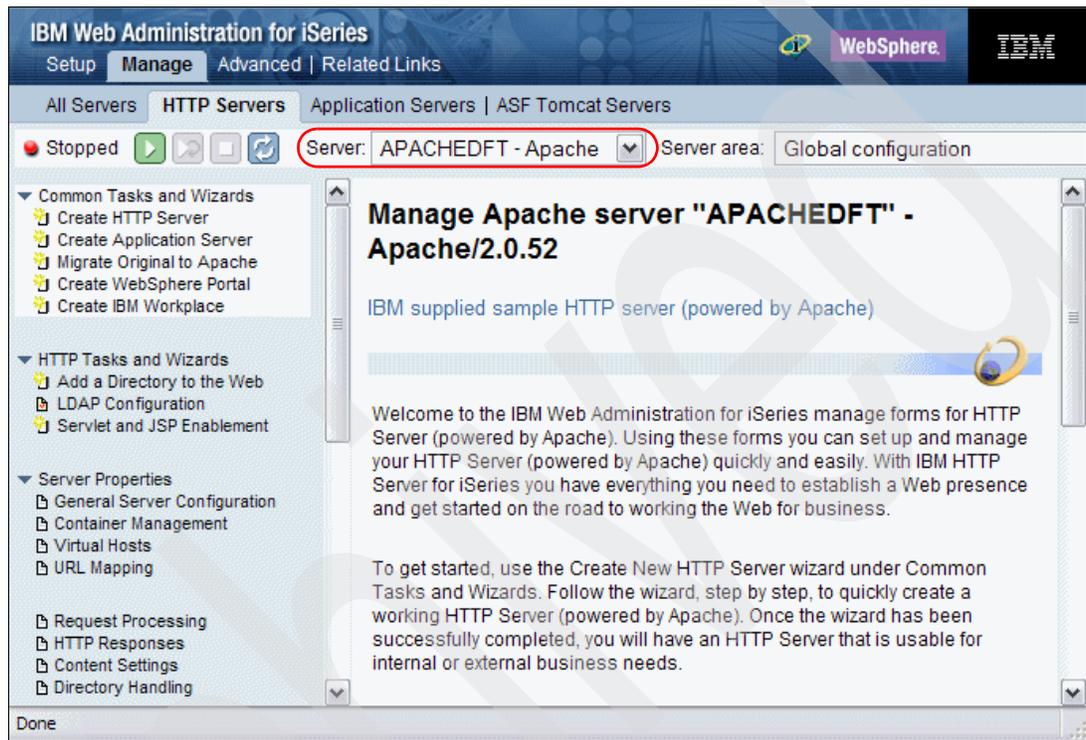


Figure 4-10 Managing HTTP servers

3. In the left navigation frame, scroll down and click the **WebSphere Application Server** link.

4. In the WebSphere Application Server pane on the right, complete the following steps as shown in Figure 4-11:
 - a. Select **WebSphere Application Server V6.0**.
 - b. From the your WebSphere instance drop-down list, select your instance, which in this case is **default**.
 - c. You can have WebSphere start when you start your HTTP server. For the Start all WebSphere application server(s) for the associated WAS instance when this HTTP server is started setting, we keep the default of **No**. We show you other ways in later chapters.
 - d. Click **OK**.

This might take a minute. Do not click any other link or button until the page refreshes and switches to the HTTP server's home page.

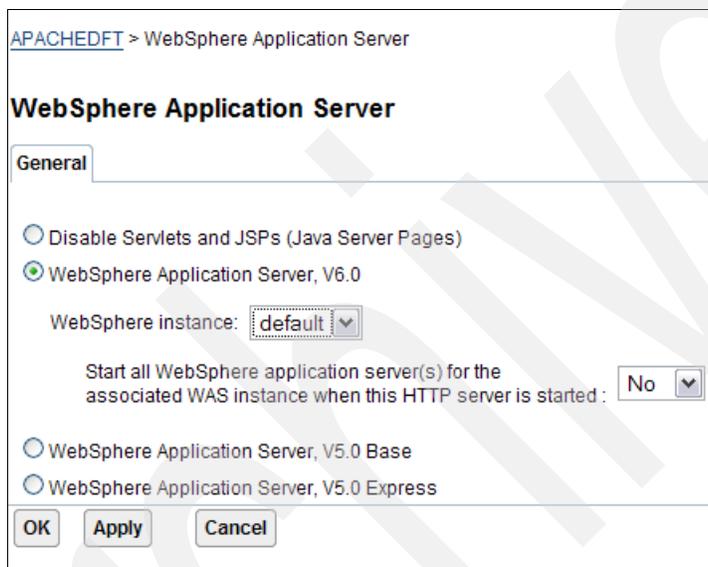


Figure 4-11 Associating APACHEDFT with WebSphere Application Server

5. Restart the APACHEDFT server if it was started, or simply start the server if it ended while you completed these steps.
6. When the APACHEDFT server is back up and running, you can test the snoop servlet again. This time use the URL that goes through the IBM HTTP Server (powered by Apache) listening on the default port 80:

`http://systemname/snoop`

You should see a similar snoop page as you did before, but you will not see a port listed since we used port 80 (Figure 4-12). Port 80 is used by default when one is not specified on a URL.



Figure 4-12 Snoop with APACHEDFT

4.4 Summary

In this chapter, you learned the basic steps for working with the default server that is installed with the WebSphere product. You tested the snoop servlet with WebSphere's internal HTTP server to ensure that everything was configured correctly and then with the APACHEDFT to see how it works with an IBM HTTP Server (powered by Apache).

The key pieces to remember from this chapter are which tabs in the IBM Web Administration for iSeries page you use for HTTP and for WebSphere. You must also remember how to stop and start your servers and understand how a request gets passed from the browser to the WebSphere Application Server.

Archived

Working with applications

WebSphere Application Server V6.0 ships with multiple sample applications. In this chapter, you learn how to get one of these sample applications running on your system. This application shows you an example of a more robust page compared to the simple snoop servlet from Chapter 4, “Getting started with WebSphere” on page 51. You also learn how to uninstall and install applications through the IBM Web Administration for iSeries wizards.

Note: Any errors in this section should show up in the application server log files. Look in the `/QIBM/UserData/WebSphere/AppServer/V6/Base/profiles/default/logs/server1` directory since this section works with the default profile. `SystemOut.log` is a good place to start.

5.1 Installing the sample applications

The sample applications are not installed automatically into the server1 application server with WebSphere 6.0 Express. The steps to install them are very straight forward:

1. Make sure your application server is running (see 4.2.1, “Starting the application server” on page 54).
2. Start a 5250 session to your iSeries and sign on.
3. In a 5250 window, start Qshell:

```
strqsh
```

4. Change directories by entering the following command:

```
cd /QIBM/ProdData/WebSphere/AppServer/V6/base/samples/bin
```

5. Install the application by running this command:

```
install -profileName default -server server1 -samples SamplesGallery
```

This command runs through the script and installs the WebSphere samples to your instance. This script only installs the SamplesGallery. It is the main page for all of the other samples. When it has completed, you see the message shown in Figure 5-1 at the bottom of your display.

```
-----  
                          Summary  
-----  
The following samples were configured and installed successfully:  
  
    SamplesGallery  
  
-----  
$
```

Figure 5-1 SamplesGallery installation complete

6. Install the Plants By WebSphere sample using the following command:

```
install -profileName default -server server1 -samples PlantsByWebSphere
```

When you see the message like in Figure 5-2, you are ready to continue.

```
-----  
                          Summary  
-----  
The following samples were configured and installed successfully:  
  
    PlantsByWebSphere  
  
-----  
$
```

Figure 5-2 PlantsByWebSphere installation complete

7. Click the **Stop** button and then the **Start** button in your application server’s home page in IBM Web Administration for iSeries to stop and restart your WebSphere server server1.

5.2 Running the samples

The sample applications are configured to use WebSphere's internal HTTP transport port. Since we are using server1, the port is 9080 (the default value). In 6.2, "Creating an IBM HTTP Server (powered by Apache)" on page 80, you see how to get the samples working with the IBM HTTP Server (powered by Apache).

5.2.1 Accessing the Samples Gallery

When you see that server1 is started in the QWAS6 subsystem (4.2.1, "Starting the application server" on page 54), you can access the Samples Gallery page (see Figure 5-3) using the following URL:

`http://servername:9080/WSsamples`

From the left navigation frame, expand **Installed Samples** → **Application Server** → **Applications** to see the applications that are installed.

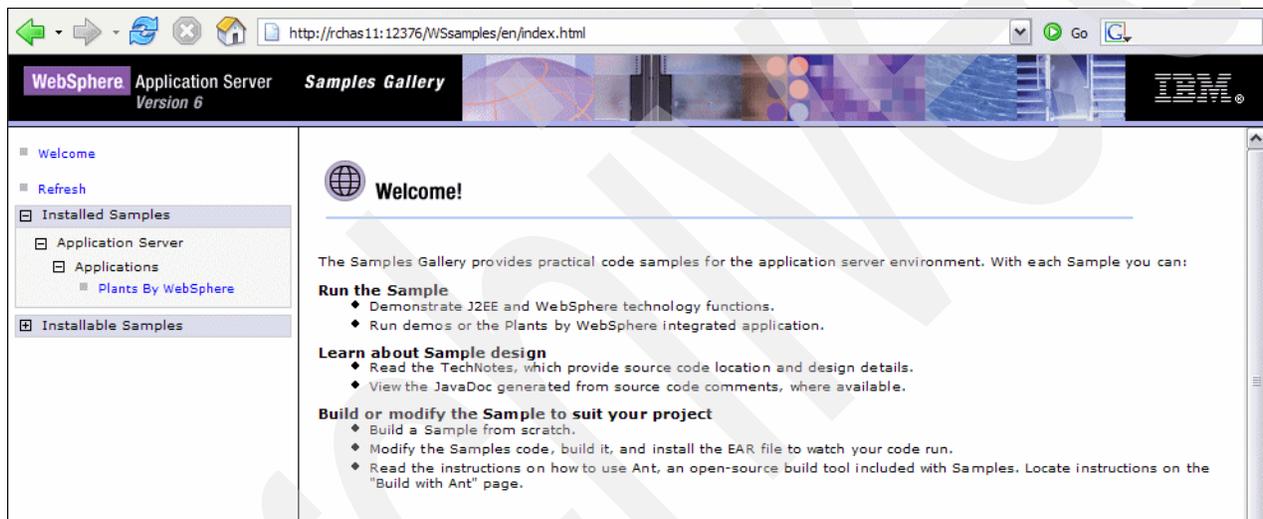


Figure 5-3 Samples Gallery page

Click the **Plants By WebSphere** hyperlink, and you see the pane on the right that explains the Plants by WebSphere sample (Figure 5-4).

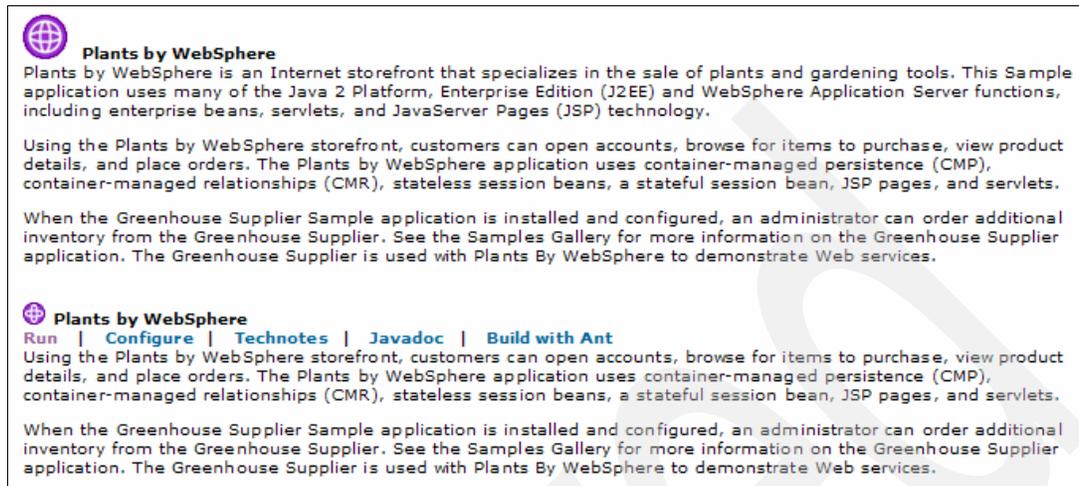


Figure 5-4 Plants by WebSphere explanation

When you click **Run**, another browser window opens that shows the Plants By WebSphere application in it. Explore the application to see what it has.

5.3 Application settings in IBM Web Administration for iSeries

In this section, you explore the common settings and application areas in the IBM Web Administration for iSeries interface. You determine the context root, look at mappings, and explore other resources, among other tasks.

To get started, follow these steps:

1. Go to your IBM Web Administration for iSeries page again using the following URL:
`http://systemname:2001`
2. Log in with your user name and password.
3. In the IBM Web Administration for iSeries, click to the **Manage** tab and **Application Servers** subtab.
4. From the Server drop-down list, select **default/server1** if the application does not automatically do it for you.

5.3.1 Manage Installed Applications

In the left navigation frame, under Applications, click the **Manage Installed Applications** link (Figure 5-5).



Figure 5-5 Selecting Manage Installed Applications from the left navigation frame

Then, in the right pane, you see all of your installed applications (see Figure 5-6).

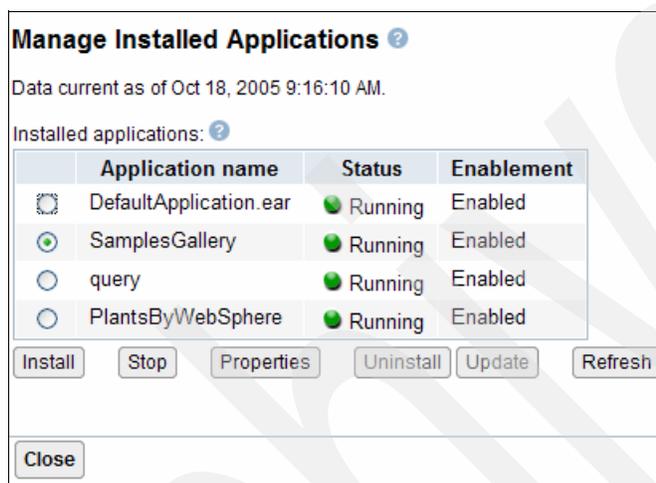


Figure 5-6 Installed applications

When you installed WebSphere, the server1 application server installed the DefaultApplication.ear and the query application by default. You installed the SamplesGallery as well as PlantsByWebSphere using the Qshell scripts in 5.1, “Installing the sample applications” on page 64.

From this pane, there are three main areas, each of which is explained in the following sections.

Status

The status of your application shows either Running or Stopped. A *Running application* has the green dot next to it and is accessible through your browser. A *Stopped application* shows a red dot and is not available.

Note: While installing or uninstalling an application, you might see additional status.

Enablement

The choices for Enablement are Enabled or Disabled. *Enabled applications* can be started and accessed through a browser. *Disabled applications* always remain in a Stopped status until they are enabled and started.

Properties

In the Manage Installed Applications pane (Figure 5-6), select the **SamplesGallery** application and more buttons are displayed. Click the **Properties** button, and you see the Application Properties pane like the example in Figure 5-7.



Figure 5-7 Application Properties General tab

The General tab has three properties:

- ▶ **Application name:** Name of the application
- ▶ **Application enablement:** Indicates whether the application is enabled or disabled (It only starts if it is enabled.)
- ▶ **Location:** The directory where the application is installed

Click the **Virtual Host Mapped to Web Modules** tab. On this page (Figure 5-8), you can see the Web modules, the virtual hosts they are mapped to, and the context root.

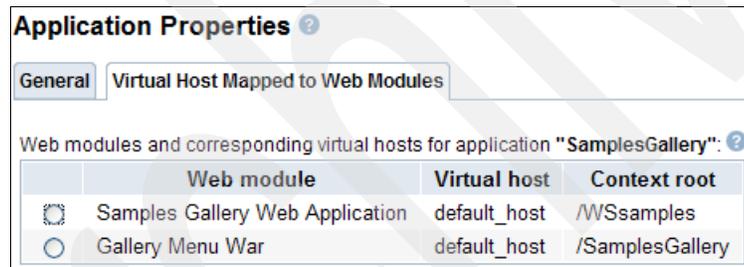


Figure 5-8 Application Properties Virtual Host Mapped to Web Modules tab

Context root

For the user who is just getting started with WebSphere, the most important piece on the Virtual Host Mapped to Web Modules tab is the *context root*. The context root is the logical name for the location of the application files in the integrated file system. You must include the context root in the URL to call the application.

A typical URL might look something like the following example:

```
http://systemname/WSSamples/index.html
```

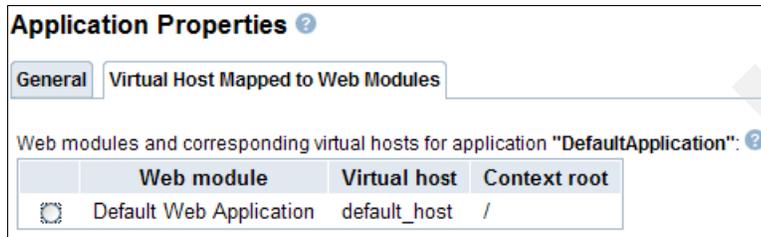
Note the following explanation:

- ▶ *systemname* is the host name of the system where the application is running.
- ▶ */WSSamples* is the context root. It tells WebSphere that the request is for a page in the application that is associated with this particular context root.
- ▶ *index.html* is the page that you are requesting from the application.

Looking at the snoop servlet page in Figure 4-8 on page 57, the URL was:

```
http://systemname:9080/snoop
```

If you look at the application properties for the Default Web Application (Figure 5-9), you can see that the context root is set to the forward slash (/). That is why you are able to call the snoop servlet without anything else in the URL besides the /.



The screenshot shows the 'Application Properties' dialog box with the 'General' tab selected. Below the tabs, there is a section titled 'Web modules and corresponding virtual hosts for application "DefaultApplication":'. A table is displayed with the following content:

	Web module	Virtual host	Context root
	Default Web Application	default_host	/

Figure 5-9 Context root of the Default Web Application

The reason behind configuring a context root is that you might have multiple applications all running on the same server and each might have a page called *index.html*. The context root allows the user to specify which *index.html* file the user wants to access.

Important: When you reach the point of trying your own applications, you might receive a “404 File Not Found” error message going to the index page. Make sure that you are using the correct URL. Check the context root of your application and compare it to the URL that you are using to call that application. *Double check case sensitivity.*

5.4 Uninstalling and installing an application

To become more familiar with the WebSphere Application Server administration, you now go through the steps of uninstalling and installing the default application.

Note: The following instructions work better when you use Internet Explorer instead of Firefox. Firefox still works, but some of the pages might not refresh properly.

You know that the Default Application works because you were able to get the snoop servlet working in 4.1, “IBM Web Administration for iSeries” on page 52. Now you go through the steps to remove this application, verify that it is gone, reinstall it, and test it again:

1. Log into the IBM Web Administration for iSeries page again.
2. Access your application server (server1) home page. Click the **Manage** tab and the **Application Servers** subtab.
3. To uninstall the application, stop it first. In the left navigation frame, under Applications, click the **Manage Installed Applications** link.

- In the right pane, select **DefaultApplication** and click the **Stop** button next to it. Wait a minute for the application to stop. If the pane does not automatically refresh to show the new status, click the **Refresh** button inside of the pane as shown in Figure 5-10, not the one on the browser.

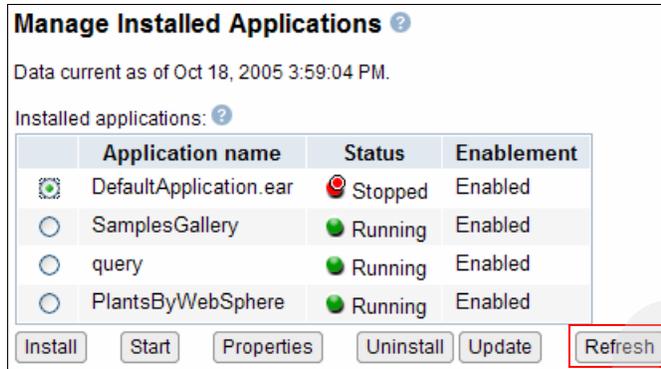


Figure 5-10 Stopped application

- You should see that the option to uninstall is now available. Click the **Uninstall** button and a message window opens (Figure 5-11). Click **OK**.

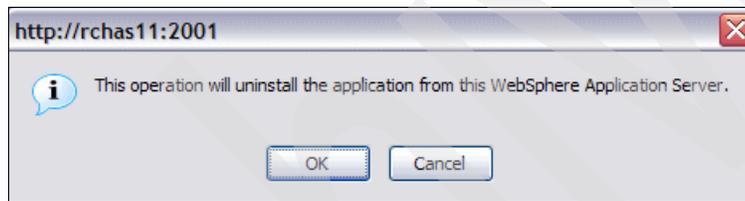


Figure 5-11 Uninstall verification message

- The status of the DefaultApplication changes to *Uninstalling* as shown in Figure 5-12. Wait a few minutes and then click the **Refresh** button.



Figure 5-12 Uninstalling status

The application is no longer displayed in the list as you can see in Figure 5-13.



Figure 5-13 Application uninstalled

Now that the application is gone, you can install it back onto server1.

5.4.1 Installing the DefaultApplication

When you install applications in WebSphere you typically either work with enterprise archive (EAR) or Web archive (WAR) files.

► EAR file

An EAR file is a standard Java archive (JAR) file with an .ear extension. The EAR file contains Enterprise JavaBean (EJB) JAR files, application client JAR files, WAR files, or all three types of files. A J2EE application with all of its modules is delivered in an EAR file.

► WAR file

Each WAR file contains the servlets or JSP, a deployment descriptor, and related resource files. The servlets and JavaServer Pages (JSPs) are packaged in WAR files.

To install the Default Application, you must start from the same Manage Installed Applications pane as shown in Figure 5-13.

1. Click the **Install** button. You can also select the **Install New Application** link in the left navigation frame.
2. The Install New Application pane opens (Figure 5-14). In this pane you specify to use an EAR file located in the ProdData WebSphere directory. You can either type in the EAR file location directly or use the Browse button to find it. We specify the path /QIBM/ProdData/WebSphere/AppServer/V6/Base/installableApps/DefaultApplication.ear.

Click the **Next** button.

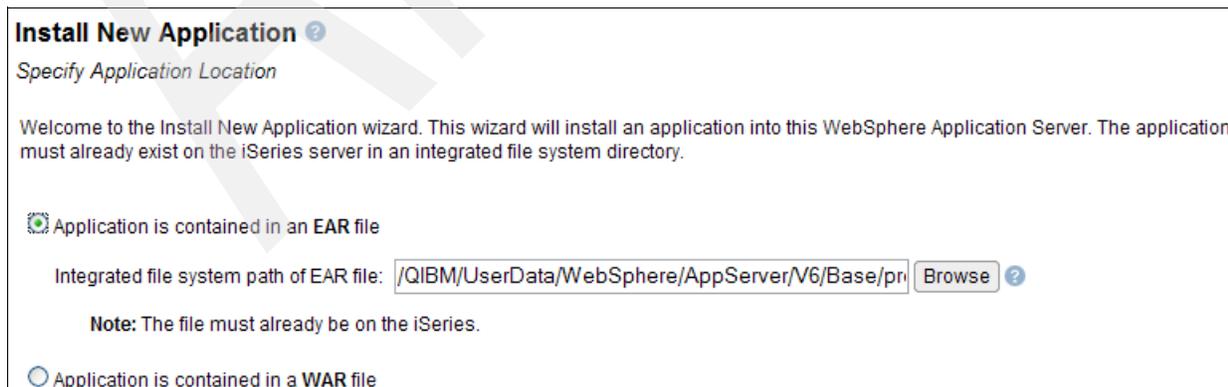


Figure 5-14 Selecting the EAR or WAR file to install

- In the next pane, you can name the application (Figure 5-15). In this example, we leave the name as the default name. For the Pre-compile JSPs check box, leave the box cleared and click **Next**.

Install New Application ?

Provide Options to Perform the Install

Specify application deployment options

Application name: ?

Directory application installed to: /QIBM/UserData/WebSphere/AppServer/V6/Base/profiles/IBMTtest/installedApps

Pre-compile JSPs ?

Note: Pre-compiling JSPs can have significant performance impacts. When enabled, the JSPs in the application will be compiled at installation time, causing the application install to take longer. When disabled, the JSPs will be compiled the first time they are accessed, causing the first use of the application to take longer.

Figure 5-15 Naming the application

- In the next pane, for Virtual host, keep the **default_host** setting as shown in Figure 5-16. Click **Next**.

Install New Application ?

Map Virtual Hosts for Web Modules

Specify the virtual host you want to associate with the web modules contained in this application. Web modules can be installed on the same virtual host or dispersed among several virtual hosts.

Map web modules to virtual hosts: ?

Web module	Virtual host
Default Web Application	default_host

Figure 5-16 Choosing the virtual host

- In the Summary page (Figure 5-17) that opens, review the information and then click **Finish**.

Install New Application ?

Summary

When you click Finish the installation will be started for the following application.

Integrated file system path of EAR file: /QIBM/ProdData/WebSphere/AppServer/V6/Base/installableApps/DefaultApplication.ear

Application name: DefaultApplication.ear

Directory application installed to: /QIBM/UserData/WebSphere/AppServer/V6/Base/profiles/IBMTtest/installedApps

Pre-compile JSPs: Disabled

Map web modules to virtual hosts:

Web module	Virtual host
Default Web Application	default_host

Figure 5-17 Summary page

- The page should refresh automatically after a few minutes. If it does not, click **Refresh**. This could take longer if you are on a smaller system. After the pane refreshes, it should look like the example in Figure 5-18.

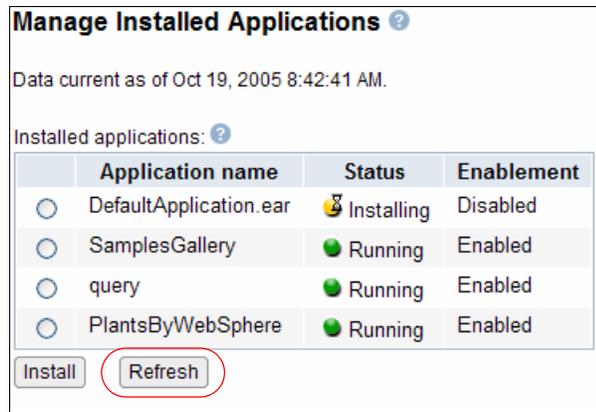


Figure 5-18 Application with the Installing status

- When the application is finished installing, it is displayed with a *Stopped* status. Select the application and click **Start** to start it.
- When you see the status of *Running* for the application, test the snoop or hitcount samples:

```
http://systemname:9080/snoop
http://systemname:9080/hitcount
```

5.5 Summary

In this chapter, you saw a more robust sample that consisted of multiple pages. You learned the important concept of context roots and how they pertain to the URL and applications. You also learned the steps for removing an application and then installing it back into the application server.

Archived



Managing WebSphere resources

In this chapter, you look at other resources inside of the IBM Web Administration for iSeries page as well as at JDBC providers, data sources, and JDBC drivers. You learn the difference between the Native and Toolbox JDBC drivers and when to use each. We present more in-depth views on custom properties and other settings in Chapter 7, “Working with the WebSphere Administrative Console” on page 87, since they are only available there.

You also learn how to create another HTTP server and associate it with WebSphere to test the snoop servlet and Plants By WebSphere application. And at the end of the chapter, you learn how to create a WebSphere instance of your own.

Note: IBM constantly improves and updates the Web Administration for iSeries interface. As the result, some of the panes might look slightly different from what you see in this book.

6.1 JDBC drivers for the iSeries

To access the IBM DB2 Universal Database for iSeries database, IBM provides two different drivers, the Native JDBC driver and the Toolbox JDBC driver. This section explains each driver to help you decide which is better for your needs. Then in 6.1.4, “Creating a JDBC provider and data source” on page 77, you see how to create the provider and data source inside of the IBM Web Administration for iSeries page.

Note: Much of the information in 6.1.1, “Native JDBC driver” on page 76, and 6.1.2, “Toolbox JDBC driver” on page 76, comes from the JDBC FAQs for the Native and Toolbox drivers:

- ▶ For Java - iSeries Native JDBC drivers

<http://www.ibm.com/servers/enable/site/java/jdbc/jdbcfaq.html>

- ▶ For Toolbox for Java and JTOpen

<http://www.ibm.com/servers/eserver/iseries/toolbox/faqjdbc.html>

6.1.1 Native JDBC driver

The Native JDBC driver ships as part of the 5722JV1 product. It works by making calls to the SQL call level interface (CLI) and, therefore, is only supported on the iSeries platform. The path to the file containing the driver is /QIBM/UserData/Java400/ext/db2_classes.jar. When using the Native driver, the jobs that are used are the QSQSRVR jobs in subsystem QSYSWRK.

6.1.2 Toolbox JDBC driver

The Toolbox driver is shipped as a separate licensed program product on the iSeries, 5722JC1. It makes direct socket connections to the database host server. It runs on any Java virtual machine (JVM). The path on iSeries to the file that contains the driver is /QIBM/ProdData/HTTP/Public/jt400/lib/jt400.jar.

The Toolbox driver uses the QZDASOINIT jobs under the QUSRWRK subsystem.

An online version of the Toolbox driver, called *JTOpen*, is available that you can download. This version is available for users who might not have an iSeries, but write programs that connect to an iSeries database from other platforms. You can download JTOpen by clicking the Downloads link from the following Web address:

<http://www.ibm.com/servers/eserver/iseries/toolbox/index.html>

6.1.3 How to choose the correct driver

The Native driver runs only on the OS/400, but performs better than the Toolbox driver when the data is on the same machine. The Toolbox driver runs on any JVM (including the JVM shipped with OS/400).

In general, we recommend that you *use the Native driver* if your program is only intended to run on the OS/400 and the data is on the same machine. If your program is intended to run on other JVMs, or the Java program is on one iSeries and the data is on a different iSeries, then *use the Toolbox driver*.

The best advice is to avoid tying (hardcoding) your program to use a specific JDBC driver. Instead, make the JDBC driver configurable at run time. Users or the system administrator

can then specify the JDBC driver that makes sense in their environment, by setting up the use of data sources.

6.1.4 Creating a JDBC provider and data source

There are two pieces for using JDBC, a provider and a data source. The *provider* is configured to use a particular driver and set up to be a *two-phase commit* (shown as XA on the provider name if it is enabled). The data source is associated to the driver and is configured to work with your database.

Two-phase commit refers to the concept, that in order for a transaction to complete, all of the pieces of the transaction must have the ability to be completed. It makes sense to use this support only in cases where your transaction spans two or more resources, such as databases. For example, in a particular transaction, you have three databases that need data changed. However, you only want the data changed if all three databases can be successfully changed at the same time.

The following steps explain how to create a data source and a provider at the same time. You can create them individually by selecting different options through the wizard.

1. Log into the IBM Web Administration for iSeries page.
`http://systemname:2001/HTTPAdmin`
2. Select the **Manage** and **Application servers** tabs.
3. In the Server drop-down box, choose **default/server1**.
4. In the left navigation frame, under WAS Wizards, click the **Create Data Source** link.
5. In the Specify Data Source Name pane that is displayed on the right (Figure 6-1), for Data source name, type TestDS. Then click **Next**.

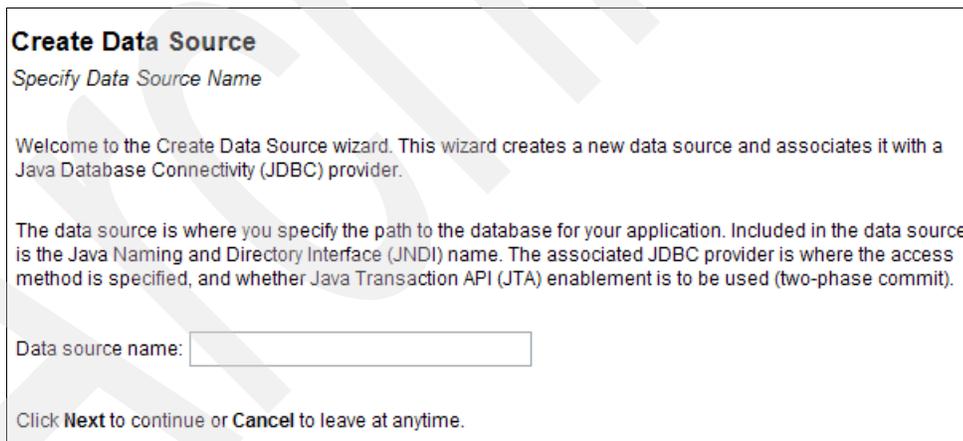


Figure 6-1 Create Data Source - Specify Data Source Name pane

6. In the Select JDBC Provider pane (Figure 6-2), select **Create new JDBC provider** and click **Next**.

Create Data Source
Select JDBC Provider

A data source contains information regarding the database location. Every data source is associated with a JDBC provider. The JDBC provider contains the information about how the application connects to the database.

JDBC provider:

- Create new JDBC provider
- Select an existing JDBC provider

Figure 6-2 Create Data Source - Select JDBC Provider pane

7. In the Create JDBC Provider pane (Figure 6-3), for JDBC provider name, type TestProvider. Then click **Next**.

Create Data Source
Create JDBC Provider

The JDBC provider specifies how an application accesses a database. The database may be either a local database or a remote database. The access method also specifies whether to enable Java Transaction API (JTA), which enables two-phase commit functionality.

JDBC provider name:

Figure 6-3 Create Data Source - Create JDBC Provider pane

- In the Specify Database Access Method and JTA Enablement pane (Figure 6-4), under Database access method, select **Local - IBM Developer Kit for Java DJBC driver** (the Native JDBC driver) and click **Next**.

Create Data Source
Specify Database Access Method and JTA Enablement

There are two JDBC drivers that are supported on the iSeries server. The IBM Developer Kit for Java JDBC^(TM) driver is used for local database access. Local database access is when the application server and the database are located on the same physical system. The IBM Toolkit for Java JDBC^(TM) driver is used for remote database access. Remote database access is when the application server and the database are located on separate systems, including databases that are located on a Logical Partition (LPAR). Java Transaction API (JTA) is supported by both iSeries database drivers. JTA enables two-phase commit functionality.

Database access method:

Local - IBM Developer Kit for Java JDBC^(TM) driver
 Remote - IBM Toolkit for Java JDBC^(TM) driver

Specify JTA enablement:

JTA enablement:

Figure 6-4 Create Data Source - Specify Database Access Method and JTA Enablement pane

- In the Specify Database Information pane (Figure 6-5), for Database schema, enter a library name that has your database. Since you are not going to use this data source for anything, you can always specify QGPL on your system. Click **Next**.

Create Data Source
Specify Database Information

Associated JDBC provider: TestProvider

The data source specifies which database the application connects to. The database can be either a local or remote database.

Database name:

Collection, Schema or Library name:

Figure 6-5 Create Data Source - Specify Database Information pane

10. In the Specify JNDI Name pane (Figure 6-6), for JNDI name, accept the default name and click **Next**.

Create Data Source
Specify JNDI Name

Associated JDBC provider: TestProvider

The Java Naming and Directory Interface^(TM) (JNDI) provides naming and directory functionality to Java applications. The JNDI name should have been provided to you as part of your application by the application developer.

JNDI name:

Figure 6-6 Create Data Source - Specify JNDI Name pane

11. When you reach the Summary pane (Figure 6-7), click **Finish**.

Create Data Source
Summary

When you click **Finish** the application server "IBMtest/IBMtest" will be modified to use the following data source and JDBC provider.

Data source information

Data source name:	TestDS
Database name:	*LOCAL
Collection, Schema or Library name:	QGPL
JNDI name:	jdbc/TestDS

Associated JDBC provider information

JDBC provider name:	TestProvider
Database access method:	Local - IBM Developer Kit for Java JDBC ^(TM) driver
JTA enablement:	Disabled

Note: When you click **Finish** you will need to restart the application server in order for the changes to take effect.

Figure 6-7 Summary pane

6.2 Creating an IBM HTTP Server (powered by Apache)

Usually you want to create a separate HTTP server along with WebSphere Application Server. This allows you to use extra pieces such as firewalls and directives in the WebSphere Application Server environment. This section shows you how to create an IBM HTTP Server (powered by Apache) and associate it with WebSphere:

1. Log into your IBM Web Administration for iSeries page:
`http://systemname:2001/HTTPAdmin`
2. Under Common Tasks and Wizards in the left frame, click **Create HTTP Server**.

3. In the Create HTTP Server pane (Figure 6-8), for Server name, type MyWeb and type a description. Click **Next**.

Create HTTP Server

Welcome to the Create New HTTP Server wizard. This wizard helps you set up and create a new HTTP server (powered by Apache).

You must name your new server. This name will be used later to manage the server.

What do you want to name your new server?

Server name:

Server description:

Click **Next** to continue or **Cancel** to leave at anytime.

Figure 6-8 Create HTTP Server pane

4. In the next pane, leave the default settings for Server root and click **Next**.
5. In the next pane, leave the default settings for Document root and click **Next**.
6. Change the port number to 12375 and click **Next**.

Note: In this step, we presume that port 12375 is not in use by another application. If it is already used, choose an unused port and substitute it for 12375 for the remainder of this section.

7. In the error log pane, click **Next**.
8. In the log file pane, click **Next**.
9. In the last pane, click **Finish**.

Now that your HTTP server is created, you must tell it to work with server1.

1. Verify that you are on the **Manage** tab and the **HTTP servers** subtab. Also verify that Server is set to **MYWEB** (see Figure 6-9).
2. Scroll down the left navigation frame and click **WebSphere Application Server** (see Figure 6-9).

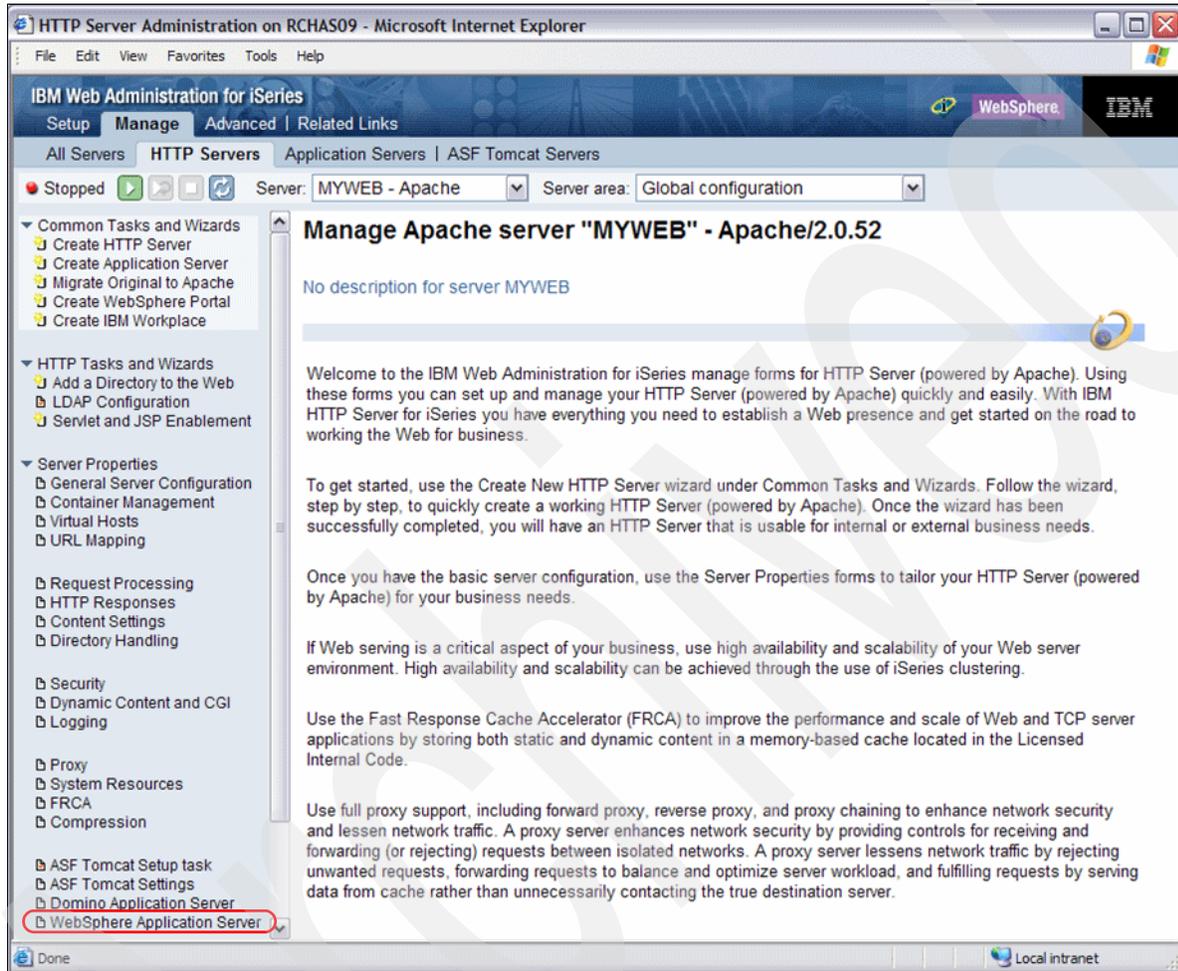


Figure 6-9 HTTP Servers page

3. In the WebSphere Application Server pane (Figure 6-10), select **WebSphere Application Server, V6.0**. From the WebSphere instance list, select **default**.

Then you see a message at the bottom of the pane, like the one in Figure 6-10, because it is disassociating the APACHEDFT Web server definition with server1.

In 4.3, “WebSphere Application Server and the IBM HTTP Server (powered by Apache)” on page 58, we configured the APACHEDFT to work with the default WebSphere profile. However, WebSphere Application Server - Express V6 is only allowed one HTTP server per application server.

Click **OK**.

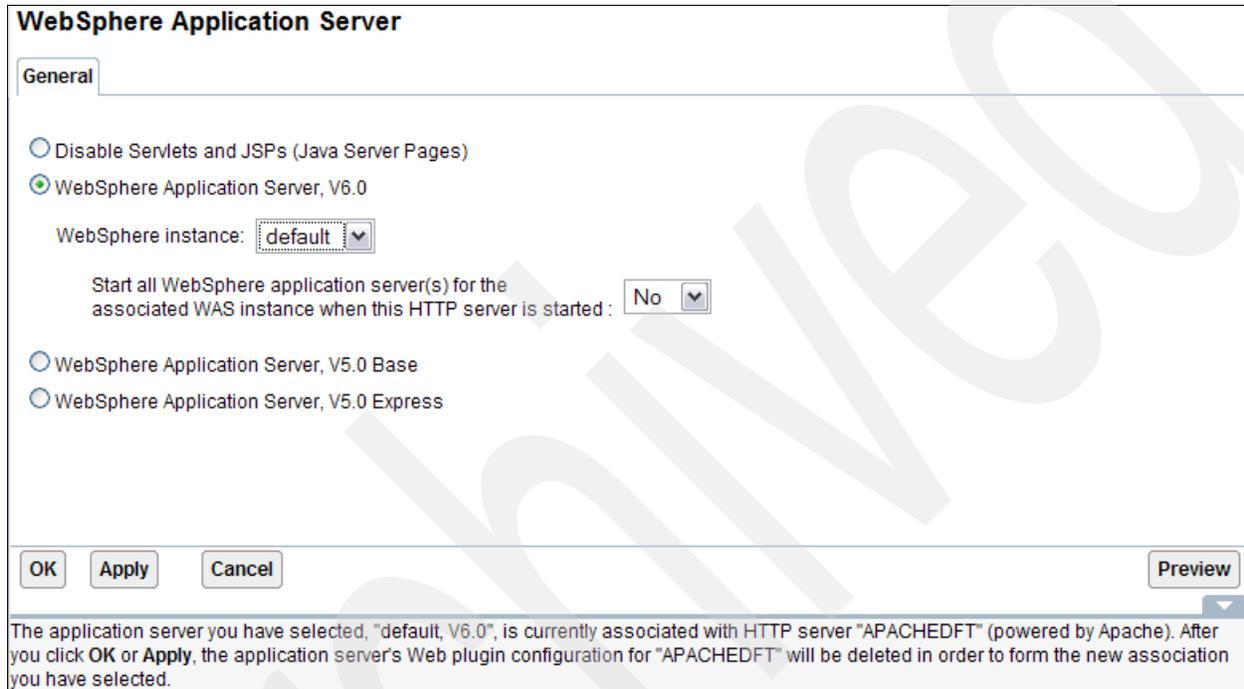


Figure 6-10 Associating MyWeb with default

You now have an IBM HTTP Server (powered by Apache) called MyWeb associated with the server1 in the default profile. Next you must configure WebSphere to recognize requests coming in on port 12375.

6.2.1 Adding a port to the virtual hosts

Now you must update the virtual host with the port number of your new HTTP server to allow WebSphere Application Server to accept requests from that server:

1. Ensure that your browser window shows the IBM Web Administration for iSeries. If not, type the following URL:
`http://systemname:2001/HTTPAdmin`
2. Click the **Manage** tab and the **Application Servers** subtab.
3. In the Server drop-down box, select the **default/server1** application server.
4. In the left navigation frame, under Resource Configuration, click **Manage Virtual Hosts**.
5. In the right pane, select **default_host** and click **Properties**.

- On the Host Alias tab, change port 80 to 12375. Select port **80**, and the pane changes to edit mode. Leave the IP address as * and change the port to 12375. Click **Apply**.

When the processing finishes and the pane refreshes, you should see MYWEB associated as shown in Figure 6-11.

Virtual Host Properties ?			
Host Aliases			
Host alias settings for virtual host default_host: ?			
	IP address or hostname	Port	Associated HTTP servers
<input type="radio"/>	*	9080	Internal HTTP Server
<input checked="" type="radio"/>	*	12375	MYWEB - Apache
<input type="radio"/>	*	9443	Internal Secure HTTP Server

Figure 6-11 MYWEB in default_host

- Restart both the HTTP server and the application server.
- Test snoop with the new port:

`http://systemname:12375/snoop`

The snoop servlet page should open as you shown in previous chapters. You can also test the WSSamples page and Plants By WebSphere application.

6.3 Creating a WebSphere Application Server

Up to this point, we have used the default application server. Now you see how to create your own application server. In this section, we talk you through the wizards to create your own WebSphere profile and an associated HTTP server. Then we test the snoop servlet to make sure it is all working correctly:

- Log into the IBM Web Administration for iSeries page if you are not already there:
`http://systemname:2001/HTTPAdmin`
- Select the **Manage** tab and **Application Servers** subtab.
- In the left navigation frame, expand **Common Tasks and Wizards** and click **Create Application Server** (Figure 6-12).

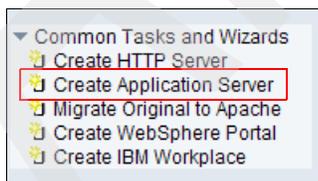


Figure 6-12 Choosing the Create Application Server option

- An information pane is displayed about what the wizard does for you. Read this pane and click **Next**.
- If you have several WebSphere Application Server versions or editions installed on your server, the next pane asks you to choose the version of WebSphere for which you want to

create a server. You might only see WebSphere 6, if that is the only version you have. Select **V6.0** and click **Next**.

6. In the next pane, enter a name your application server and a description. Then click **Next**.
7. In the Select HTTP Server Type pane (Figure 6-13), select **Create a new HTTP server (powered by Apache)** and click **Next**.

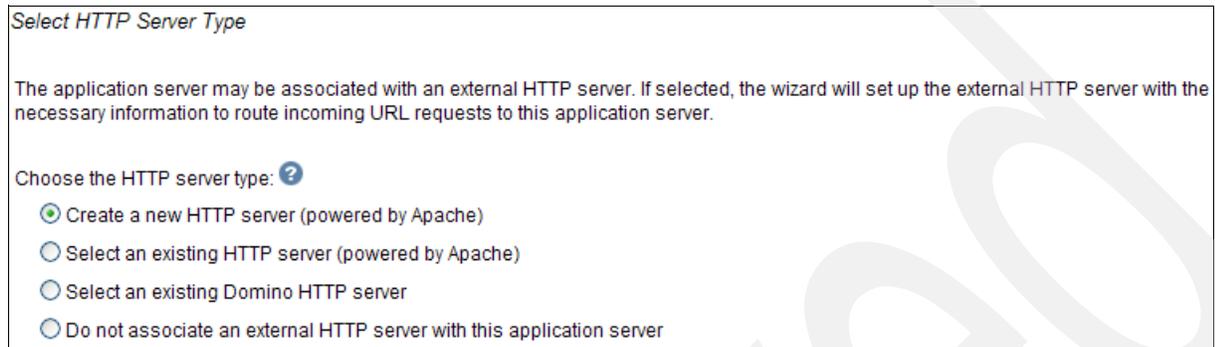


Figure 6-13 Choosing the HTTP server type

8. In the next pane, name your IBM HTTP Server (powered by Apache). Typically, we recommend that you give it the same name as your application server so that you know that they are a pair. Leave the IP Addresses field at the default setting. For the port to listen on, select a unique number or accept the default. Write down this number for future use. Click **Next**.

Note: The wizard is smart enough to check the IP ports that are in use (active and used by other application and HTTP servers). On this pane, it offers an unused port that you can safely use.

9. In the next pane, set up the ports for WebSphere to use. Give it a starting port and it uses the next 12 ports after that. It needs these ports for internal communications as well as for setting up the internal HTTP server to respond to requests. Click **Next**.
10. In the Select Business and Sample Applications pane, select only **Default Applications** and click **Next**.
11. You do not use single sign-on (SSO) on this server. Therefore, in the next pane, keep the default of **Do not configure Identity Tokens** and click **Next**.
12. When you see the Summary pane, you might want to print this pane for your records. It gives you the URLs to test your new server. Click **Finish**.
13. Your server is now being created, which can take up to 20 minutes depending on the size of your system. When it is finished, the server should show a status of *Stopped*, with both applications (DefaultApplication.ear and query) also having a status of *Stopped*.
14. Click the **green start triangle** (▶), next to where it indicates that your server is *Stopped*, to start your application server.
15. Select the **Manage** tab and **HTTP servers** subtab. From the Server list, select your new HTTP server.
16. Click the **green start triangle** (▶) to start your HTTP server.
17. After you verify that your WebSphere job is started by using the steps in 4.2.1, "Starting the application server" on page 54, test the server with one of the URLs from the summary page.

6.4 Summary

This chapter took you through a lot of the common functionality of the IBM Web Administration for iSeries page and what you can accomplish with it in working with WebSphere. You learned how to add new HTTP servers to existing application servers, as well as how to create a new application server and HTTP server.



Working with the WebSphere Administrative Console

When you are comfortable with maneuvering through the IBM Web Administration for iSeries page, you can explore the WebSphere Administrative Console page. This page has the same functionality as the IBM Web Administration for iSeries page and more. There are many additional settings that you can use to streamline and tune your application server.

This chapter shows you the places in the console that a typical user needs to know. It also explains more about Web servers, JDBC settings, plug-in files and other areas of common interest for users.

Note: If you let your console sit idle too long in between steps (30 minutes to be exact), it times out and forces you back to the login page.

7.1 Why using WebSphere Administrative Console is essential

Web Administration for iSeries offers an integrated and easy-to-use user interface to manage WebSphere Application Server. Nevertheless, there are several reasons why you must know how to use WebSphere Administrative Console:

- ▶ Web Administration for iSeries contains only a *subset* of the configuration options for WebSphere Application Server.
- ▶ Web Administration for iSeries can manage only the *stand-alone* application server. If a server is part of a Network Deployment cell, you must use the Administrative Console.
- ▶ If you enable *global security* for your application server, you must use the Administrative Console.

7.2 Accessing the console

There are two ways to access the WebSphere Administrative Console. The easiest way is from the IBM Web Administration for iSeries page. Select your application server, and in the lower left navigation frame, click **Launch Administrative Console** (Figure 7-1).



Figure 7-1 Launch Administrative Console

Then you see a new pane on the right prompting you to login like the example in Figure 7-4 on page 89. Refer to steps 8 on page 89 and on page 90 which pertain to the console in general regardless on how you start it.

The other way to access WebSphere Administrative Console, if your Admin HTTP server is not running, is to go directly to the URL in a browser as explained in the following steps. To get to the WebSphere Administrative Console, you must know the port it is listening on. Make sure your server1 job is running. Then follow these steps:

1. On a 5250 command line, type the following command and press Enter:

```
wrkactjob sbs(qwas6)
```
2. On the Work with Active Jobs display, type option 5 next to server1 and press Enter.
3. On the Work with Job display, type option 10 on the command and press Enter to view the job log.
4. On the Display Job Log screen, press the F10 key.

- In the Display All Message screen, you see the message at the bottom indicating that server1 is ready like the example in Figure 7-2. Move your cursor to the “WebSphere application server server1 ready” message and press F1.

```

                                Display All Messages
Job . . . : SERVER1      User . . . : QEJBSVR      System: RCHAS11
                                Number . . . : 133341

>> CALL PGM(QWAS6/QWASSTRSVR) PARM('-profilePath' '/QIBM/UserData/WebSphere/A
ppServer/V6/Base/profiles/default' '-server' 'server1')
ACGDTA for 133341/QEJBSVR/SERVER1 not journaled; reason 1.
Server starting with user profile QEJBSVR and JDK 1.4.2.08.
WebSphere application server server1 ready.

```

Figure 7-2 Display All Messages screen

- In the Additional Message Information display (Figure 7-3), you can see that the application server is handling administrative requests on port 9060.

```

                                Additional Message Information
Message ID . . . . . : WAS0106      Severity . . . . . : 00
Message type . . . . . : Information
Date sent . . . . . : 10/31/05      Time sent . . . . . : 11:23:13

Message . . . . . : WebSphere application server server1 ready.
Cause . . . . . : WebSphere application server server1 in job
                  133341/QEJBSVR/SERVER1 is ready to handle administrative requests on port
                  9060.

```

Figure 7-3 Port message

- Open a browser window and type the following URL:

`http://systemname:9060/ibm/console`

- In the login pane (Figure 7-4), you can type any user ID that you choose. The purpose of the user ID is for Administrative Console to keep track of changes that you make. It allows more than one person to access the Administrative Console. The changes are temporary until you save them.

Note: If you enable global security, you should see two fields: one for user ID and one for the password. In this case, a user ID has to be a valid ID, because it is verified against the authentication information repository (LDAP or operating system).

Welcome, please enter your information.

User ID:

The User ID does not require a password, and does not need to be a User ID of a user in the local user registry. It is only used to track user-specific changes to configuration data. Security is NOT enabled

Figure 7-4 Login display

After you login, you see the Administrative Console page like the example in Figure 7-5.

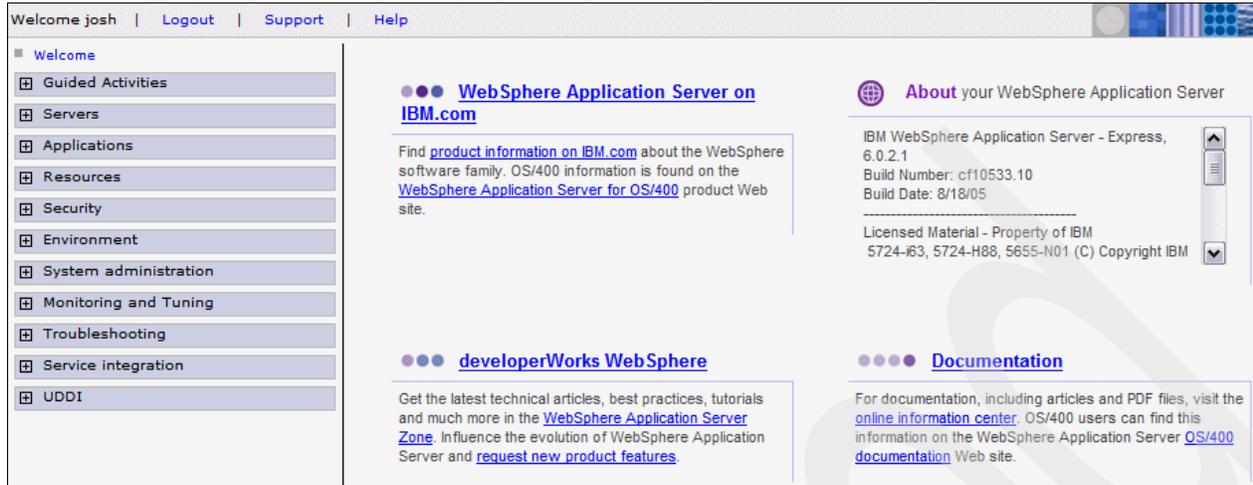


Figure 7-5 Administrative Console page

7.3 Servers

This section explains the major sections under the Servers tab in the Administrative Console. You explore the Application servers section first and then look at the Web servers section. The application server parameters, such as heap size values and Java virtual machine (JVM) arguments, allow you to modify the behavior of the server itself. Some of them are important for tuning the performance of your application server.

7.3.1 Application servers

Applications servers are what process and run your WebSphere applications. It is important to know where in the console you must go to view them and find their settings:

1. In the left navigation frame, expand the **Servers** section and click **Application servers**.
2. In the right pane, you see the Application servers section (Figure 7-6). This pane lists all of your application servers. In this case, you only have server1. Click the **server1** link.

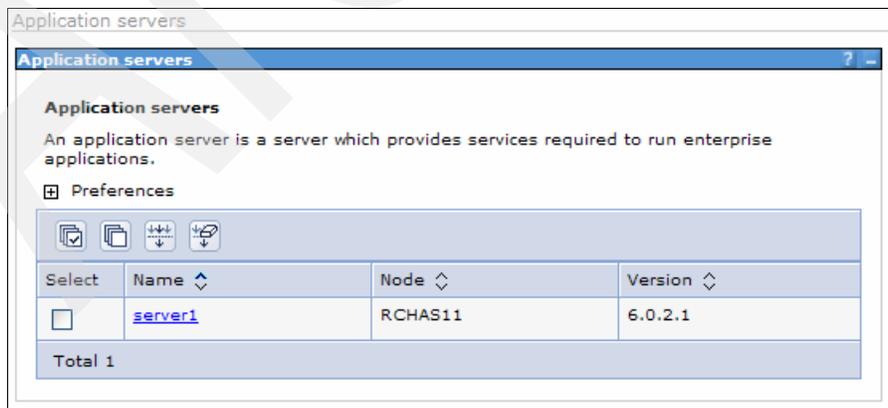


Figure 7-6 Application servers

The pane that you go to has the links to all of the main functions for your application server. As you can see in that pane, there are a lot more places to go than in the IBM Web Administration for iSeries page.

Java and Process Management

In the navigation section on the right side of the Administrative Console (see Figure 7-7), you see an area for Java and Process Management. This is a typical area you might go into on the console to modify the default parameters that are related to the Java execution environment.

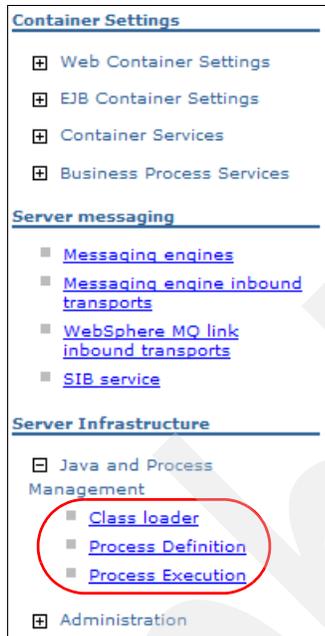


Figure 7-7 Navigation frame showing the Java and Process Management options

To access the JVM settings pane:

1. Click **Java and Process Management** and select **Process Definition**.
2. In the Process Definition pane (Figure 7-8), click **Java Virtual Machine**.

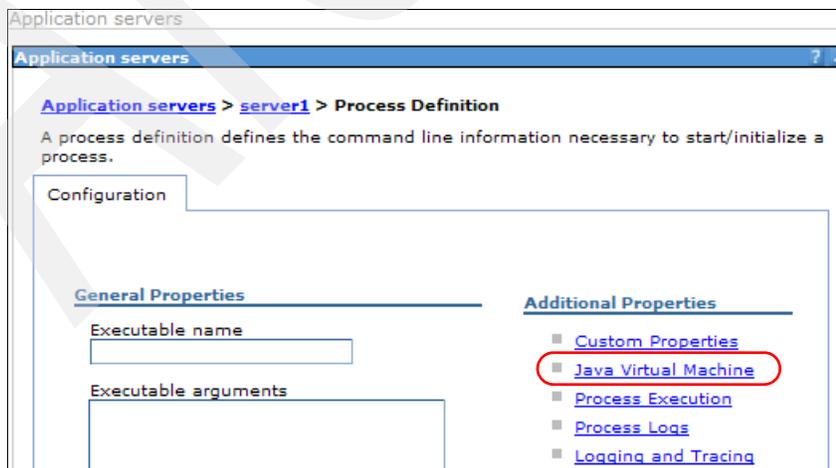


Figure 7-8 Process Definition pane

A new pane opens that shows options like those in Figure 7-9. This pane holds some of the commonly changed areas for the JVM settings, *Initial Heap Size* and the *Generic JVM arguments*. For more information about Initial Heap Size Chapter 8, “Performance tips” on page 105.

Generic JVM arguments include command line arguments for the JVM that you might be required to set for debugging. IBM Technical Support might ask you to place certain strings here to help debug different issues.

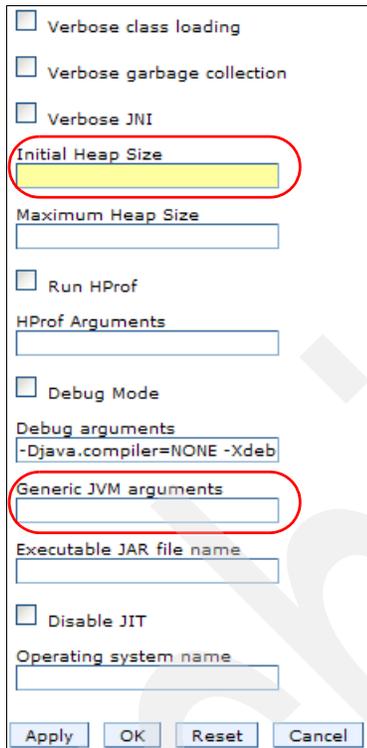


Figure 7-9 Java virtual machine settings

For more information about the Initial Heap Size and the Generic JVM arguments settings, see the WebSphere Information Center at the following Web address:

<http://publib.boulder.ibm.com/infocenter/wsdoc400/index.jsp>

From the Information Center navigation area on the left, expand **WebSphere Application Server for OS/400** → **Administering applications and their environment** → **Setting up the application serving environment** → **Administering application servers** → **Using the JVM** → **Java virtual machine settings**.

7.3.2 Web servers

Web servers are the HTTP servers that are working with your application server. They can be on the iSeries itself, on the remote iSeries, or on Web servers on different platforms such as a Windows Internet Information Services (IIS) server.

In the left navigation frame, expand **Servers** and click **Web servers**.

In the Web servers pane (Figure 7-10), you should see one Web server listed (if you followed the steps in 6.2, “Creating an IBM HTTP Server (powered by Apache)” on page 80). This one

Web server is working with the WebSphere Application Server. It is an IBM HTTP Server (IHS), is on the RCHAS11 system, and is named MYWEB. Its current status is *Started*.

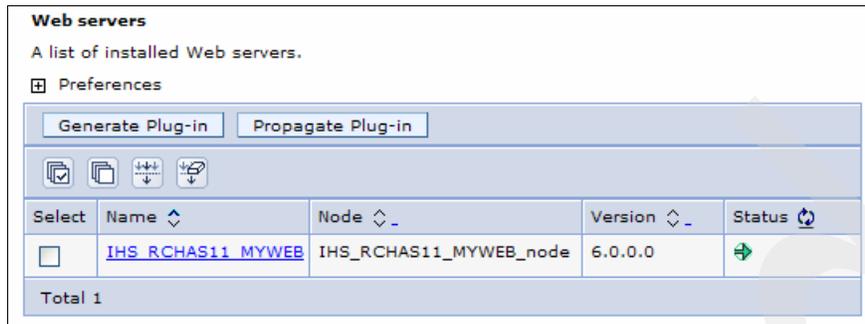


Figure 7-10 Web servers

Note: You can configure only one HTTP server for a stand-alone WebSphere Application Server. It is a one-to-one relationship. Or you can configure multiple HTTP servers for an application server that is part of a Network Deployment cell.

The pane in Figure 7-10 also shows you two buttons, the *Generate Plug-in* and *Propagate Plug-in* buttons.

Generate Plug-in

A *Web server plug-in component* is the connecting component between an HTTP server and an application server (see 4.3, “WebSphere Application Server and the IBM HTTP Server (powered by Apache)” on page 58). In order for the Web server plug-in to work properly, it must know several pieces of information about the application server:

- ▶ Its host name (IP address) and port number on which application server accepts the incoming requests
- ▶ The list of “allowable” servers
 - This is the host information that you configure in the virtual hosts. This list contains host names (IP addresses) and ports of the servers that are allowed to access the applications hosted by the application server.
- ▶ Context roots of the applications that can be accessed through the HTTP server

All required information is provided in the *plug-in configuration file*. This file is created and maintained by the application server. To generate (or create) this file, the Administrative Console provides the *Generate Plug-in* button.

Note: When you configure your HTTP server instance for WebSphere Application Server in Web Administration for iSeries, it generates the plug-in configuration file under the covers. This is an example of the tight integration of the IBM HTTP Server and WebSphere Application Server configuration in Web Administration for iSeries.

Propagate Plug-in

In WebSphere Application Server V6.0, you have a capability to remotely manage a few of the Web server functions. One is the propagation of the plug-in configuration file to a remote Web server. This is why you see the Propagate Plug-in button on the pane shown in Figure 7-10. Be aware that you must perform additional steps to enable this capability. See Appendix D, “Configuring a remote HTTP server” on page 221, for more information.

Viewing the plug-in configuration file

In the following steps, you access the plug-in configuration file and review its content. Understanding the content of the plug-in file might help while debugging application access problems.

1. In the Administrative Console, select the Web server name.
2. Under Additional properties in the next pane, click **Plug-in properties**.
3. In the Plug-in properties pane (Figure 7-11), click the **View** button.

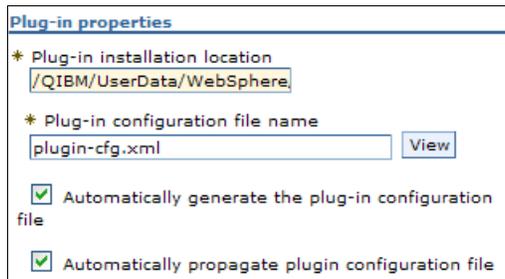


Figure 7-11 Plug-in properties

You see the details of the plug-in configuration file (*plugin-cfg.xml*). Figure 7-12 shows a section of the plug-in file for server1. Yours should be similar.

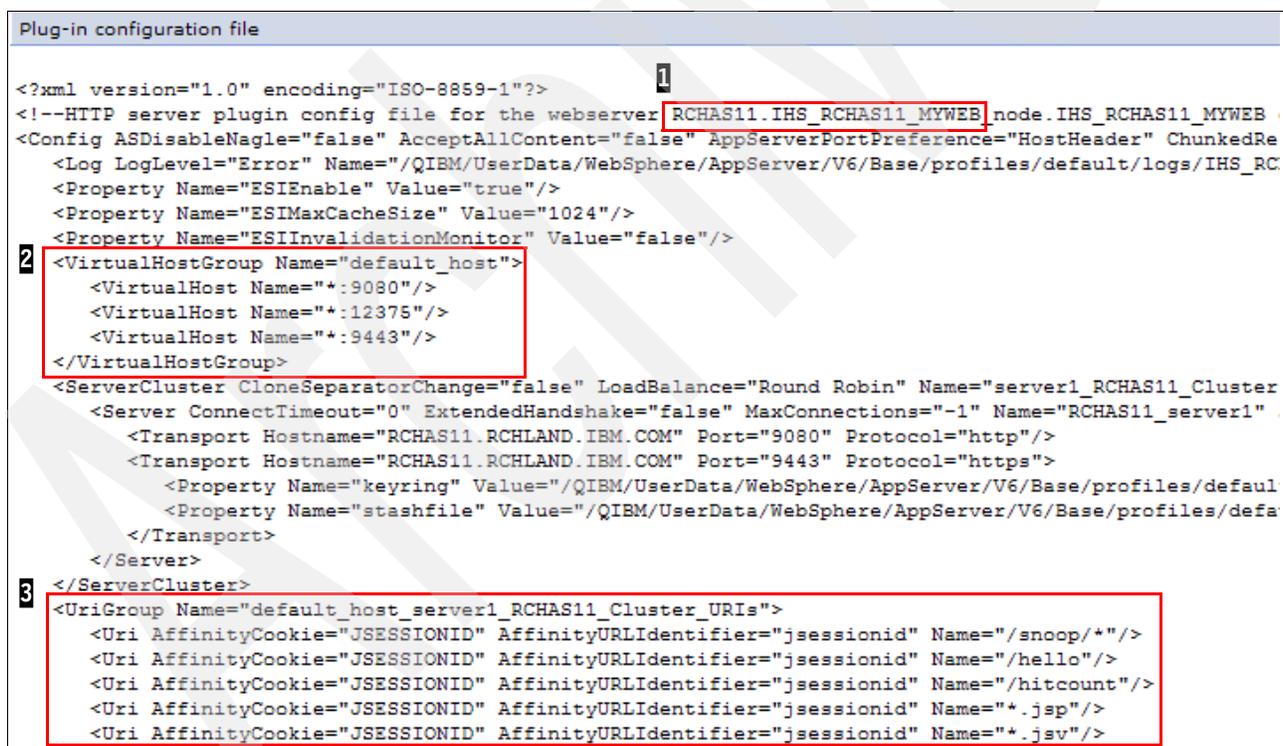


Figure 7-12 Plug-in file

Note the following explanation for the three numbered boxes in the plug-in file in Figure 7-12:

- 1 This text indicates the Web server that this plug-in file is associated with. In this example, you can see that it is for the MYWEB HTTP server.
- 2 This text indicates the virtual host default_host. You should recognize this information as being the same as in Figure 6-11 on page 84. This list contains host names (IP addresses)

and ports of the servers that are allowed to access the applications hosted by the application server.

- 3 This section of the plug-in is where you can see the context roots of the applications that can be accessed through the HTTP server (see “Context root” on page 68).

7.4 Applications

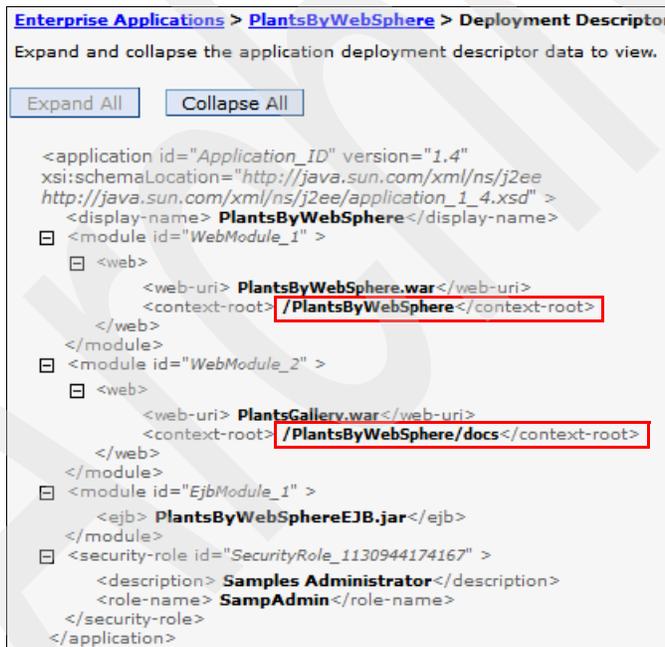
The Applications section of the console is where you manage and install new applications. You can also change numerous settings, such as classloader policies and timeout values, as well as map the application modules to the Web servers.

7.4.1 Finding the context root

In “Context root” on page 68, we explained how to find the context root on the IBM Web Administration for iSeries page. The following steps show you how to do the same in the WebSphere Administration Console:

1. In the left navigation frame, click **Applications** and then **Enterprise Applications**.
2. Click your application’s name, for example **PlantsByWebSphere**.
3. In the right pane, under Additional Properties, click **View Deployment Descriptor**.

You should see the Deployment Descriptor pane similar to the example Figure 7-13, which shows the context roots.



```
Enterprise Applications > PlantsByWebSphere > Deployment Descriptor
Expand and collapse the application deployment descriptor data to view.
Expand All Collapse All

<application id="Application_ID" version="1.4"
xsi:schemaLocation="http://java.sun.com/xml/ns/j2ee
http://java.sun.com/xml/ns/j2ee/application_1_4.xsd" >
  <display-name> PlantsByWebSphere</display-name>
  <module id="WebModule_1" >
    <web>
      <web-uri> PlantsByWebSphere.war</web-uri>
      <context-root> /PlantsByWebSphere</context-root>
    </web>
  </module>
  <module id="WebModule_2" >
    <web>
      <web-uri> PlantsGallery.war</web-uri>
      <context-root> /PlantsByWebSphere/docs</context-root>
    </web>
  </module>
  <module id="EjbModule_1" >
    <ejb> PlantsByWebSphereEJB.jar</ejb>
  </module>
  <security-role id="SecurityRole_1130944174167" >
    <description> Samples Administrator</description>
    <role-name> SampAdmin</role-name>
  </security-role>
</application>
```

Figure 7-13 Deployment Descriptor

You can also see that there is a lot more information on this pane than on the corresponding pane from the IBM Web Administration for iSeries page (Figure 7-14) shown in Chapter 5, “Working with applications” on page 63.

	Web module	Virtual host	Context root
<input type="checkbox"/>	PlantsByWebSphere Web Application	default_host	/PlantsByWebSphere
<input type="radio"/>	PlantsByWebSphere Sample Gallery Web Application	default_host	/PlantsByWebSphere/docs

Figure 7-14 IBM Web Administration for iSeries

7.5 Resources

WebSphere Application Server uses many additional resources such as database, mail and messaging servers, and so on. To enable an application server to use these resources, a WebSphere administrator must configure them using the Resources section in the WebSphere Administrative Console.

7.5.1 Viewing JDBC providers and data sources

In this section, you explore the JDBC section under the Administrative Console to look at the JDBC provider and data source that you created in 6.1, “JDBC drivers for the iSeries” on page 76.

1. Expand **Resources** and click **JDBC Providers**.
2. Since you have not used this pane before, the red arrow should point to *Node*. You must change this to server.
 - a. Click the **Browse Servers** button.

Note: You can configure a resource at three different levels:

- ▶ Cell
- ▶ Node
- ▶ Server

Depending on the level, the resource is available respectively to all the resources under the cell, a single node (with zero or more application servers), or a single application server.

- b. Select **server1** and click **OK**.

The red arrow should now point to Server, with *server1* in the box underneath it (see Figure 7-15). You also see more JDBC providers including the TestProvider you created in 6.1, “JDBC drivers for the iSeries” on page 76.

- c. Click **TestProvider** to go to the associated data sources.

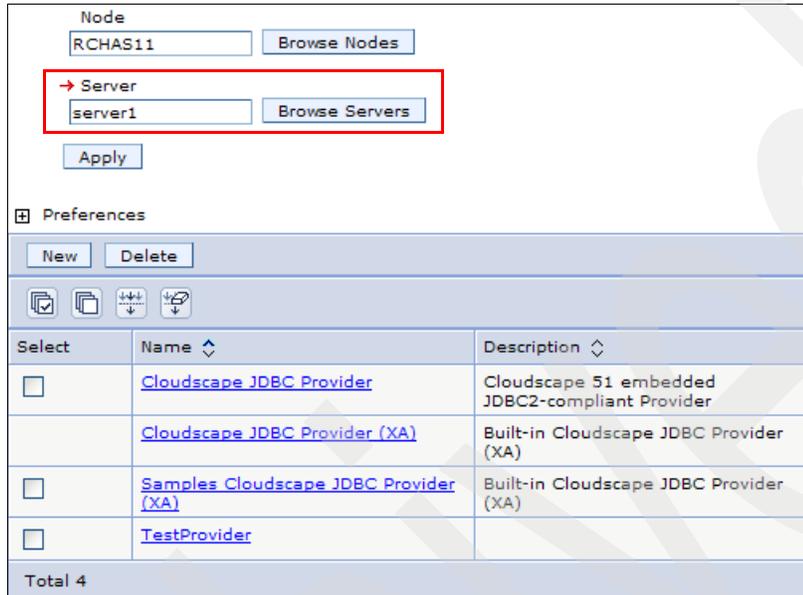


Figure 7-15 Server scope

3. In the right navigation frame, under Additional properties, click **Data Sources**.
4. In the list of data sources, you should see TestDS that you created in Chapter 6, “Managing WebSphere resources” on page 75 (Figure 7-16). Click **TestDS**.

Note: You can configure more than one data source for each JDBC provider. This allows you to use the same database access mechanism, but access different libraries (schemas) and tables.

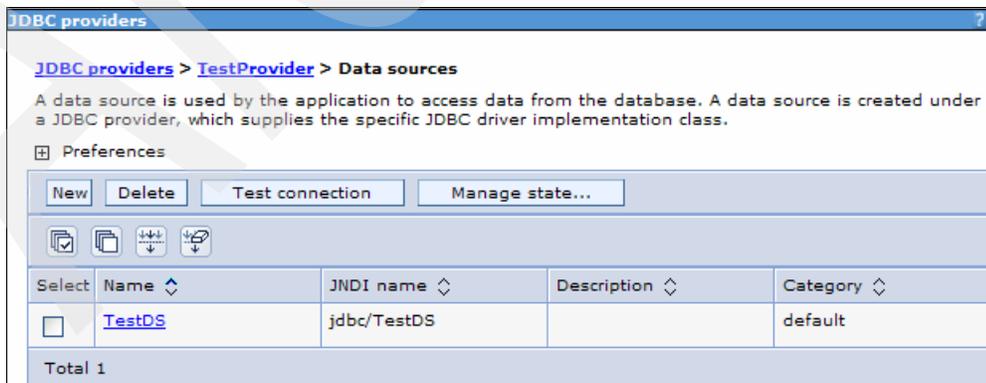


Figure 7-16 Data sources

5. On the data source pane, you can test the connection to see if it is configured correctly to connect to your server. Click the **Test Connection** button.

You see a message at the top indicating that the text connection was successful, like the example in Figure 7-17.

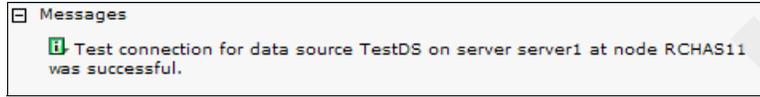


Figure 7-17 Test connection

7.5.2 Data source custom properties

Data source custom properties allow you to control the behavior of a data source. For example, you can:

- ▶ Change the amount of data that is sent from a database server at a time
- ▶ Enable SQL or System naming
- ▶ Specify the library list
- ▶ Enable tracing

To access the custom properties for your data source, click the **Custom properties** link (see Figure 7-18) on the data source page.

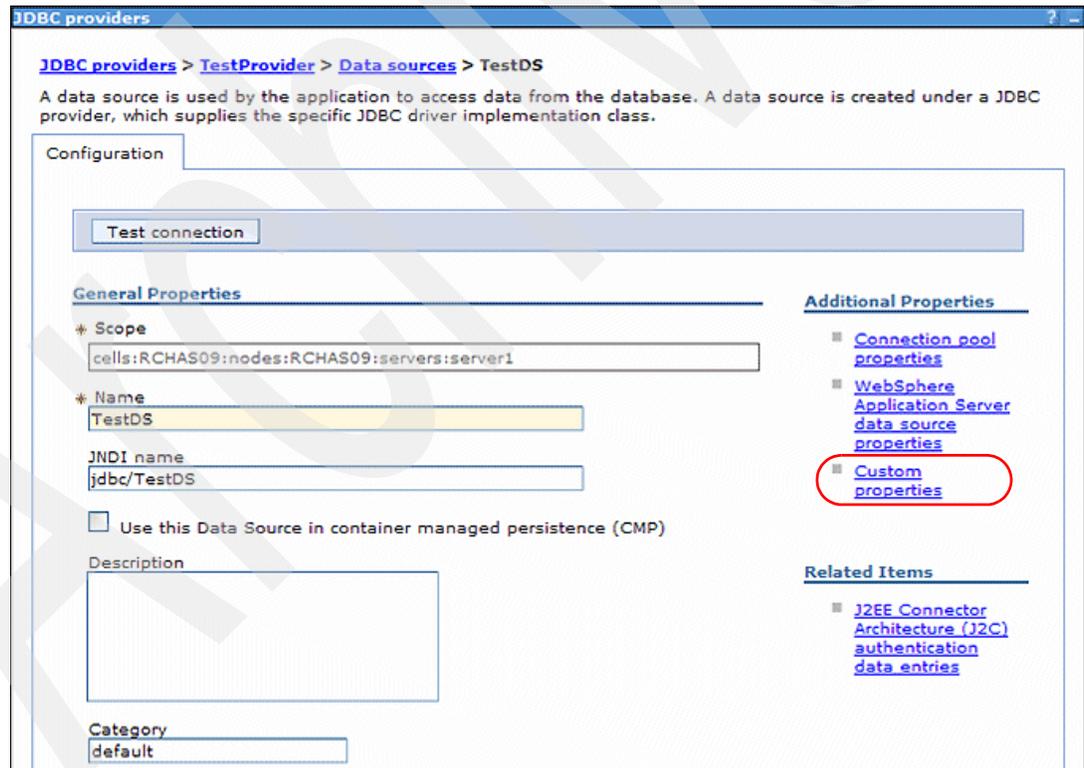


Figure 7-18 Data source properties

Custom properties for either JDBC provider (Toolbox or Native) occupy several pages. There is a good description of each property on the page. For more details on each property, see the iSeries Information Center:

- ▶ For Native JDBC provider:

<http://publib.boulder.ibm.com/infocenter/iseries/v5r4/index.jsp>

When you reach the Information Center, navigate to **iSeries Information Center, Version 5 Release 4 → Programming → Java → IBM Developer Kit for Java → Database access with the IBM Developer Kit for Java → Connections → Connection properties.**

- ▶ For Toolbox JDBC provider:

<http://publib.boulder.ibm.com/infocenter/iseries/v5r4/index.jsp>

When you reach the Information Center, navigate to **iSeries Information Center, Version 5 Release 4 → Programming → Java → IBM Toolbox for Java → JDBC → IBM Toolbox for Java JDBC properties.**

7.5.3 Connection pooling

Each time an application attempts to access a back-end store, such as a database, it requires resources to create, maintain, and release a connection to that data store. To mitigate the strain that this process can place on overall application resources, WebSphere Application Server enables administrators to establish a pool of back-end connections that applications can share on an application server. Connection pooling spreads the connection overhead across several user requests, thereby conserving application resources for future requests.

To access the menu for connection pooling in the Administrative Console, look under Additional Properties, which is the same section as the custom properties for the data source (see Figure 7-18). The connection pooling properties include the parameters for modifying several timeout values and the number of simultaneous connections to the database that the data source supports.

For more information about using connection pooling and why you might want to modify its parameters, see Chapter 8, “Performance tips” on page 105.

7.6 Environment

Under Environment, the most commonly used link is Virtual Hosts, which closely resembles the same section on the IBM Web Administration for iSeries page. To explore Virtual Hosts:

1. In the left navigation frame, click **Environment** and then click **Virtual Hosts** as shown in Figure 7-19.

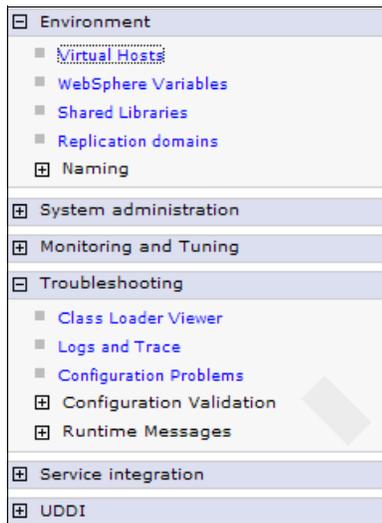


Figure 7-19 Navigation frame

2. In the Virtual Hosts pane (Figure 7-20 on page 100), click **default host**.

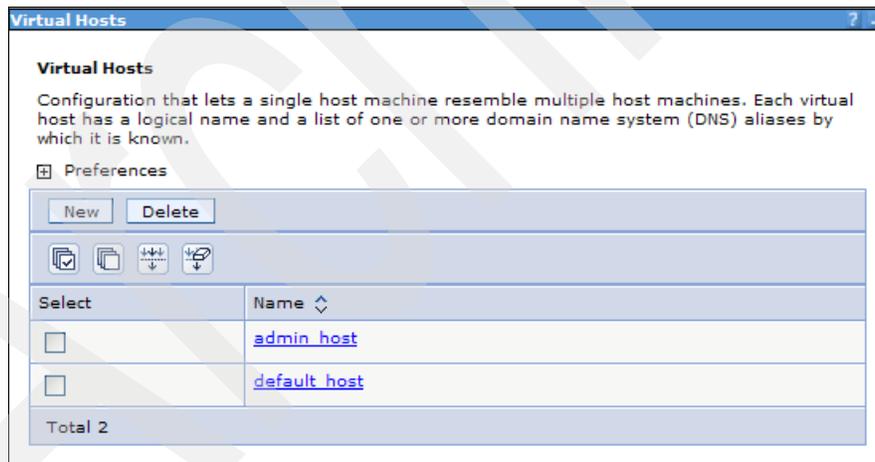


Figure 7-20 Virtual hosts

- In the default_host pane (Figure 7-21), under Additional Properties on the right, click **Host Aliases**.

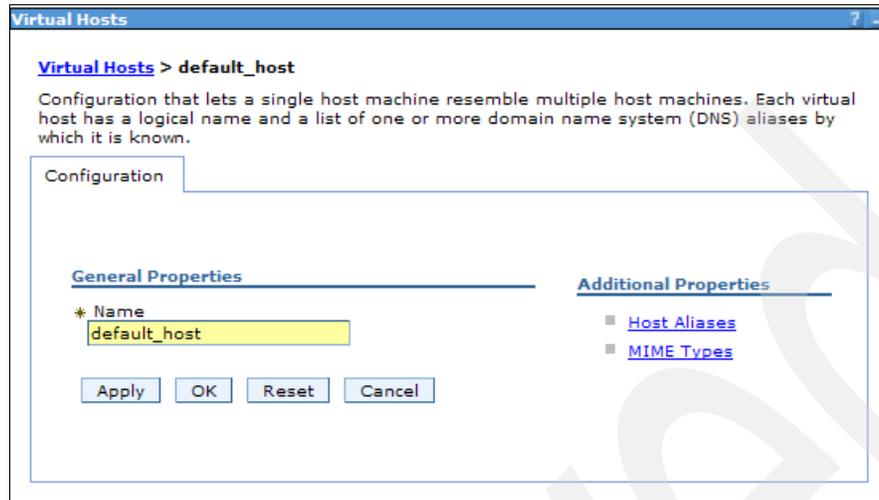


Figure 7-21 Default host

You see the host names (IP address) and ports of the servers that are allowed to access the applications (see Figure 7-22).

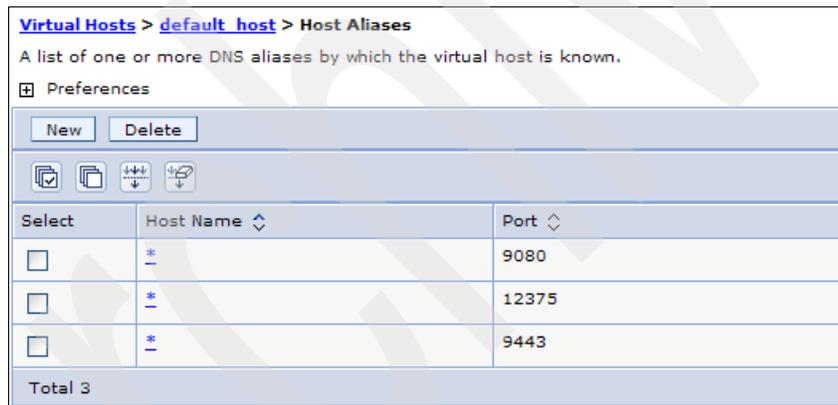


Figure 7-22 Host Aliases

This list should look much like the Host Alias section of the IBM Web Administration for iSeries page (Figure 7-23), without the helpful explanation of each port.

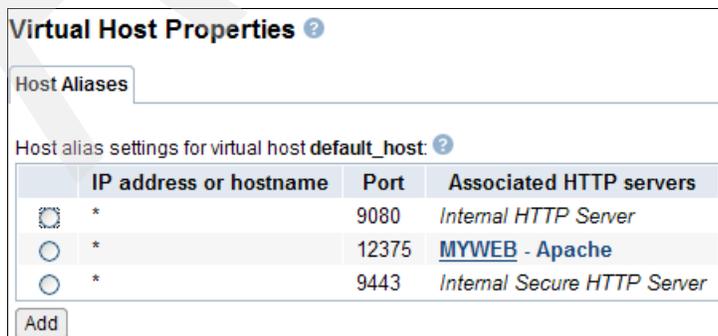


Figure 7-23 Host Aliases tab on the IBM Web Administration for iSeries page

7.7 System administration

Anytime you make changes through the Administrative Console, you must save those changes to the master repository. The *master repository* essentially contains the XML files that hold all of the configuration data for your profile. To save any changes, perform the following steps:

1. In the left navigation frame, click **System administration** and click **Save Changes to Master Repository**.
2. In the Save pane (Figure 7-24), click **Save**.

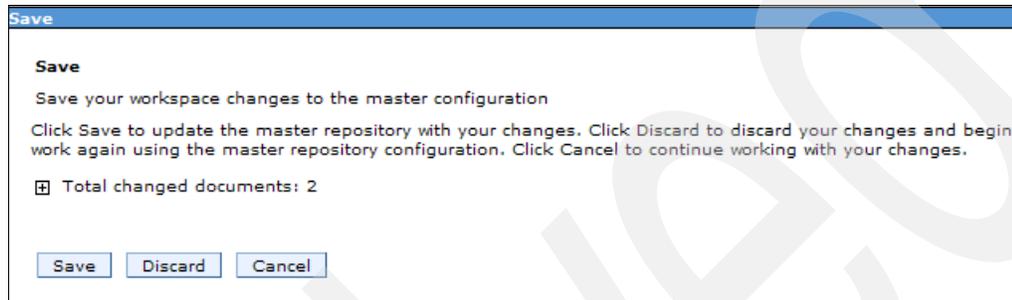


Figure 7-24 Saving to the master configuration

7.8 Troubleshooting

This section shows you how to access the logs through the WebSphere Administrative Console. While Chapter 9, “Troubleshooting” on page 129, explains more about the logs, this chapter show you how to view them. It also shows where you turn on tracing.

1. In the left navigation frame, expand **Troubleshooting** and click **Logs and Trace** (see Figure 7-25).

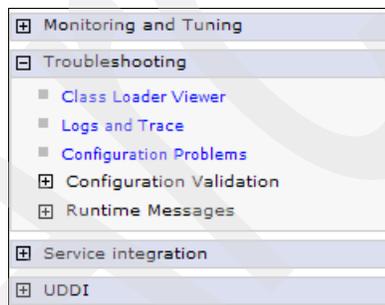


Figure 7-25 Selecting Logs and Trace under Troubleshooting

2. In the right pane, click **server1** and click **JVM Logs**.

3. The Logging and Tracing JVM Logs pane (Figure 7-26) that opens defaults to start on the Configuration tab, which shows all of the current settings for the SystemOut.log and the SystemErr.log files.

To view the logs inside of the console, click the **Runtime** tab. Then click the **View** button next to the log that you want to see.

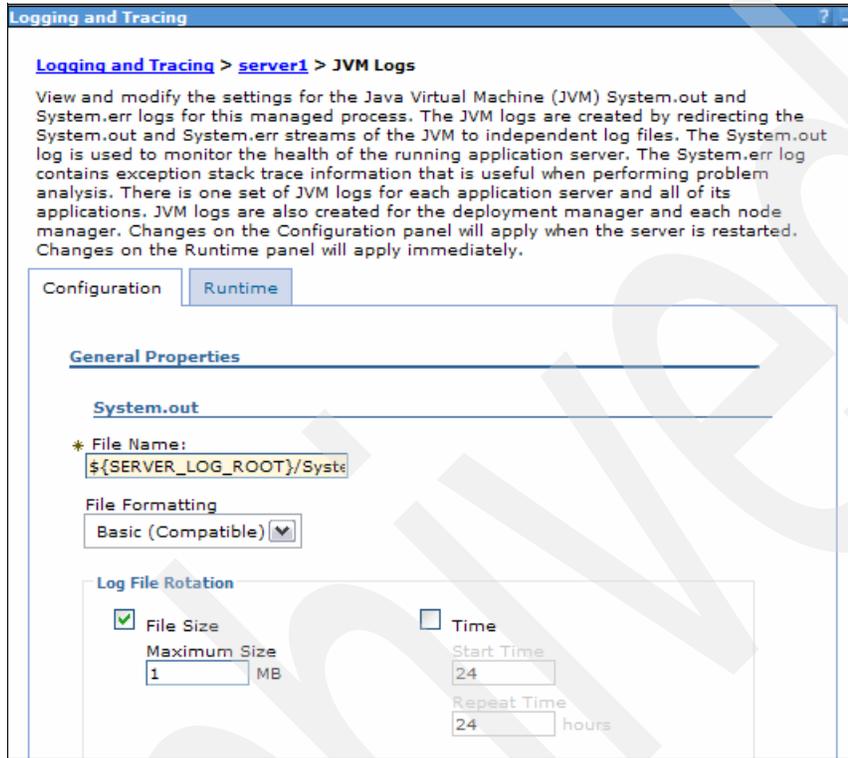


Figure 7-26 JVM Logs pane

4. You see the log in the pane, which shows the number of lines that are in the file. It also provides an input area for you to select lines that you want to view (Figure 7-27).

When you finish looking through the logs, click **Logout** at the top of the console window.



Figure 7-27 Log file viewing

7.9 Summary

This chapter showed you where some of the more common settings and areas are in the WebSphere Administrative Console and how to use them. You also saw how the Administrative Console and the IBM Web Administration for iSeries page can perform the same tasks, but learned that one offers more settings to customize your server.

For more information about other sections of the Administrative Console that we might not have covered here, see the WebSphere Information Center at the following Web address:

http://publib.boulder.ibm.com/infocenter/wsdoc400/index.jsp?topic=/com.ibm.websphere.iseries.doc/info/ae/ae/ucon_rconsole.html

Performance tips

This chapter provides performance tips to help you obtain the best possible results from your application and the hardware on which it is running. It also points you to the location of system values and other areas of interest to ensure that you have enough capacity to function efficiently in your environment.

In addition, this chapter touches on several other areas where you can take a proactive stance. It explains how to take preventive measures in identifying possible red flags and addressing performance issues now, as opposed to later when it might be too late.

Important: Prior to reading this chapter, you must understand that every environment is different. The performance tips that we recommend might show immediate results for some, but might not be as effective for others. This is where the system administrator must decide on and make the proper modifications based on your application and environment. At the end of the day, no one knows your environment the way that you do.

Note: For more information about all of the recommendations in this chapter, refer to *Maximum Performance with WebSphere Application Server V5.1 on iSeries*, SG24-6383. Despite the fact that this redbook is based on WebSphere Application Server V5.1, most of the recommendations are true for Version 6.0.

8.1 Server hardware resources

One of the first areas to focus on is the server configuration itself, on which your application is hosted. You must see if the server has sufficient resources to accommodate the existing workload before tuning any other areas. At the same time, consider and project any future growth.

Java and WebSphere Application Server environments are typically known to be memory intense in regard to the amount of memory they require to process efficiently, compared to the traditional host applications. We recommend that when you select an IBM System i model to host your Java and WebSphere Application Server applications, look for models with higher gigahertz, not only higher commercial processing workload (CPW). If your System i platform is dedicated to Java and WebSphere Application Server activity only, we recommend that you use a server with no interactive features.

For assistance in sizing your application, you can use IBM Systems Workload Estimator, which is discussed in detail in Chapter 2, “Planning for WebSphere Application Server installation” on page 9.

8.1.1 Use of the latest server model

The common recommendation for almost any environment is to use the latest hardware. Java and WebSphere workloads are CPU and memory intensive. Each piece of *new hardware* comes with faster CPUs, memory, and CPU cache. These updates can significantly improve the performance of the Java applications. As an example, look at Figure 8-1. You can see the jump in the WebSphere application’s throughput when moving from IBM POWER4™ to IBM POWER5™ technology.

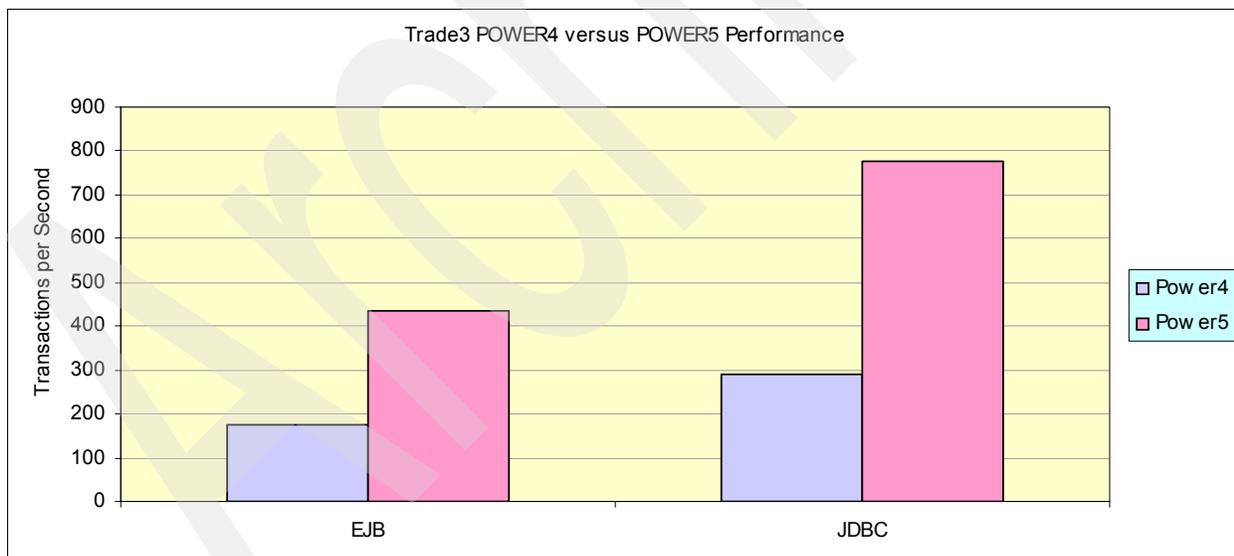


Figure 8-1 Performance improvements with POWER5 technology

Remember: The performance gain by moving to a newer technology depends on the application that you are running.

Use the *latest version of WebSphere Application Server*. It implements newer, more efficient algorithms. The benchmark shows a steady growth in application performance with each new version of WebSphere Application Server.

Install the latest program temporary fixes (PTFs). PTFs often fix the performance problems in software. This is especially true if you work with software that has released recently. The WebSphere Application Server group PTFs are packaged with the group PTFs for other relevant products, such as database, Java, and HTTP server. Refer to the following Web address for the latest level of the corresponding group PTFs:

http://www-912.ibm.com/s_dir/sline003.nsf/GroupPTFs?OpenView&view=GroupPTFs

8.1.2 Memory and cache

Java and WebSphere Application Server applications require more memory (main storage) than traditional green-screen applications. Insufficient memory can lead to a number of problems and can cause increased CPU and disk usage, which in turn results in poor application performance.

We highly recommend that you have a server with a level 2 (L2) cache. The bigger the L2 cache is, the better your results are. To enable smaller-sized customers to run a WebSphere Application Server workload, IBM offers the Processor Accelerator on the entry models.

For more information, refer to the IBM Systems Hardware Information Center at the following Web address:

<http://publib.boulder.ibm.com/infocenter/eserver/v1r3s/index.jsp>

When you reach the Information Center, navigate to **IBM Systems Hardware Information Center** → **Capacity on Demand** → **Accelerator for System i5**.

8.1.3 Shared pools

On the System i platform, all main storage can be divided into logical allocations called *memory pools*. A *pool* is a division of main or auxiliary storage (memory). The two types of memory pools in a system are:

- ▶ **Shared memory pool:** A pool in which multiple subsystems can run jobs in. There are 63 memory pools that you might define system wide, but you only define up to 10 memory pools for one subsystem.
- ▶ **Private memory pool:** A pool in which only a single subsystem can run jobs. A private pool contains a specified amount of storage to be used by only one subsystem.

Four memory pools are defined by default:

- ▶ ***MACHINE:** The memory pool for System i system jobs
- ▶ ***BASE:** The memory pool which contains all unassigned main storage on the system, (all main storage that is not required by another memory pool)

By default, the WebSphere Application Server workload runs in this pool.

- ▶ ***INTERACT:** The interactive storage pool used for interactive jobs
- ▶ ***SPOOL:** The storage pool used for spool writers

If you have a mixed application environment on your system, we often recommend that you create a separate memory pool for your WebSphere Application Server workload. This allows you to better manage the memory utilization for WebSphere Application Server.

To create a separate memory pool for the WebSphere Application Server subsystem jobs to run in, follow these steps:

1. Sign on to your system using a 5250 session.
2. Enter the Work with Shared Pool (WRKSHRPOOL) command.
3. In the Work with Shared Pools display (Figure 8-2), you can view the shared memory pools. Look for the next available shared memory pool. For the purpose of this example, we use *SHRPOOL1.
 - a. In the Defined Size (M) column, set the desired amount of memory in MB.

Attention: The minimum requirement for WebSphere Application Server V6 is 768 MB. However we recommend that you increase the memory to at least 1 GB. In most cases, you must run workload tests to determine the correct amount of memory for your application usage pattern.

- b. In the Max Active column, set the desired activity level (see 8.1.4, “Activity level for a pool” on page 111, for more information) and press Enter.
 - c. Press F3 to exit this command display.

Work with Shared Pools							System: RCHAS11
Main storage size (M) . . :		31614.06					
Type changes (if allowed), press Enter.							
Pool	Defined Size (M)	Max Active	Allocated Size (M)	Pool ID	-Paging Defined	Option-- Current	
*MACHINE	3081.56	+++++	3081.56	1	*FIXED	*FIXED	
*BASE	21507.07	5254	21507.07	2	*CALC	*CALC	
*INTERACT	7010.17	527	7010.17	3	*CALC	*CALC	
*SPOOL	15.25	5	15.25	4	*FIXED	*FIXED	
*SHRPOOL1	.00	0			*FIXED		
*SHRPOOL2	.00	0			*FIXED		
*SHRPOOL3	.00	0			*FIXED		
*SHRPOOL4	.00	0			*FIXED		
*SHRPOOL5	.00	0			*FIXED		
*SHRPOOL6	.00	0			*FIXED		
						More...	
Command							
===>							
F3=Exit F4=Prompt F5=Refresh F9=Retrieve F11=Display tuning data							
F12=Cancel							

Figure 8-2 Work with Shared Pools display

- Enter the Change Subsystem Description (CHGSBSD) command to tell the subsystem it will be allocated to a new memory pool (see Figure 8-3):

```
CHGSBSD SBSD(QWAS6/QWAS6) POOLS((2 *SHRPOOL1))
```

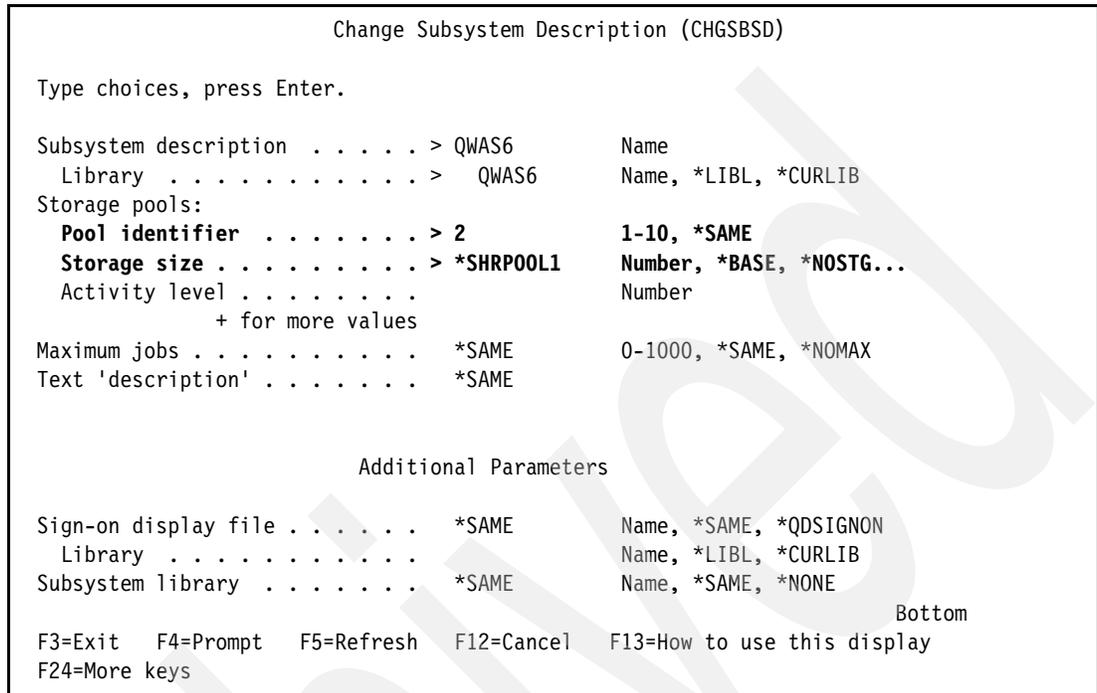


Figure 8-3 Change Subsystem Description display

- Change the Routing Entry in order to direct the jobs to the newly created memory pool. Enter the following command (see Figure 8-4):

```
CHGRTGE SBS(QWAS6/QWAS6) SEQNBR(9999) POOLID(2)
```

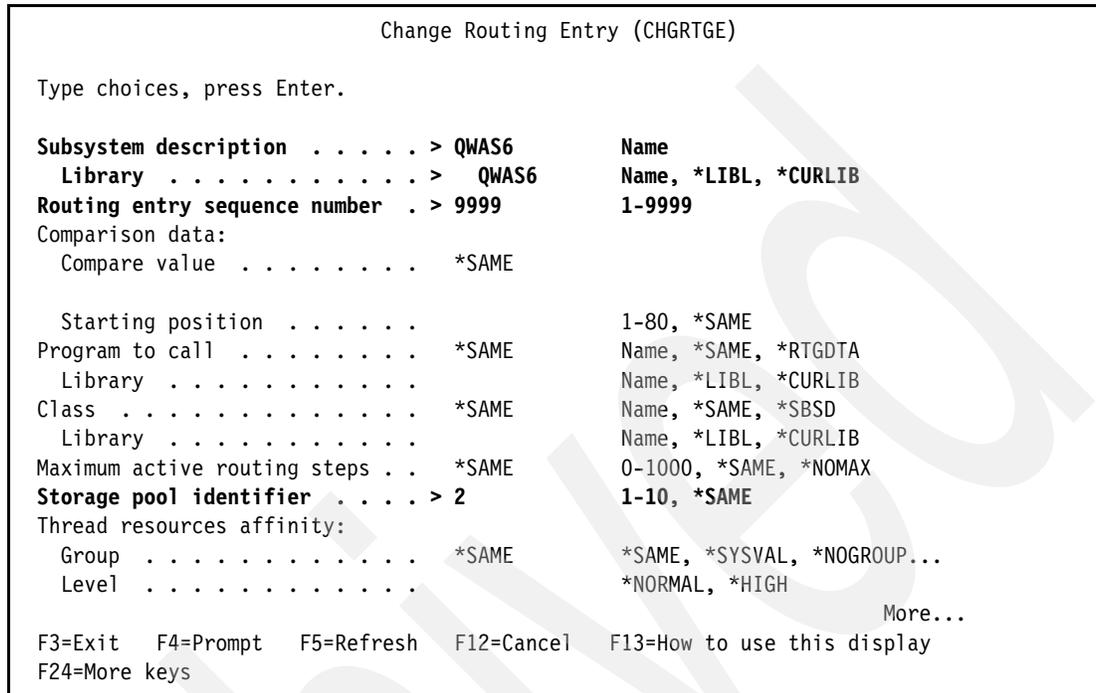


Figure 8-4 Change Routing Entry display

- Restart the subsystem by using the End Subsystem (ENDSBS) command.

The CHGRTGE command does not affect the jobs that are already active within a subsystem. It only affects the jobs that are started after the routing entry is changed. To direct all the jobs to the newly created memory pool, you must either end the subsystem and restart it, or stop and restart each application server.

Attention: If you have a production WebSphere Application Server running, it is best to select a time that does not impact the availability of the application or let maintenance restart it for you.

- You are not required to start the subsystem with WebSphere Application Server V6.0. Any time you start an application server, the QWAS6 subsystem starts automatically.

To determine the approximate amount of memory required for a single Java virtual machine (JVM):

- Start the JVM.
- Ramp up the workload running on the JVM.
- Run the Dump Java Virtual Machine (DMPJVM) command. Look at the output section labeled *Garbage Collection*. When you run the DMPJVM command, you must have information about the job name, user name, and job number.

4. The general rule is that the JVM requires the amount of memory indicated by the following formula:

heap size + JIT heap size + JVM heap size = required JVM memory

The JVM in this sample needs a minimum of approximately 1 GB of memory to provide a comfortable amount of space to process. The calculation is done as follows to determine the 1 GB recommendation as shown in this example:

347840 + 144096 + 242968 = 734094 KB

```
.....  
. Garbage Collection .  
.....  
Garbage collector parameters  
  Initial size: 98304 K  
  Max size: 240000000 K  
Current values  
  Heap size: 347840 K  
  Garbage collections: 27  
Additional values  
  JIT heap size: 144096 K  
  JVM heap size: 242968 K  
  Last GC cycle time: 310 ms  
.....
```

Figure 8-5 Dump Java Virtual Machine (DMPJVM) output

8.1.4 Activity level for a pool

The Work with System Status (WRKSYSSTS) command is a useful command that allows you to quickly display a summary of CPU, disk, and memory pool usage. It displays the current memory pool sizes and activity levels for each pool on your system, giving you insight as to whether a possible problem exists.

One of the most important parameters on this display is the information about the thread transitions. This information is presented in the three right-most columns (use F21 to select the *Advanced* assistance level for this display; see Figure 8-6):

- ▶ Act - Wait
- ▶ Wait - Inel
- ▶ Act - Inel

Work with System Status										RCHAS11	
										11/02/05	18:17:59
% CPU used :	49.4	System ASP :	74.58 G								
% DB capability :	.0	% system ASP used :	34.4796								
Elapsed time :	00:00:38	Total aux stg :	74.58 G								
Jobs in system :	259	Current unprotect used :	3601 M								
% perm addresses :	.009	Maximum unprotect :	3963 M								
% temp addresses :	.013										
Sys Pool	Pool Size M	Reserved Size M	Max Act	----DB-----	Fault Pages	--Non-DB---	Act- Wait	Wait- Inel	Act- Inel		
1	615.19	332.62	+++++	.0	.0	.1 .2	9.3	.0	.0		
2	12170.62	.87	749	.0	.0	.0 .0	440.1	.0	.0		
3	2041.48	.00	268	.0	.0	3.0 3.0	51.3	.0	.0		
4	15.25	.00	5	.0	.0	.0 .0	.0	.0	.0		
5	1221.75	.14	150	.0	.0	21.2 560.0	4607	.0	.0		
										Bottom	
===>											
F21=Select assistance level											

Figure 8-6 WRKSYSSTS display

The data that you see in the *Act - Wait* column represents the number of the thread transitions per minute from active to wait state. This is normal behavior when, for example, a thread waits for a completion of the disk read operation.

Data in the *Wait - Inel* column represents the number of the thread transitions per minute from wait to ineligible state. An *ineligible state* is when a thread is ready to continue its execution, but must wait for the number of active threads in the memory pool to fall below the maximum activity level or for a thread to reach the end of its time slice.

Data in the *Act - Inel* column represents the number of thread transitions per minute from active to ineligible state.

Your goal is to have no transitions (0) in the Wait-Inel and Act-Inel column. In this environment, you do not place a barrier for the threads to access the pool resources; increasing the activity level achieves this.

To change the activity level, you type the new value in the Max Active column and press Enter. If the automatic performance adjuster is not enabled, the new value is used while the subsystem is active.

However, there is a trade-off. As soon as you increase the activity level for the pool, more threads are eligible to share the pool's memory. This might create a situation when the allocated memory for the pool is not enough to satisfy all of the threads's needs. Some data from the memory must be placed on a disk (*page swapping*). This increases the disk faulting rate (see 8.1.5, "Disk configuration" on page 112 for more information) and can create a situation known as *system thrashing*. For this reason, your memory allocation should correspond to the activity level of the shared pool.

8.1.5 Disk configuration

As with any system workload, it is important to have a sufficient number of disk arms and a sufficient amount of free disk space. When you have less than 50% of free disk space, disk service times start to increase, creating a domino effect and eventually resulting in degraded

performance. When you have less than 10% of free disk space, the system starts sending you warning messages.

For good performance, keep your disk arm utilization under 50% and the disk IOP utilization under 60%. If Java workload does not have adequate memory, the response time often degrades. To easily determine if an application has reached this state, use the WRKSYSSTS command as shown in Figure 8-7.

Work with System Status										RCHAS11	
										10/24/05	14:12:57
% CPU used	:	46.4	System ASP	:	74.58 G						
% DB capability	:	.0	% system ASP used	:	34.2708						
Elapsed time	:	00:00:12	Total aux stg	:	74.58 G						
Jobs in system	:	260	Current unprotect used	:	3438 M						
% perm addresses	:	.009	Maximum unprotect	:	3963 M						
% temp addresses	:	.013									
Sys	Pool	Reserved	Max	----DB-----	--Non-DB---	Act-	Wait-	Act-			
Pool	Size M	Size M	Act	Fault	Pages	Fault	Pages	Wait	Inel	Inel	
1	604.68	332.66	+++++	.0	.0	.0	.0	9.8	.0	.0	
2	13406.12	.87	749	.0	.0	.0	.0	291.7	.0	.0	
3	1412.05	.00	268	.0	.0	.3	.3	9.8	.0	.0	
4	15.25	.00	5	.0	.0	.0	.0	.0	.0	.0	
5	626.20	.11	150	.0	.0	31.0	880.4	662.7	.0	.0	
										Bottom	
===>											
F21=Select assistance level											

Figure 8-7 Working with page faulting data

View the data in the *DB Fault* and *Pages* and *Non-DB Fault* and *Pages*. The data in the Non-DB columns is of interest for performance tuning. If you press F16 on this display, you switch to the Work with Disk Status display (see Figure 8-8).

Work with Disk Status										RCHAS11	
										10/24/05	14:31:25
Elapsed time:		00:00:02									
Unit	Type	Size (M)	% Used	I/O Rqs	Request Size (K)	Read Rqs	Write Rqs	Read (K)	Write (K)	% Busy	
1	4326	30769	75.2	2.0	4.0	2.0	.0	4.0	.0	0	
2	4326	30769	75.2	2.0	4.0	2.0	.0	4.0	.0	0	
3	4326	30769	75.2	2.0	4.0	2.0	.0	4.0	.0	20	
4	4326	30769	75.2	1.6	4.0	1.6	.0	4.0	.0	0	
5	4326	30769	75.2	1.6	4.0	1.6	.0	4.0	.0	0	
6	4326	30769	75.2	1.6	4.0	1.6	.0	4.0	.0	20	
7	4326	30769	75.2	1.6	4.0	1.6	.0	4.0	.0	0	
8	4326	30769	75.2	2.0	4.0	2.0	.0	4.0	.0	0	
										Bottom	
Command											
===>											
F3=Exit F5=Refresh F12=Cancel F24=More keys											

Figure 8-8 Work with Disk Status display

Disk arms can create a bottleneck when you have high database activity or write excessively to the integrated file system. If there are high page faulting rates, the disk is being overloaded, resulting in a long wait time to access the data.

High page faulting rates and high disk utilization are indicators that the amount of memory is not adequate for the workload. Plan to increase the amount available memory in the pool to gain the expected application performance.

As a rough guide, the total page faulting rate (the sum all of the DB Fault and Non-DB Fault values added over all the pools) should be below value that results from this equation:

$$100 \times (\%CPU \text{ used} / 100) \times \text{number of processors in this partition} = \text{total page faulting rate}$$

If we use the data shown in Figure 8-7, the calculation is:

$$100 \times (46.4 / 100) \times 2 = 92.8 \text{ faults per second}$$

For a more detailed discussion, refer to Chapter 19, "Miscellaneous Performance Information", which provides recommendations about page faulting, in *iSeries Performance Capabilities Reference i5/OS Version 5, Release 4*, SC41-0607, at the following Web address:

<http://publib.boulder.ibm.com/infocenter/iseries/v5r4/topic/books/sc410607.pdf>

The best way to view peak disk arm utilization is to use the Collection Services, which is beyond the scope of this topic. Alternatively you can get a quick estimate about whether disk utilization is a problem by using the following steps, assuming that you are running a Java or WebSphere workload:

1. Start the JVM.
2. Start the workload and produce stress on the JVM for a period of about 10 minutes.
3. Run the Work with Disk Status (WRKDSKSTS) command.
4. Press the F10 key and then the F5 key every 5 to 10 seconds.
5. Look at the Busy column. A single disk arm that is at 50% busy (or more) during the period can indicate a sign that the disk arms are in a bottleneck.

Important: Do not perform this stress test in your production environment because it might affect your existing applications and performance. If you must, then select a window of time when the system is not heavily used or running during peak hours.

8.1.6 Checking system values

In addition to the shared pool and disks considerations, you must be aware of several system values that can affect the performance of the WebSphere Application Server workloads.

Automatic performance adjuster

The *QPFRADJ* system value allows you to control the automatic performance adjuster component on your System i platform. The performance adjuster controls:

- ▶ The storage pools memory allocation
- ▶ The storage pools activity level
- ▶ The storage pools paging

Setting this system value provides the following levels of IBM-provided automatic tuning:

- ▶ 0 = No adjustment
- ▶ 1 = Adjustment at IPL
- ▶ 2 = Adjustment at IPL and automatic adjustment
- ▶ 3 = Automatic adjustment

If you are not experienced in tuning WebSphere Application Server, we recommend that you set QPFRADJ to either 2 or 3 and let the adjuster determine the pool's size and activity level.

Be aware that during low activity on your WebSphere or Java workload, the performance adjustment can, and probably will, remove memory from the pool in which those jobs are located if that memory is needed elsewhere. Then, if you have an increase in workload, it is possible that performance adjustment will not react fast enough to prevent paging. At best, this paging causes a short performance issue for your Web site and will cause more critical issues if it is prolonged.

The WebSphere workload might be the main workload on the system and you want to make sure that all of the required resources are available to the shared pool where the WebSphere jobs are running. In this case, perform the following steps:

1. Set the QPFRADJ system value to 3.
2. Let your applications run under a heavy workload. The automatic performance adjuster sets the pool's parameters according to the workload.
3. Enter the WRKSYSSTS command.
4. Record the size of the storage pool where the WebSphere workload runs. For example, it is 3 GB.
5. Calculate the percentage of the total main storage memory allocated to the WebSphere shared pool. For example, if you have 12 GB of memory on the system and 3 GB is allocated to the shared pool where you run WebSphere workload, then the percentage is:
$$(3 / 12) \times 100\% = 25\%$$
6. Enter the WRKSHRPOOL command.
7. Press F11 to tune the data.

- For the shared pool where you run the WebSphere workload, set the minimum pool size equal to your calculations in step 5. For an example, see Figure 8-9. This tells the automatic adjuster not to adjust this pool below 25% of the total system memory.

```

Work with Shared Pools
System: RCHAS11
Main storage size (M) . . : 12288.31
Type changes (if allowed), press Enter.

-----Size %----- -----Faults/Second-----
Pool      Priority  Minimum  Maximum  Minimum  Thread  Maximum
*MACHINE   1         2.93     100      10.00    .00     10.00
*BASE      1         4.99     100       5.00     .50     200
*INTERACT  2         5.00     100      10.00    2.00    100
*SPOOL     2         1.00     100       5.00     1.00    100
*SHRPOOL1  2         25.00    100      10.00    2.00    100
*SHRPOOL2  2         1.00     100      10.00    2.00    100
*SHRPOOL3  2         1.00     100      10.00    2.00    100
*SHRPOOL4  2         1.00     100      10.00    2.00    100
*SHRPOOL5  2         1.00     100      10.00    2.00    100
*SHRPOOL6  2         1.00     100      10.00    2.00    100
More...

Command
===>
F3=Exit  F4=Prompt  F5=Refresh  F9=Retrieve  F11=Display text
F12=Cancel

```

Figure 8-9 Limiting the effect of the automatic adjuster

QMAXACTLVL (Maximum activity level of system)

The QMAXACTLVL value specifies the number of threads that can compete at the same time for main storage and processor resources. For all active subsystems, the sum of all threads running in all memory pools cannot exceed QMAXACTLVL.

If a thread cannot be processed because the activity level was reached, the thread is held until another thread reaches a time slice end or a long wait. In Java or WebSphere environments, this usually generates a transaction rollback. This value should be larger than the sum of the activity levels for all your memory pools. If QMAXACTLVL is smaller, activity levels in the memory pools might not be used.

We recommend that you use the default setting *NOMAX. A change to this system value takes effect immediately.

8.2 WebSphere performance parameters

Besides i5/OS, there are several important parameters that you have to adjust at the JVM and WebSphere Application Server levels. This section provides recommendations for setting these parameters.

8.2.1 Tuning Java virtual machine

One of the most important tuning parameters for the Java workload is the *initial heap size* of JVM. The initial heap size controls the execution of the *garbage collector*, which in turn

affects the performance characteristics of your application. To better tune the JVM on System i5, you must understand the significance of garbage collector.

Understanding garbage collection

Garbage collection is the process of freeing the storage used by objects that are no longer referred to by any program. Because of garbage collection, Java programmers do not have to write the code to explicitly free (or delete) their objects that, otherwise, can result in memory leak program errors. The garbage collector automatically detects an object or group of objects that a user program can no longer reach, since there are no references to that object in any program structure. When the object is collected (deleted), the JVM automatically allocates the storage space for other objects.

Garbage collection on most platforms, other than on the System i platform, uses a methodology known as *stop and copy*. This means that, while the garbage collection takes place, all threads are stopped and the garbage collector takes control over of the entire memory to clean it up. While this is quite efficient, it has the disadvantage that it can cause unpredictable pauses in the user's response time.

The System i platform has concurrent and asynchronous garbage collection, which results in consistent performance to the end user. Later this chapter explains how to tune garbage collection on the System i platform to achieve the optimum performance.

Garbage collection has a price. Whether it is running as stop and copy or concurrent, it must still use CPU resources to perform its task. Understanding how the garbage collector works can help you understand how to tune it.

Garbage collector execution on the System i platform (but not on other platforms) is based on the initial heap size parameter. The initial heap size parameter is a threshold that triggers a garbage collection cycle. It does not trigger a garbage collection cycle based on the absolute size of the heap, but on the amount that the heap has grown since the last cycle (or since startup, if no cycle has yet been run).

Figure 8-10 illustrates the JVM garbage collection cycles on the System i platform. For example, if you specify an initial heap size of 96 MB, the first cycle runs after the 96 MB of space has been allocated. The garbage collector then frees some of that space for reuse (36 MB in the example in Figure 8-10). An additional 60 MB are added to the heap to make the size of the free heap equal to the initial heap size, which is 96 MB in our example. Then garbage collection waits until another 96 MB is allocated before running again.

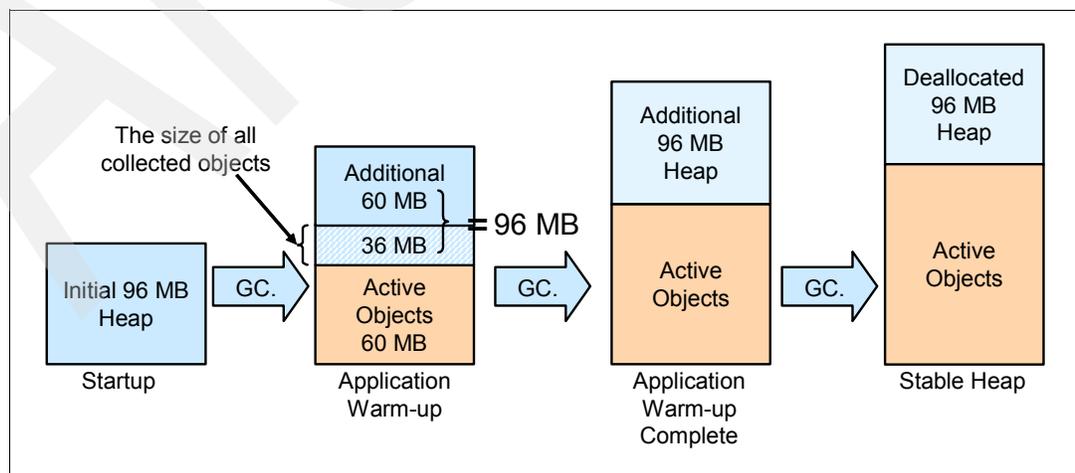


Figure 8-10 Garbage collector algorithm

Using PEX to collect performance data and tune JVM

One of the most accurate methods to tune the JVM (also known as *initial heap size*) is to use *Performance Explorer (PEX)*. The goal is to collect data about garbage collector CPU utilization. Based on this data, we make a decision about garbage collector performance.

Create a PEX trace that shows CPU utilization for garbage collection:

1. Start a 5250 session.
2. On an OS/400 command line, create a PEX trace definition:

```
ADDPEXDFN DFN(GCTEST) TYPE(*TRACE) JOB((*ALL)) MAXSTG(1000000) INTERVAL(1)
TRCTYPE(*SLTEVT) SLTEVT(*YES) BASEVT((*PMCO)) TEXT('TPROF with run cycle sampling
interval of 1 ms')
```
3. Start the trace:
 - a. Type the Start PEX (STRPEX) command and press Enter.
 - b. Enter a session ID (unique name), for example GCTEST96. For Option, select *NEW. Press Enter.
 - c. In the Filter field, type the PEX definition name (GCTEST) and press Enter. Notice the message that indicates that PEX trace has started.
4. Start your application or load tool.
5. When your test is finished, on an OS/400 command line, type the End PEX (ENDPEX) command and press Enter.
6. Select the trace (GCTEST), and press Enter.
7. Print a PEX Report by running the following command:

```
PRTPEXRPT MBR(GCTEST96) LIB(QPEXDATA) TYPE(*PROFILE)
```
8. Type the Work with Spooled File (WRKSPLF) command. Look for the QVPERPT spooled file and type option 5 (Display) next to the report. If you have multiple QVPERPT files, verify the member name, which should be equal to your session ID. In our case, it is GCTEST96.

- In the PEX trace report, search for the JAVAGC indicator as shown in Figure 8-11. In our first test garbage collection, CPU utilization is 2.9%. The best value for garbage collection CPU utilization is around 3% - 4%, but values under 10% are also acceptable.

```

Display Spooled File
File . . . . . : QVPPERPT
Control . . . . .
Find . . . . .
*...+...1...+...2...+...3...+...4...+...5...+...6...+...7...+...8...+...9...+...0...+...1...+...2...+...3
Performance Explorer Report
Profile Information
10/25/05 15:22:3
Page 1

Library . . . : QPEXDATA
Member . . . : GCTEST96
Description : *BLANK

Histogram Hit Hit Cum Start Map Stmt Name
Cnt % % Addr Flag Nbr

** 3370 5.6 5.6 FFFFFFFFC7AF320 == 000000 JITINTPT
* 2889 4.8 10.4 02F8E5B7AC3468E4 == 0 JAVA400_JD
* 1754 2.9 13.3 FFFFFFFFC8FD89C0 == ***** JAVAGC
* 1751 2.9 16.3 FFFFFFFFC84FED8 == ***** JITQCOMS
1454 2.4 18.7 FFFFFFFFC234836C == ***** JAVACLAS
1386 2.3 21.0 FFFFFFFFC1D32350 == ***** JITDATAF
1235 2.1 23.1 C7FF6026260035EC == 0
1094 1.8 24.9 FFFFFFFFC8787A8 == ***** JITQCPYP
1084 1.8 26.7 FFFFFFFF8027DC == ***** CFPLPBL
986 1.6 28.3 FFFFFFFFC4939BCC == ***** INFFAST
965 1.6 29.9 FFFFFFFF03A2E0 == ***** SMHMDBLA

F3=Exit F12=Cancel F19=Left F20=Right F24=More keys
More...

```

Figure 8-11 PEX report

Setting initial heap size for your WebSphere Application Server

To modify the initial heap size (96 MB by default), use the WebSphere Administrative Console.

- Start the Administrative Console (see 7.2, “Accessing the console” on page 88).
- Log in.
- In the left navigation frame, expand **Servers** and click **Application servers**.
- Click the name link for your application server, which is **server1** in our example.

5. In the next pane, expand **Java and Process Management** and click **Process Definition** (see Figure 8-12).

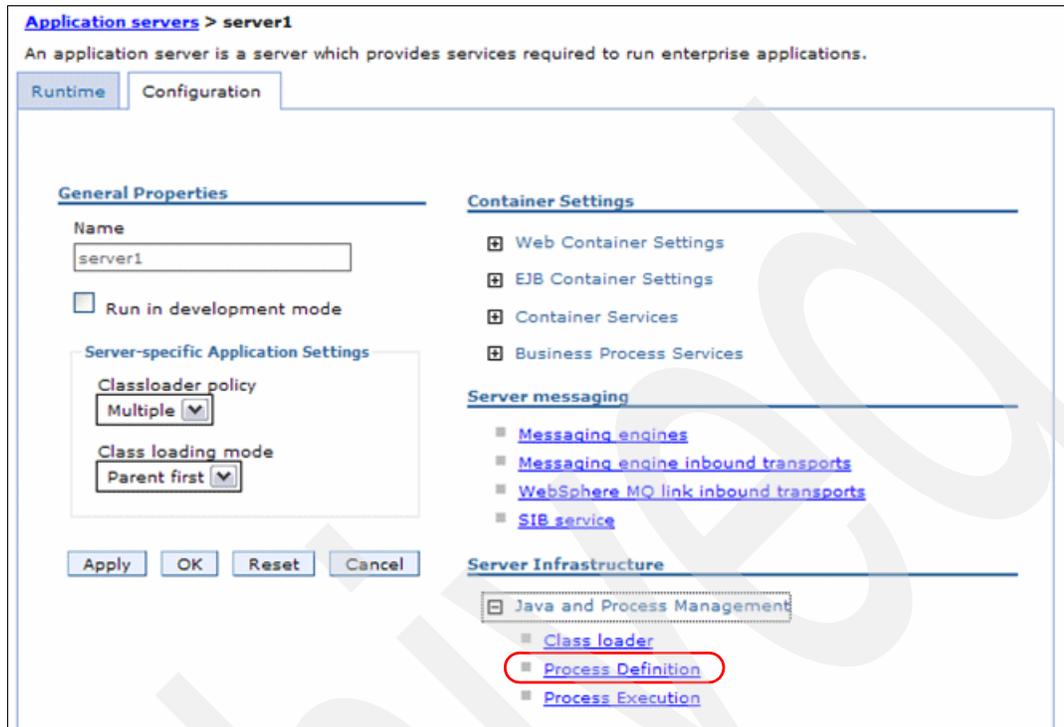


Figure 8-12 Accessing process definitions

6. In the next pane, click the **Java Virtual Machine** link.

7. In the Java Virtual Machine pane, under General Properties, in the Initial Heap Size field, type the desired value of the initial heap size (in MB). If this is the first time that you are changing this value, the field is blank. This indicates that the default value is used. See Figure 8-13. Click **OK**.

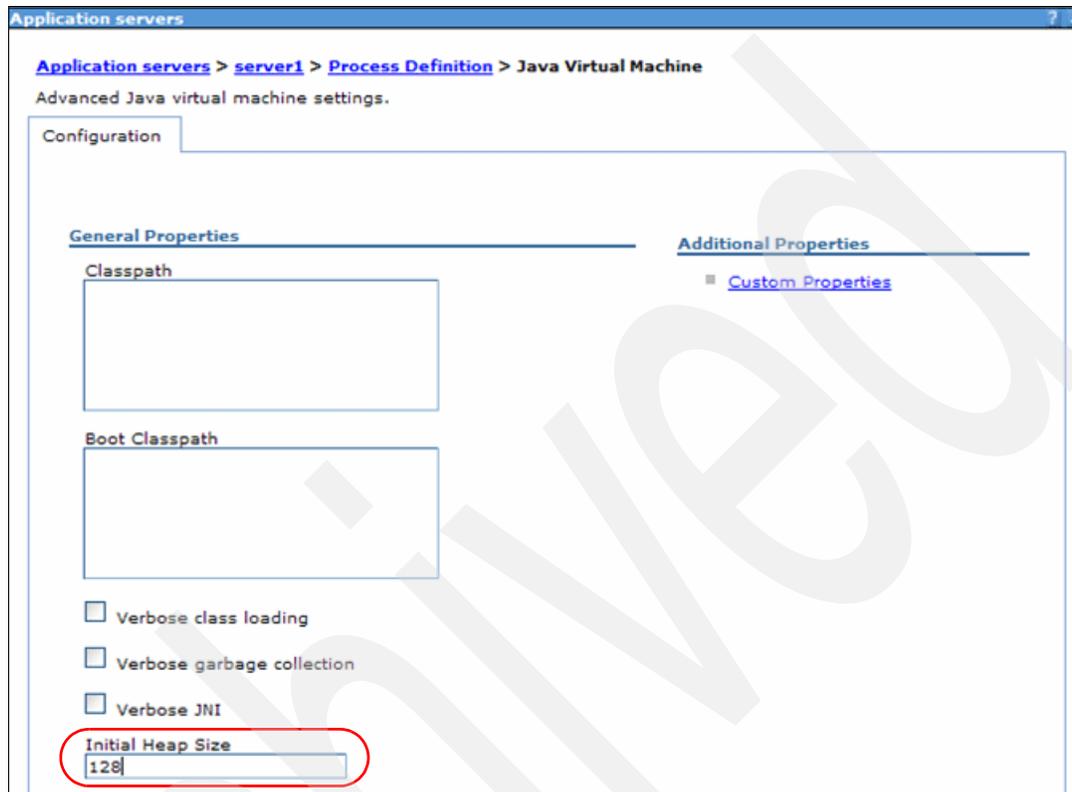


Figure 8-13 Setting the initial heap size

8. Click the **Save** link at the top of the page to save your changes.
9. Log out from the console.
10. Restart your application server.

Tuning methodology

In the previous sections, you learned how to analyze and set the initial heap size. However, it takes time to find an optimal value. Repeat the process of setting and analyzing the initial heap size several times before you can get close to the optimal value. In an ideal situation, you should plan for stress testing and tuning your applications before you deploy them on a production server.

8.2.2 Web container

Each WebSphere Application Server contains a Web container that routes requests to a transport queue between the Web server plug-in and the Web container. The Default Web container properties are set for simple Web applications. However, these values might not be appropriate for more complex Web applications. Therefore, you might have to adjust these parameters to tune the Web container based on the specific needs of your environment.

Thread pool

The thread pool settings within the Web Container is where you set the number of clients that your application server can process concurrently. This greatly depends on your system's CPU speed, amount of memory, and number of disk arms.

We recommend that you set the value of the maximum size to handle the peak load on your application server. Set it to a maximum size less than or equal to the number of threads processing requests in your HTTP Server (powered by Apache). A value in the range of 25 to 50 is generally a good starting point for smaller Web applications. Use the Tivoli Performance Viewer to monitor the number of threads being used to provide you with a better idea on the value that you should set the maximum size value to.

To determine your current workload, use *Tivoli Performance Viewer* to view real-time activity. Access Tivoli Performance Viewer for your thread pool settings by using these steps:

1. Access the WebSphere Administrative Console.
2. Log in.
3. Expand **Monitoring and Tuning** → **Performance Viewer** and click **Current Activity** (see Figure 8-14).

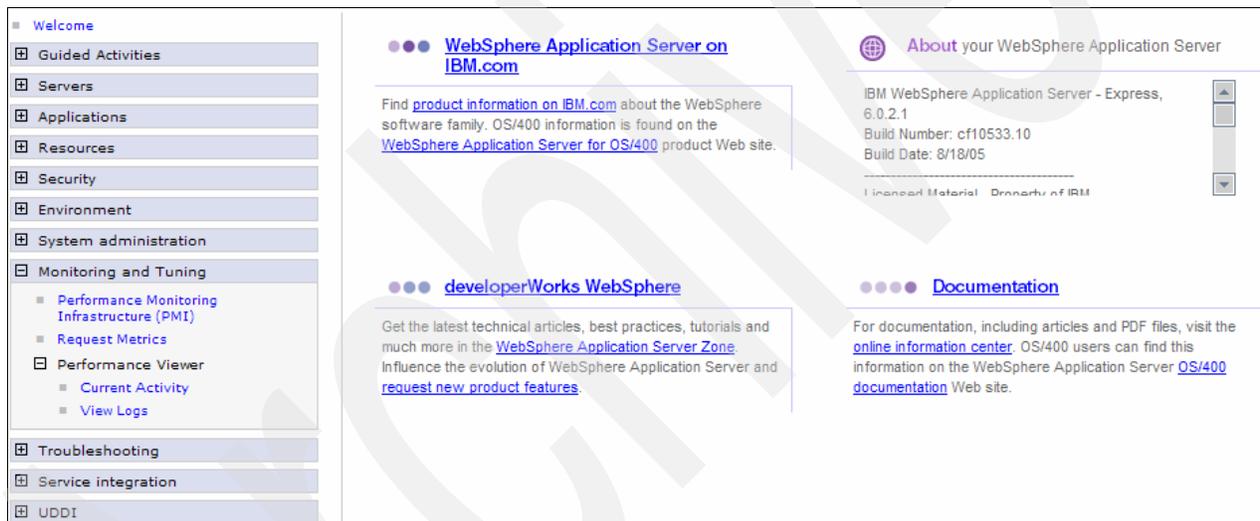


Figure 8-14 Accessing

- In the next pane (Figure 8-15), select the name of the application server. In this example, we select **server1**. Then click the **Start Monitoring** button to start the collection of data.

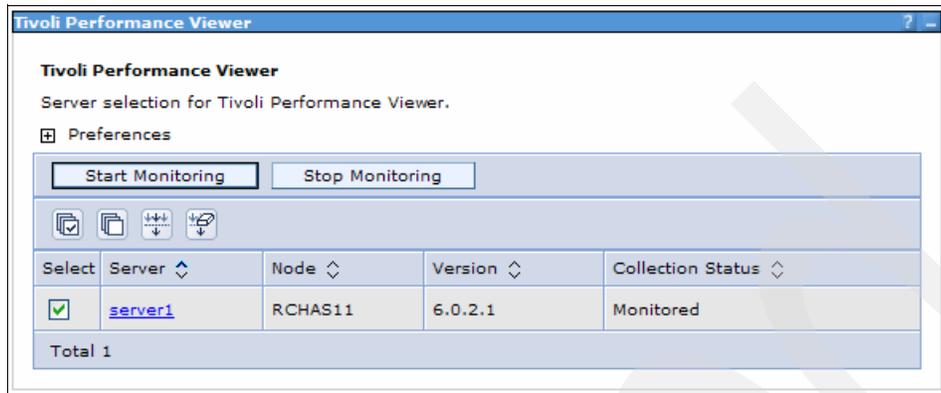


Figure 8-15 Tivoli Performance Viewer - Application Server

- Click the server name link.
- As shown in the pane in Figure 8-16, expand **Performance Modules** and select the **Thread Pools** section.

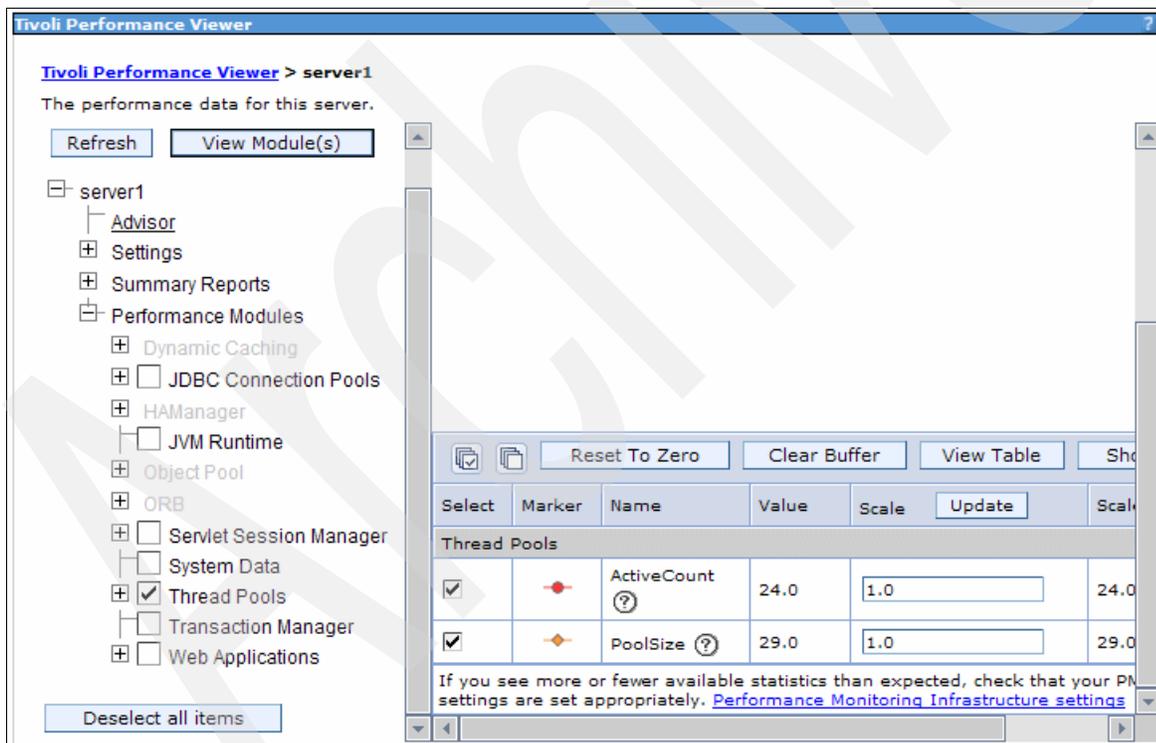


Figure 8-16 Tivoli Performance Viewer - Thread Pools

- Click the **View Modules** button. Real-time data is displayed in the lower right pane of your window.

- To view the number of current active threads in your pool, click the **View Table** button. A time window is displayed showing the number of connections on a predefined time interval basis (see Figure 8-17).

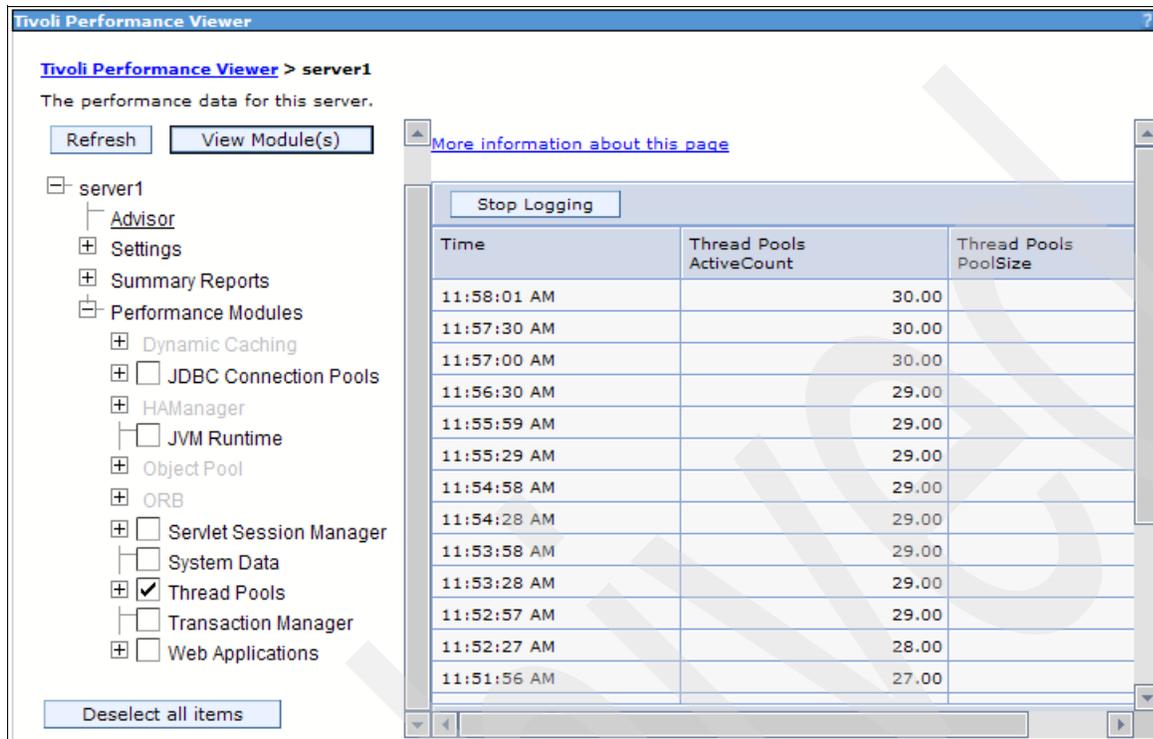


Figure 8-17 Tivoli Performance Viewer - Thread Monitoring

After you view this information, you should have a good understanding of the size of your thread pool. Repeat this process for several days to obtain a clear picture of the thread activity in your environment.

If the number of active threads is always at the maximum capacity of the pool, increase the maximum size of your pool. However keep in mind, that increasing the pool size places more workload on your system. Consequently you have enough capacity on your server to support this additional workload.

You should also analyze the effect of this change on the system performance. Most likely you will have to re-evaluate your shared pool and JVM runtime settings to make sure they are still at their optimum level.

To modify your thread pool settings based on the information obtained from the Tivoli Performance Viewer, follow these instructions:

1. Access the WebSphere Administrative Console.
2. Log in.
3. In the navigation frame, expand **Servers** and click **Application servers**.
4. Click the name of your server, which is **server1** in our example.
5. In the next pane, toward the bottom, click the **Thread Pools** link.
6. In the next pane, click the **WebContainer** link.

7. In the next pane, which shows the thread pool settings (see Figure 8-18), modify the value in the Maximum Size field. Then click **OK**.

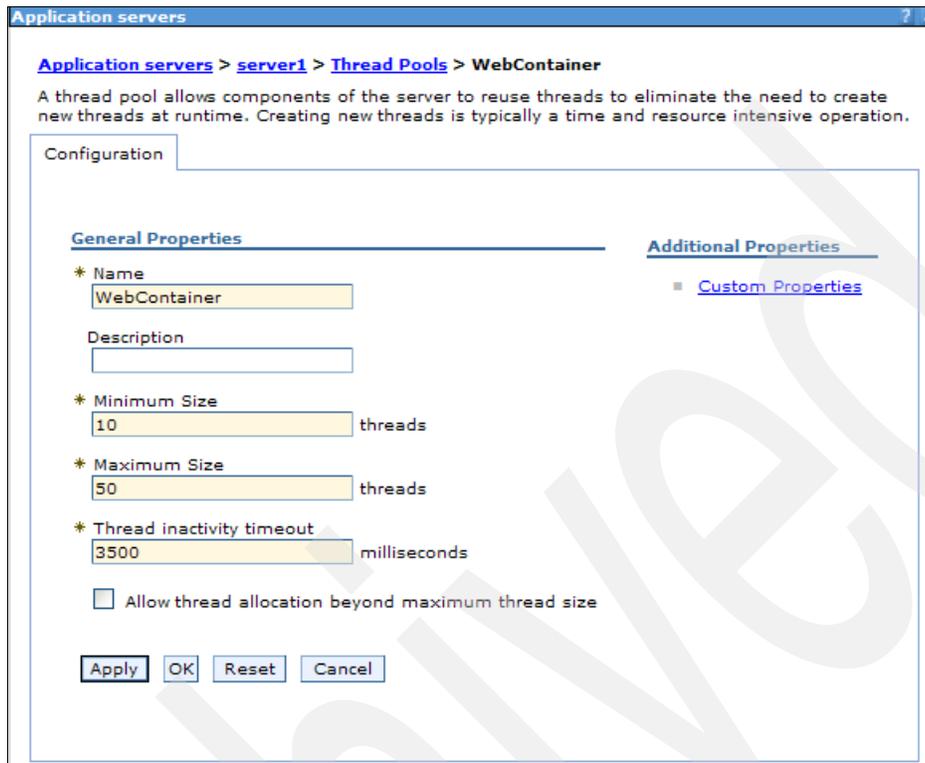


Figure 8-18 Thread pool settings

Tip: We recommend that you do not enable the Allowed thread allocation beyond maximum thread size property if you are confident that the current maximum size value can adequately process the peak load on your application server.

8.2.3 Connection pool (data source)

The connection pool basically manages the connections to the database and ensures that the connections are used in an efficient manner because establishing a database contention can be an expensive operation. When a user makes a request over the Web to a resource, the resource accesses a data source. Because clients connect and disconnect quite frequently with applications on the Internet, the application requests for data access can increase to a considerably large volume, resulting in performance deterioration. However, when connection pooling capabilities are used, Web applications can take advantage of performance improvements of up to 20 times the normal results.

To determine the minimum and maximum number of connections that your application must establish to the database, use the Tivoli Performance Viewer. Tivoli Performance Viewer will provide you with a starting point for monitoring the connections usage.

To access the Tivoli Performance Viewer for your connection pool settings:

1. Access the WebSphere Administrative Console.
2. Log in.

3. Expand **Monitoring and Tuning** → **Performance Viewer** and click **Current Activity** (see Figure 8-14 on page 122).
4. In the next pane, select the name of the application server by placing a check mark in the **Select** column. Then click the **Start Monitoring** button to start the collection of data (see Figure 8-15 on page 123).
5. Click the server name link.
6. In the pane that opens (see Figure 8-19), expand **Performance Modules**. Select the appropriate JDBC Driver for your application to monitor. In our example, we select **DB2 UDB for iSeries (Toolbox)**. Place a check mark in the boxes located next to the components that you want to monitor for and click **View Tables**.

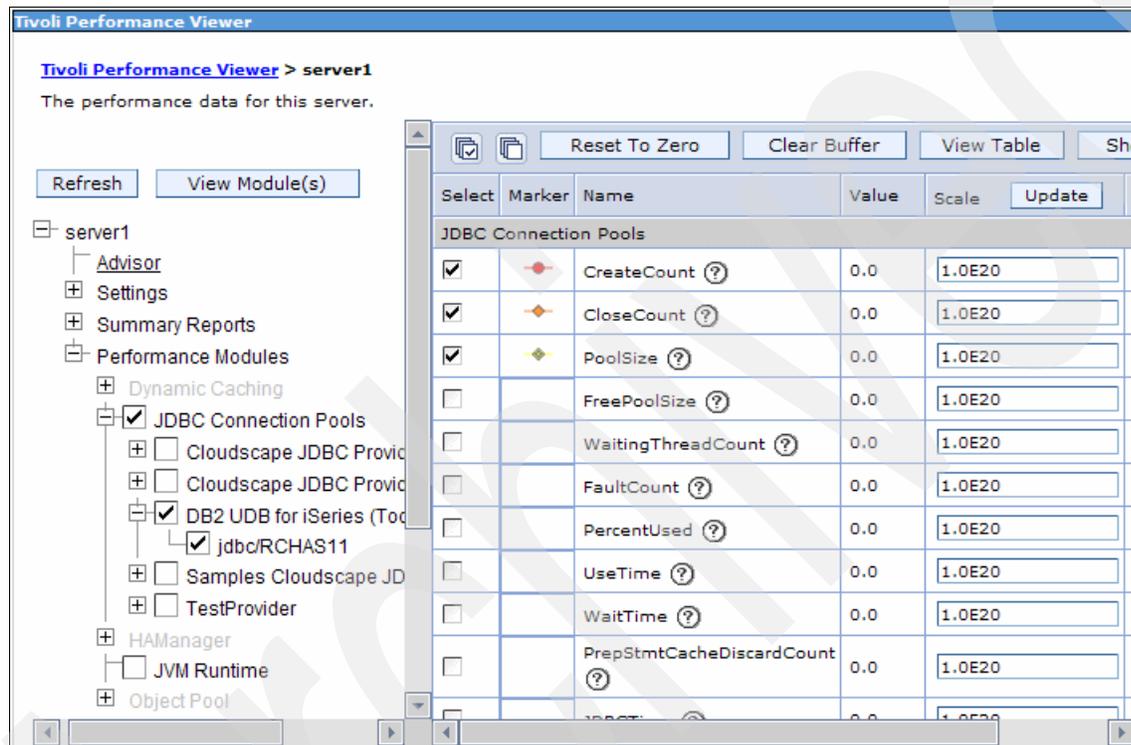


Figure 8-19 Tivoli Performance Viewer - database connections

7. A time window opens showing the number of connections that are being used. This should give you an idea on the number of connections your application is presently using. Perform this monitoring for several days to give you the best possible idea on the average amount of connections being established.
8. With that information, you are ready to update the connection pool (if required). Expand **Resources** and click **JDBC Providers**.
9. Select the name of your JDBC provider, which in our case is **DB2 UDB for iSeries (Toolbox)**.
10. In the next pane, click the **Data Sources** link.
11. In the next pane, click the data source name link.
12. In the next pane, click the **Connection pool properties** link.

13. Modify the value in the Maximum connections field (see Figure 8-20).

The screenshot shows a 'Configuration' dialog box with two main sections: 'General Properties' and 'Additional Properties'. Under 'General Properties', there are several input fields: 'Scope' (text box with 'cells:RCHAS11:nodes:RCHAS11:servers:server1'), 'Connection timeout' (text box with '180' and 'seconds' label), 'Maximum connections' (text box with '10' and 'connections' label, circled in red), 'Minimum connections' (text box with '1' and 'connections' label), 'Reap time' (text box with '180' and 'seconds' label), 'Unused timeout' (text box with '1800' and 'seconds' label), 'Aged timeout' (text box with '0' and 'seconds' label), and 'Purge policy' (dropdown menu with 'EntirePool' selected). Under 'Additional Properties', there are two links: 'Advanced connection pool properties' and 'Connection pool custom properties'. At the bottom of the dialog are four buttons: 'Apply', 'OK', 'Reset', and 'Cancel'.

Figure 8-20 Connection pool settings

8.2.4 JDBC performance considerations

Two JDBC drivers are available for DB2 Universal Database for iSeries: the Native driver and IBM Toolbox driver. The Native JDBC driver is a part of the iSeries JVM and performs better than the Toolbox JDBC driver. However, you can only use this driver if your application and database are on the same server.

The Toolbox driver runs on any JVM. Currently, we recommend to our clients that when you are running on the iSeries directly, use the Native JDBC driver. When your program runs from another JVM and will access the iSeries, use the Toolbox driver.

The best advice is to avoid tying (hardcoding) your program to use a specific JDBC driver. Instead, make the JDBC driver configurable at run time. Users can then specify the JDBC driver that makes sense in their environment.

8.2.5 Stress test tools

When experiencing performance related issues, you might want to engage in some load and stress testing to help identify your thresholds and bottlenecks. The following load generating tools, among others, can help simulate your workload in order to produce consistent results.

- ▶ *IBM Rational® Performance Tester* is an enterprise-level test automation tool for performance analysis of Web applications.
- ▶ *Apache JMeter* is a 100% pure Java desktop application that is designed to load test functional behavior and measure performance.
- ▶ *Mercury LoadRunner* is probably the most popular software in this list. It is used as the industry-standard load testing product for predicting system behavior and performance.
- ▶ Open source *OpenSTA* is a distributed software testing architecture, based on CORBA, that can generate realistic, heavy loads simulating the activity of hundreds to thousands of virtual users.
- ▶ *SourceForge Grinder* is a pure Java load-testing framework.



Troubleshooting

Your WebSphere Application Server V6 environment consists of a vast number of components and product features that interact with each other. Managing such a complex environment can sometimes be quite challenging for an administrator. Often you are confronted by error conditions that you have not encountered before and you attempt to solve these problems by trial-and-error. This approach has its benefits; you acquire valuable skills which you can use in the future when you encounter similar situations. However, you probably do not always have time to search for answers and to attempt a number of different approaches for solving your problem.

In this chapter, we provide you with several basic troubleshooting tips and techniques. These methods will assist you in identifying some of the more common WebSphere Application Server V6 problems. We show you examples of typical errors that Clients encounter and how you can correct these. We also provide information to assist you in tracking WebSphere Application Server V6 performance problems. And we explain how you can use the built-in monitoring tools to analyze and address performance-related problems.

9.1 Where to start

The first step in solving a problem is to identify the problem and then to understand which area of your WebSphere Application Server V6 environment is generating the error condition, for example:

- ▶ Is the problem in IBM Web Administration for iSeries?
- ▶ Is WebSphere Application Server V6 generating the error?
- ▶ Is it a Java application problem?

The basic principle is first to focus on the more obvious causes and then to expand into more complex problem analysis and investigations. In the sections that follow, we show you some of the more common areas of problem determination that you should focus on.

9.1.1 Checking your PTFs

We discuss the importance of installing all the required WebSphere Application Server V6 group program temporary fixes (PTFs) in 2.2.6, “Install your System i5 program temporary fixes” on page 26.

When faced with WebSphere Application Server V6 problems, ensure that you have met all the WebSphere Application Server V6 PTF requirements and that your group PTF levels are current. You can verify your current group PTF levels by using the iSeries Navigator interface or by using the Work with PTF Groups (WRKPTFGRP) OS/400 command.

For more information about the latest available OS/400 group PTFs, go to Fix Central at the following Web address:

<http://www.ibm.com/eserver/support/fixes/fixcentral/main/iseries>

You can find a list of the latest available PTFs for WebSphere Application Server V6.0 for OS/400 at the following Web address:

<http://www.ibm.com/servers/eserver/iseries/software/websphere/wsappserver/services/service.html>

If your group PTFs, cumulative PTF packages, or individual PTFs are older than the recommended levels, then you can download these directly to your iSeries server by using Fix Central (see previous Web address).

For more detailed information about how to order and download PTFs from Fix Central, refer to Appendix C, “Downloading PTFs using Fix Central” on page 207.

9.1.2 Checking your fix packs

WebSphere Application Server fix packs address and fix known problems as well as provide new functionality. Interim fix packs are released approximately every six to eight weeks.

Always make sure that you have the latest WebSphere Application Server V6 fix pack installed. You can view and download the latest available fix packs from the following Web address:

<http://www.ibm.com/software/webservers/appserv/was/support>

We recommend that you download and install these interim fix packs regularly so that your system remains current with the latest available WebSphere Application Server V6 fixes. “Installing the WebSphere Application Server V6 fix pack” on page 40 contains detailed information about how to download and install WebSphere Application Server V6 fix pack.

9.1.3 Checking software prerequisites

Make sure that you have all software products and components installed that are required by WebSphere Application Server V6. Refer to 2.2.5, “Check your System i5 software” on page 24, which contains a list of all WebSphere Application Server V6 prerequisite software.

It is important that you have these product options installed in order for WebSphere Application Server V6 to function.

9.1.4 Checking the iSeries TCP/IP configuration

Both WebSphere Application Server and the HTTP Admin server use TCP/IP to communicate with your System i platform. If you encounter communication problems or are unable to access any of these services, make sure that iSeries host tables are configured correctly. WebSphere Application Server V6 has a built-in utility, called *IPTest* to assist you with this.

To use *IPTest* to verify that TCP/IP is configured correctly:

1. In a 5250 emulator, start the Qshell interface by using Start Qshell (STRQSH) OS/400 command.
2. Change your current directory to the WebSphere Application Server V6 installation directory, for example:

```
cd /QIBM/ProdData/WebSphere/AppServer/V6/Base/bin
```
3. Type *IPTest* to run the *IPTest* utility and press Enter. Figure 9-1 shows an example of the output result of the *IPTest* script.

```
QSH Command Entry

$
> cd /QIBM/ProdData/WebSphere/AppServer/V6/Base/bin
$
> IPTest
Local Address: 10.10.1.1
Local Name: RCHAS.RCHLAND.IBM.COM
All addresses for RCHAS11.RCHLAND.IBM.COM:
    10.10.1.1
$
===>
$
```

Figure 9-1 *IPTest* output

If the *IPTest* utility produces an error or the information does not correspond to the TCP/IP address of your iSeries server, then verify your host table entries and your iSeries TCP/IP domain information.

To check your TCP/IP domain information:

1. Enter the Configure TCP/IP (CFGTCP) OS/400 command and press Enter.
2. In the Configure TCP/IP display, type option 12 (Change TCP/IP domain information) and press Enter.
3. In the Change TCP/IP Domain display, write down the host and domain names. Press F12 to exit.

4. In the Configure TCP/IP display, enter option 10 (Work with TCP/IP host table entries) and press Enter.
5. In the Work with TCP/IP Host Table Entries display, look for the IP address entry that corresponds to your iSeries server. Make sure that it contains a host name entry that you recorded in step 3. Figure 9-2 shows an example of the details that you should see.

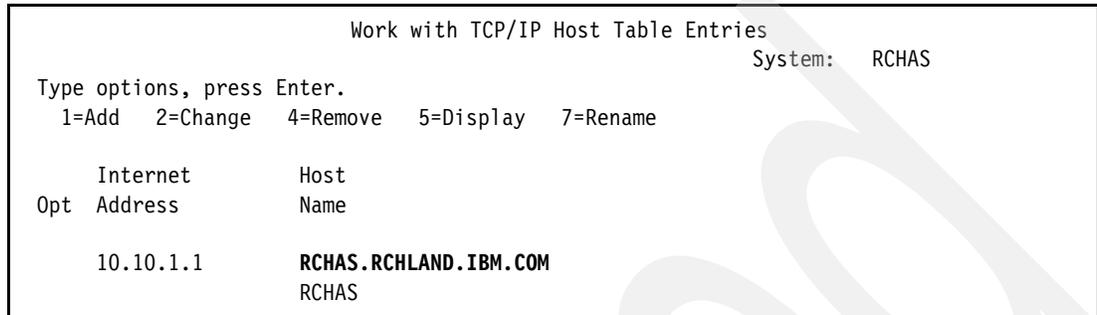


Figure 9-2 Host table entry

If the *host name.domain name* entry does not exist, type option 2 next to the TCP/IP address of your server and add the entry.

6. After you make any changes to the TCP/IP configurations, restart the HTTP Admin server.
7. Run the IPTest utility again as explained previously to ensure your configuration is correct.

9.1.5 Checking the QEJBSVR user profile

The QEJBSVR OS/400 user profile is required by WebSphere Application Server V6, as well as the wizards in the IBM Web Administration for iSeries. For any reason, if this user profile is deleted or disabled, you will encounter errors related to the QEJBSVR profile when accessing the integrated file system of system objects.

You can check the status of the user profile by using iSeries Navigator. As shown in Figure 9-3, select **your server** → **Users and Groups** → **All Users**.

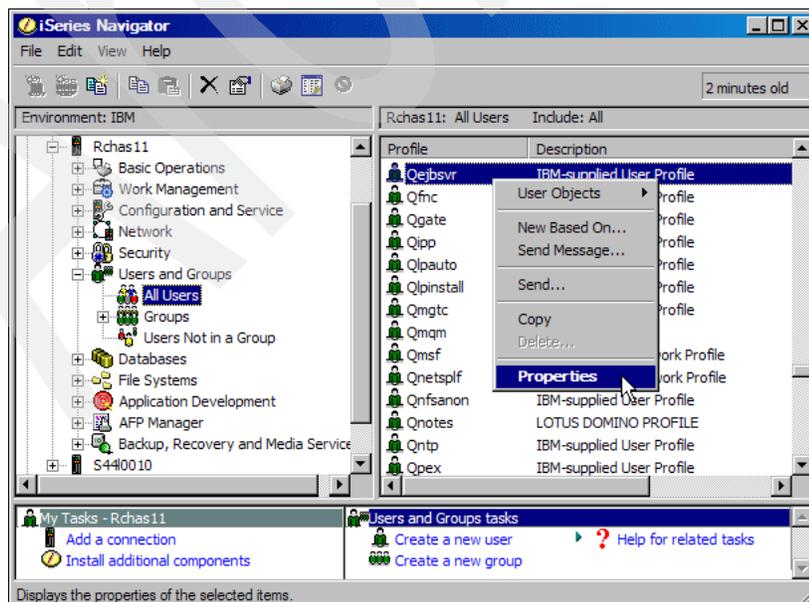


Figure 9-3 Checking the QEJBSVR user profile

In the Properties window (Figure 9-4), ensure that **Enable user for processing** is selected.

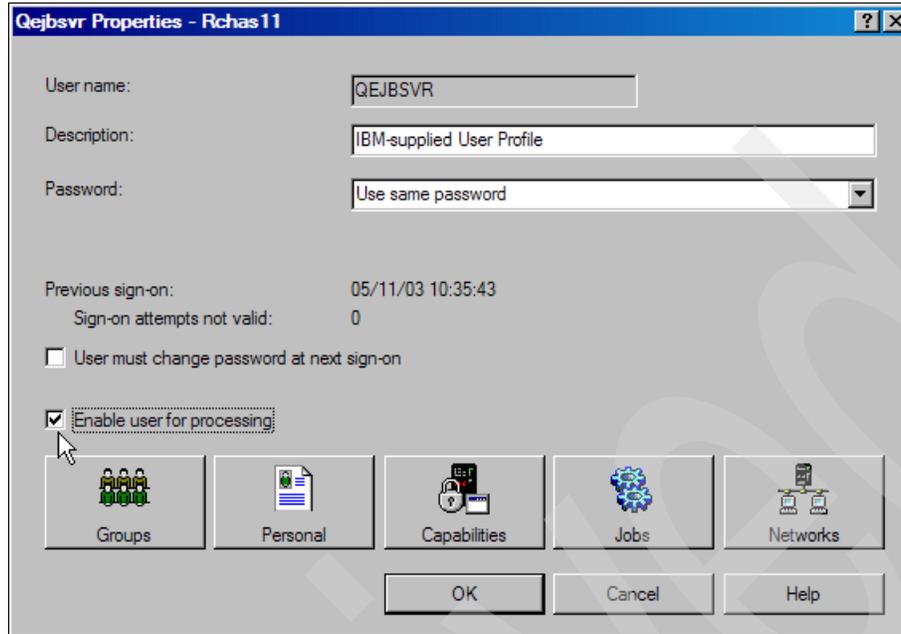


Figure 9-4 Enable QEJBSVR user profile

You can also use the Display User Profile (DSPUSRPRF) OS/400 command to display this information, for example:

```
DSPUSRPRF USRPRF(QEJBSVR)
```

Then make sure that the Status parameter shows the command and that the third line down is the status. Make sure it is *ENABLED.

If you find that the QEJBSVR user profile is disabled, you must re-enable it and determine the reason why this user profile has become disabled.

The Analyze Profile Activity (ANZPRFACT) OS/400 command is a prime candidate for disabling user profiles. When you run the ANZPRFACT OS/400 command, or you select option 4 on the OS/400 SECTOOLS menu, an OS/400 job is created that periodically checks for user profiles that was not physically signed onto the iSeries for a specified period of time. These user profiles are then automatically disabled, unless you specifically exclude a particular user profile.

To check if this job is scheduled on your iSeries server:

1. Enter the Work with Job Schedule Entries (WRJOBSCDE) OS/400 command.
2. Look for an entry named QSECIDL1. Figure 9-5 shows an example of the displayed entries.

If you do not see the QSECIDL1 entry, then the job is not scheduled on your server.

If you see the QSECIDL1 entry, type option 5 next to it to see how often this job runs.

The QSECIDL2 program parameter indicates the number of days after which a user profile is disabled if that user did not sign on to the iSeries server. For example the following command indicates that user profiles that had not signed on to the server in the last 60 days will be disabled:

```
QSYS/CALL PGM(QSYS/QSECIDL2) PARM('60')
```

Work with Job Schedule Entries						RCHAS	
						11/18/05 15:01	
Type options, press Enter.							
2=Change		3=Hold		4=Remove		5=Display details	
6=Release		8=Work with last submission		10=Submit immediately			
Opt	Job	Status	-----Schedule-----		Frequency	Recovery Action	Next Submit Date
	PERFNAVPG	HLD	*MONTHSTR	02:30:00	*MONTHLY	*SBMRLS	12/01/05
	QSECIDL1	SCD	*ALL	01:00:00	*WEEKLY	*SBMRLS	11/19/05
	QSJHEARTBT	SCD	*ALL	09:57:00	*WEEKLY	*NOSBM	11/19/05
	QS9SACOL	SCD	*ALL	10:27:00	*WEEKLY	*NOSBM	11/19/05

Figure 9-5 QSECIDL1

You can ensure that the QEJBSVR user profile is not automatically disabled by using the Change Active Profile List (CHGACTPRFL) OS/400 command, for example:

```
CHGACTPRFL USRPRF(QEJBSVR) ACTION(*ADD)
```

This command adds the QEJBSVR user profile to the list of permanently active user profiles. You can also use the OS/400 menu SECTOOLS, option 3, to perform this task.

9.2 WebSphere log files

If you must investigate a particular problem or error condition in more detail, the WebSphere Application Server V6 logs are a good starting point. In this section, we briefly discuss a few of the different logs that you can look into to determine the cause of a particular error.

9.2.1 OS/400 job logs

The OS/400 job log for your application server contains useful information to troubleshoot the errors that you might have even before the Java virtual machine (JVM) is started. Typically, if the application server fails to start, the job log is written to the job's spool file. You can read this spooled output to determine the cause of the problem.

Figure 9-6 shows how you can access the server jobs using iSeries Navigator. Select **your server name** → **Basic Operations** → **Jobs**. In the right pane, right-click the server job that you want to analyze, which in this case is **Server1**. If the job is currently active, you can select the **Job Log** option; otherwise, select the **Printer Output** option.

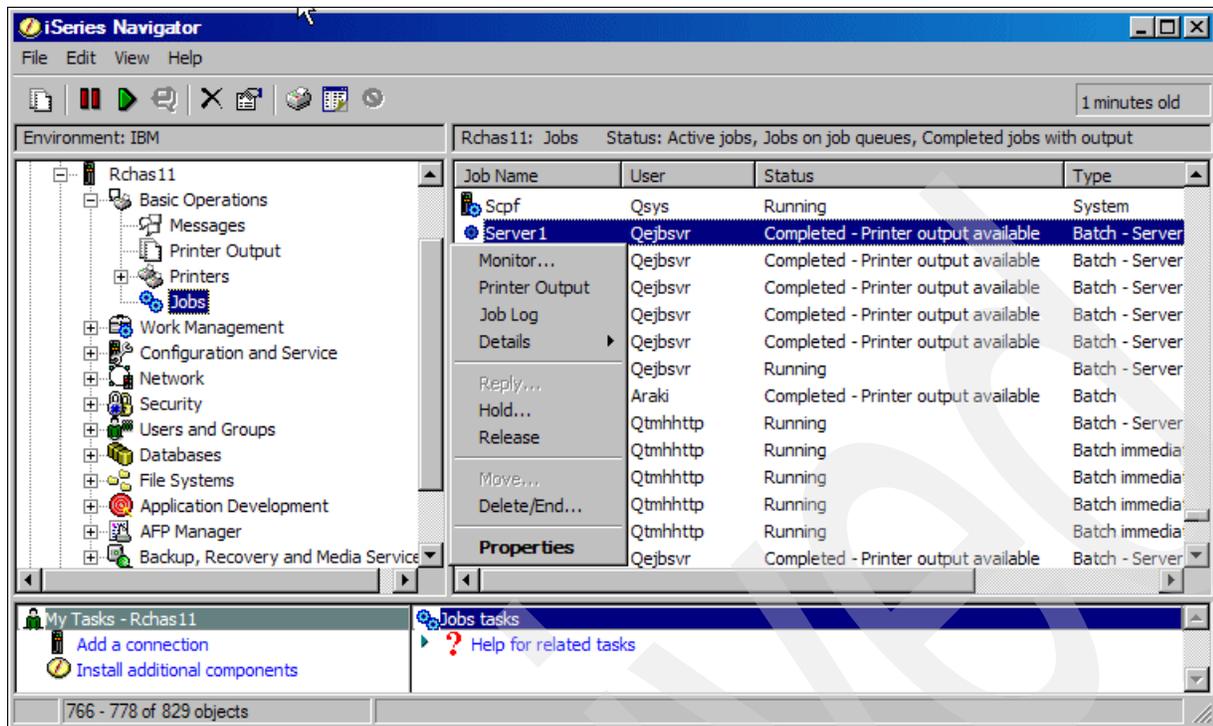


Figure 9-6 Work with server job information

You can also access this job log or printer output by using the Work with Jobs (WRKJOB) OS/400 command, for example:

```
WRKJOB JOB(SERVER1)
```

Then, select option 10 (Display job log), if active or on job queue, or select option 4 (Work with spooled files).

The job might have generated more than one spool file. For example, if the JVM could not start, a QJAVA report is generated, in addition to the default QPJOBLOG report. One of the typical reasons for not being able to start a JVM is specifying a wrong server name on the command line.

9.2.2 SystemErr.log and SystemOut.log

The SystemErr.log and SystemOut.log log files are located in `/QIBM/UserData/WebSphere/AppServer/V6/Base/profiles/profilename/logs/servername`. In this path, *profilename* corresponds to the name of the WebSphere Application Server V6 profile that you want to troubleshoot, and *servername* is the name of the server under this profile. In most cases, the server and profile names are the same.

These log files contain the following information:

- ▶ Java System.out and System.err streams
- ▶ All WebSphere runtime messages
- ▶ Application output through System.err and System.out

You can access these log files through IBM Web Administration for iSeries or the WebSphere Administrative Console. To use Web Administration for iSeries, access your server home page (see Chapter 4, “Getting started with WebSphere” on page 51). In the left navigation frame, under Problem Determination, select the **View Logs** link (see Figure 9-7).

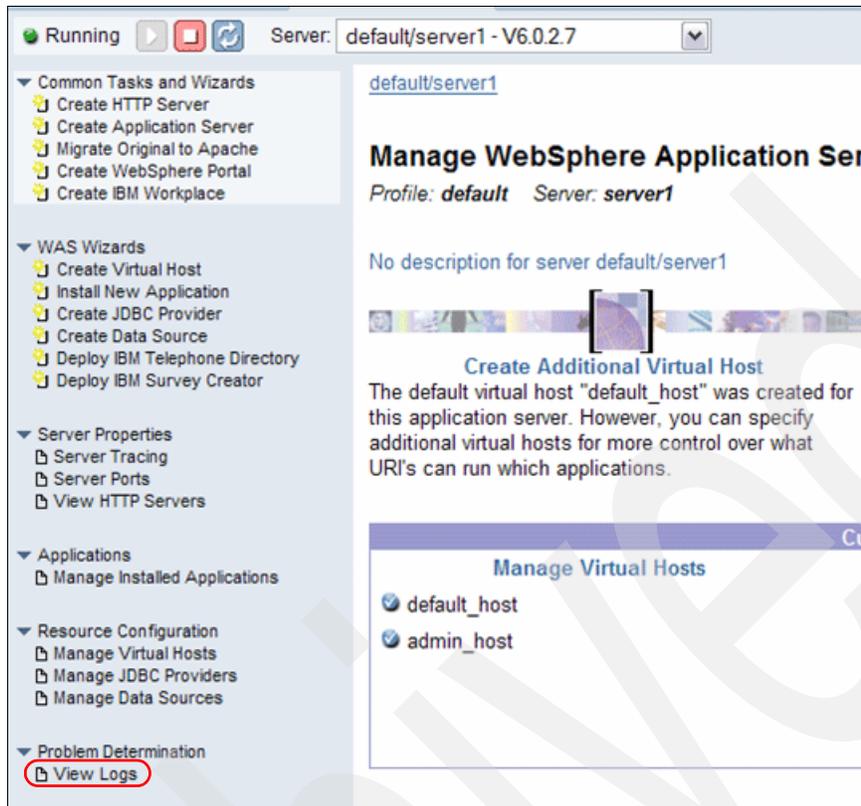


Figure 9-7 Accessing the logs

Figure 9-8 shows an example of how you can access these logs from the WebSphere Administrative Console. In the navigation frame on the left, click **Troubleshooting** → **Logs and Trace**. Then in the right pane, under General Properties, click **JVM Logs**.

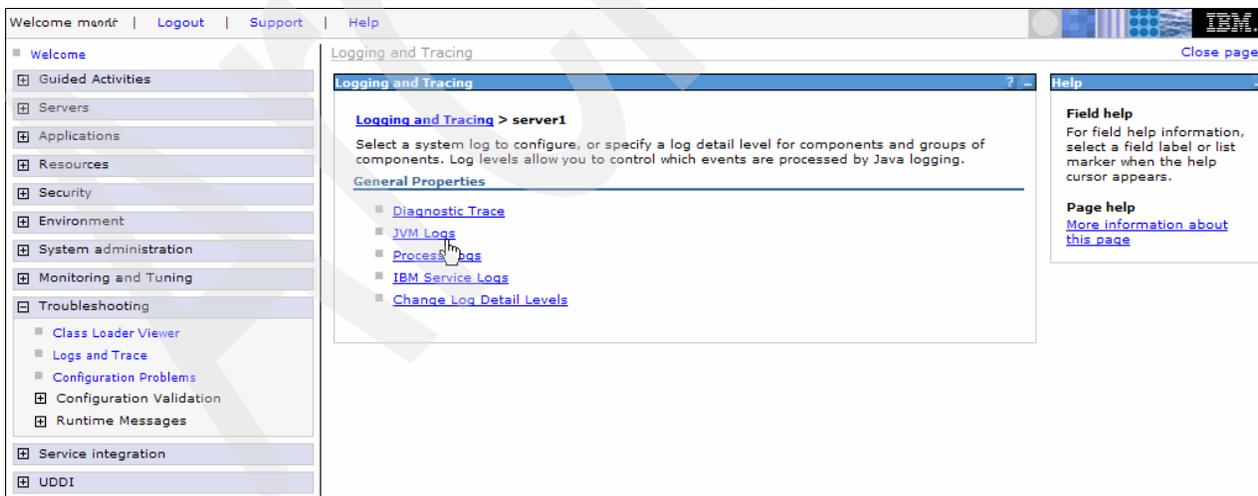


Figure 9-8 Accessing the JVM logs

To view the log file:

1. Select **JVM logs** as shown in Figure 9-8.
2. In the next pane, click the **Runtime** tab.
3. Click the **View** button next to the log file that you want to view (see Figure 9-9).

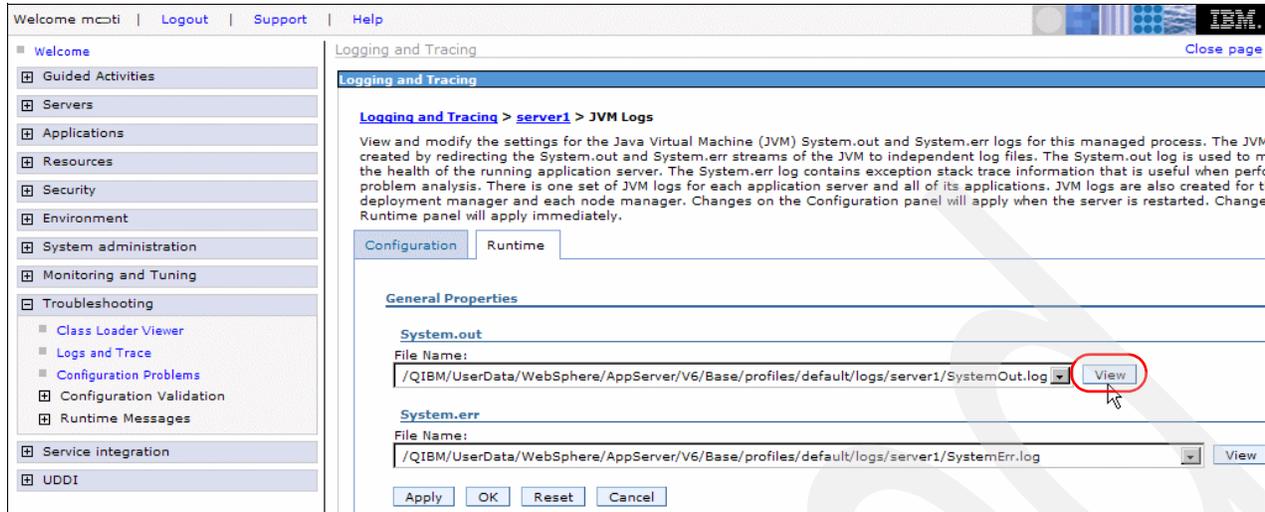


Figure 9-9 Viewing the JVM logs

On the Configuration tab (see Figure 9-9), you can specify:

- ▶ The maximum size of the log files
- ▶ The number of historical log files that you want to retain on the system
- ▶ The directory path where you want to store these log files

Figure 9-10 shows an example of the contents of the SystemOut.log file.

```
[11/3/05 11:16:50:959 CST] 000000ac ThreadMonitor W   WSVR0605W: Thread "WebContainer :
3" (0000008c) has been active for 743667 milliseconds and may be hung. There is/are 1
thread(s) in total in the server that may be hung.
[11/3/05 11:16:51:307 CST] 000000ac ThreadMonitor W   WSVR0605W: Thread "WebContainer :
0" (0000004c) has been active for 713592 milliseconds and may be hung. There is/are 2
thread(s) in total in the server that may be hung.
[11/3/05 11:16:51:332 CST] 000000ac ThreadMonitor W   WSVR0605W: Thread "WebContainer :
4" (00000094) has been active for 708487 milliseconds and may be hung. There is/are 3
thread(s) in total in the server that may be hung.
[11/3/05 11:16:51:340 CST] 000000ac ThreadMonitor W   WSVR0605W: Thread "WebContainer :
1" (0000004f) has been active for 709637 milliseconds and may be hung. There is/are 4
thread(s) in total in the server that may be hung.
[11/3/05 11:17:39:462 CST] 000000af ServletWrappe A   SRVE0242I: [adminconsole]
[/ibm/console] [/com.ibm.ws.console.pmirm/filterSummary.jsp]: Initialization successful.
[11/3/05 11:17:44:561 CST] 000000bd ServletWrappe A   SRVE0242I: [adminconsole]
[/ibm/console] [/com.ibm.ws.console.servermanagement/collectionTableLayout.jsp]:
Initialization successful.
[11/3/05 11:17:45:073 CST] 000000bd ServletWrappe A   SRVE0242I: [adminconsole]
[/ibm/console] [/com.ibm.ws.console.probdetermination/blank.jsp]: Initialization
successful.
[11/3/05 11:17:52:141 CST] 000000bd ServletWrappe A   SRVE0242I: [adminconsole]
[/ibm/console] [/com.ibm.ws.console.servermanagement/tabsLayout.jsp]: Initialization
successful.
[11/3/05 11:17:53:596 CST] 000000bd ServletWrappe A   SRVE0242I: [adminconsole]
[/ibm/console] [/com.ibm.ws.console.perf.pmi/pmiConfig60.jsp]: Initialization
successful.
```

Figure 9-10 SystemOut.log file

9.2.3 native_stderr.log and native_stdout.log

The native_stderr.log and native_stdout.log log files are located in `/QIBM/UserData/WebSphere/AppServer/V6/Base/profiles/profilename/logs/servername`. Here *profilename* corresponds to the name of the WebSphere Application Server V6 profile that you want to troubleshoot. *servername* is the name of the server under this profile. In most cases, the server and profile names are the same.

Native output from Java Development Kit (JDK™) or Java Native Interface (JNI) code that is written to stdout and stderr is written to these logs. If you enable verbose class loading, the output goes to the native_stdout.log

To view these files in the WebSphere Administrative Console, select **Troubleshooting** → **Logs and Trace** → *server name* → **Process Logs**.

You can change the name and directory where they are stored on the Configuration tab. Then you can use the Runtime tab to view the logs.

9.3 Tracing IBM Web Administration for iSeries

If you receive error messages while going through any of the wizards or doing anything in the IBM Web Administration for iSeries console, enable tracing on the *ADMIN HTTP server since this is where the wizards run. This is also where you look for errors if you do not see the expected results from the wizards and if the application servers do not display in the GUI:

1. Use either the Edit File (`edt`) command or a mapped drive and go to `/QIBM/ProdData/HTTPAdmin/admin/conf/workers.properties`.
2. In the workers.properties file, look for the following line:

```
worker.jni.sysprops=com.ibm.websphere.os400.express.AdminWrapperTracing=false
```

Change the value of this property to true, to enable tracing with the default trace specification: `com.ibm.*=all=enabled`.
3. Restart the *ADMIN HTTP server.
4. Reproduce the problem that you are seeing.
5. Look inside the `/QIBM/UserData/HTTPAdmin/admin/logs/jvmstdout.txt` file. This file contains the trace data. *HTTPAdmin.log* might also contain some useful information.

9.4 Analyzing JVM with the DMPJVM command

To determine which WebSphere threads are doing as well as the current heap size of the JVM is, use the Dump JVM (DMPJVM) command. To run this command, you must know the job name, the user, and job number.

1. Then run the command using the WebSphere job's data, for example:

```
DMPJVM JOB(141098/QEJBSVR/SERVER1) STACKFRAME(*ALL)
```
2. A spool file is created for your interactive job. To view the output, type the WRKJOB command and press Enter. Then type option 4 (Work with spooled files).

3. If the command is successful, you should see a QDMPJVM spool file. Type option 5 to view the file. The first part of the DMPJVM display shows the class path (see Figure 9-11).

```
Thu Nov 17 12:46:44 Central Standard Time 2005
Java Virtual Machine Information 141098/QEJBSVR/SERVER1
.....
. Classpath
.....
java.version=1.4
sun.boot.class.path=/QIBM/ProdData/WebSphere/AppServer/V6/Base/java/endorsed/ibmorb.jar:/QIBM/ProdData/WebSphere/AppServer/V6/Base/java/endorsed/ibmext.jar:/QIBM/ProdData/WebSphere/AppServer/V6/Base/java/endorsed/ibmext.jar:/QIBM/ProdData/WebSphere/AppServer/V6/Base/java/endorsed/ibmjgssfw.jar:/QIBM/ProdData/WebSphere/AppServer/V6/Base/java/endorsed/ibmjgssprovider.jar:/QIBM/ProdData/WebSphere/AppServer/V6/Base/java/endorsed/ibmjssprovider2.jar:
...
.....
```

Figure 9-11 DMPJVM classpath

You can scroll down in the spool file and see the second major section, which is the Garbage Collection and heap size information (Figure 9-12).

```
.....
. Garbage Collection
.....
Garbage collector parameters
  Initial size: 98304 K
  Max size: 240000000 K
Current values
  Heap size: 329376 K
  Garbage collections: 54
Additional values
  JIT heap size: 147680 K
  JVM heap size: 286568 K
  Last GC cycle time: 244 ms
.....
```

Figure 9-12 DMPJVM Garbage Collection

The Garbage Collection section shows you such information as the initial size that the JVM started with, the maximum size, and current sizes. You see 240000000K as the maximum size, which is the value associated with the *NOMAX default setting.

The *Heap size* value is important because it shows how much memory this JVM is using for the object heap. You must ensure that there is at least this amount of memory in the pool that WebSphere is running in.

The third section of the DMPJVM command shows you what the threads of the application server are doing (Figure 9-13).

```
Information for 47 thread(s) of 47 thread(s) processed
Thread: 00003928 Thread-0
  TDE: B004300007B27000
  Thread priority: 5
  Thread status: Destroy wait
  Thread group: main
  Runnable: java/lang/Thread
Stack:
  None
Locks:
  None
Thread: 00003A2A Non-deferrable Alarm : 52
  TDE: B004300008FB0000
  Thread priority: 5
  Thread status: Waiting
  Wait object: com/ibm/ws/util/BoundedBuffer
  Thread group: main
```

Figure 9-13 DMPJVM thread callstacks

This is convenient when you think that WebSphere is either slow or not responding at all. You look for a thread in *Running* status or just look through the threads to see if there are common callstacks between them. This shows you the code with which it might have an issue running.

You might also see a thread waiting for some object (thread status is *Java wait*). If this thread waits for a long time, it is a good indication that you have a deadlock situation of an object lock problem.

9.5 Tracing

There might be times where IBM Support needs you to turn on tracing. When you become a more advanced WebSphere user, it might also help in your own problem determination. This section shows you how to enable tracing through the WebSphere Administrative Console.

9.5.1 Tracing the application server

Tracing on the application server can be either *static* where you must restart the server to enable tracing, or *dynamic* where the tracing starts as soon as you enable it. Both settings are located in the same path, but they are on different tabs.

To enable static tracing:

1. Open the WebSphere Administrative Console and log in.
2. In the left navigation frame, click **Troubleshooting** → **Logging and Tracing**. Then click **servername** → **Diagnostic Trace**.
3. In the Diagnostic Trace Service page, click the **Configuration** tab and complete the following steps:
 - a. Select the **Enable Log** check box to enable trace (later you might clear the check box to disable the trace).
 - b. Under Trace output, select **File**. The output is saved in a file (see Figure 9-14).

- c. For Maximum File Size, specify a size in MB to which the file should be allowed to grow. When the file reaches this size, the existing file is closed and renamed, and a new file with the original name is reopened. The new name of the file is based upon the original name with a timestamp qualifier added to the name.
- d. Specify the number of historical files to keep.
- e. Select the desired format for the generated trace.
- f. Click **OK**.

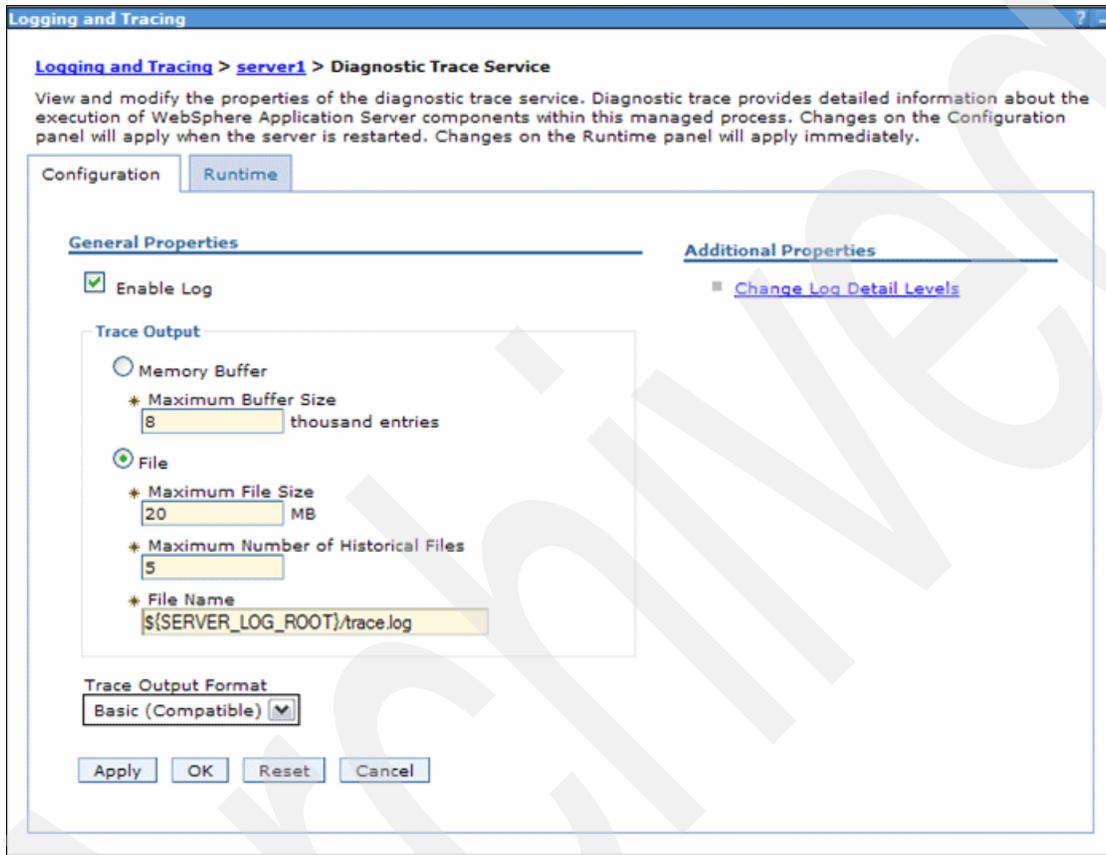


Figure 9-14 Enabling the tracing

4. Save the changed configuration.

Next, select the components to trace and the level of tracing:

1. To enter a trace string to set the trace specification to the desired state, in the left navigation frame, click **Troubleshooting** → **Logging and Tracing**.
2. Click **your server name**.
3. Under General Properties, click **Change Log Level Details** (see Figure 9-15).

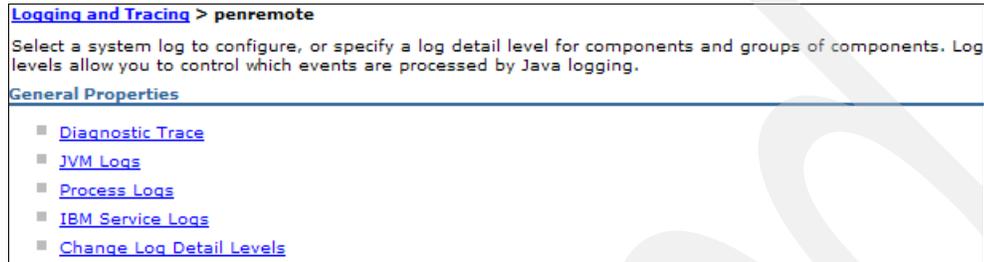


Figure 9-15 Logging and Tracing

4. The page might take a few extra seconds to load the trace specifications at the bottom. By default, you are on the Configuration tab and the components should be listed as the traces specs. *=info is in the box (Figure 9-16).

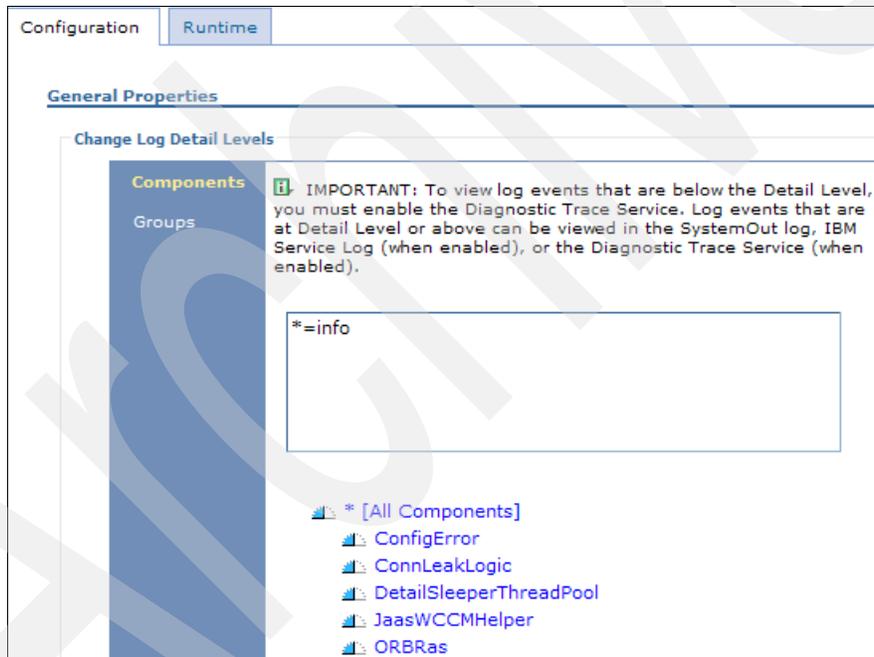


Figure 9-16 Default Trace panel

5. To change the trace specification, click any component, and it gives you the option to change the trace level (Figure 9-17). Click the level of tracing that you desire. Click **Apply**.

 off
 fatal
 severe
 warning
 audit
 info
 config
 detail
 fine
 finer
 finest
 all

Figure 9-17 Trace levels

6. Click **Save** at the top of the browser in the Messages box to save the configuration.

As mentioned earlier, doing this on the configuration tab is a static trace change where you are required to end and start the application server to enable the traces. If you change over to the Runtime tab and enable tracing, this is a dynamic trace and starts as soon as you save your changes. Dynamic tracing is also reset back to what is on the Configuration tab when the application server is restarted.

Dynamic tracing allows to enable a subset of the tracing information collected by the static trace. Information from these traces is logged into the /QIBM/UserData/WebSphere /AppServer/V6/Base/profiles/*profilename*/logs/trace.log file.

9.5.2 Plug-in trace and TRCTCPAPP

The plug-in trace and Trace TCP/IP Application (TRCTCPAPP) command traces are used together quite frequently to determine issues where URL requests do not get back to the user. The two traces when taken together show the cycle of a URL request. It goes from the HTTP server to the plug-in, to WebSphere, to the plug-in, back to the HTTP server.

TRCTCPAPP traces the HTTP server pieces, and a plug-in trace traces the plug-in. With the two traces on, you can identify which component has a problem.

TRCTCPAPP

The TRCTCPAPP trace shows you everything that the HTTP server is doing as far as processing requests. To trace your HTTP server, use the TRCTCPAPP command as explained in the following steps:

1. On the OS/400 command line, enter TRCTCPAPP and press Enter.
2. In the Trace TCP/IP Application display, complete these tasks:
 - a. For TCP/IP application, type *HTTP and press Enter. More options are displayed.
 - b. Make sure Trace option setting is set to *0N.
 - c. Find the HTTP server instance line and put your HTTP server name on that entry.
 - d. Change Trace level to *verbose.
 - e. Press Enter.

3. You return to a command line. Turn off the trace using the following command:

```
TRCTCPAPP APP(*HTTP) SET(*OFF)
```

Do not prompt the command, enter is just as it appears. A spool file is created on your interactive job called QZSRHTTPTR.

Plug-in trace

Turning on a plug-in trace is easy as long as you know where the plugin-cfg.xml file is located. When using IBM HTTP Server (powered by Apache), the plug-in is located in the WebSphere subtree. To find the file location:

1. Access Web Administration for iSeries and open your HTTP server home page. See the example in Figure 9-18. In the navigation frame, click the **Display Configuration File** link.

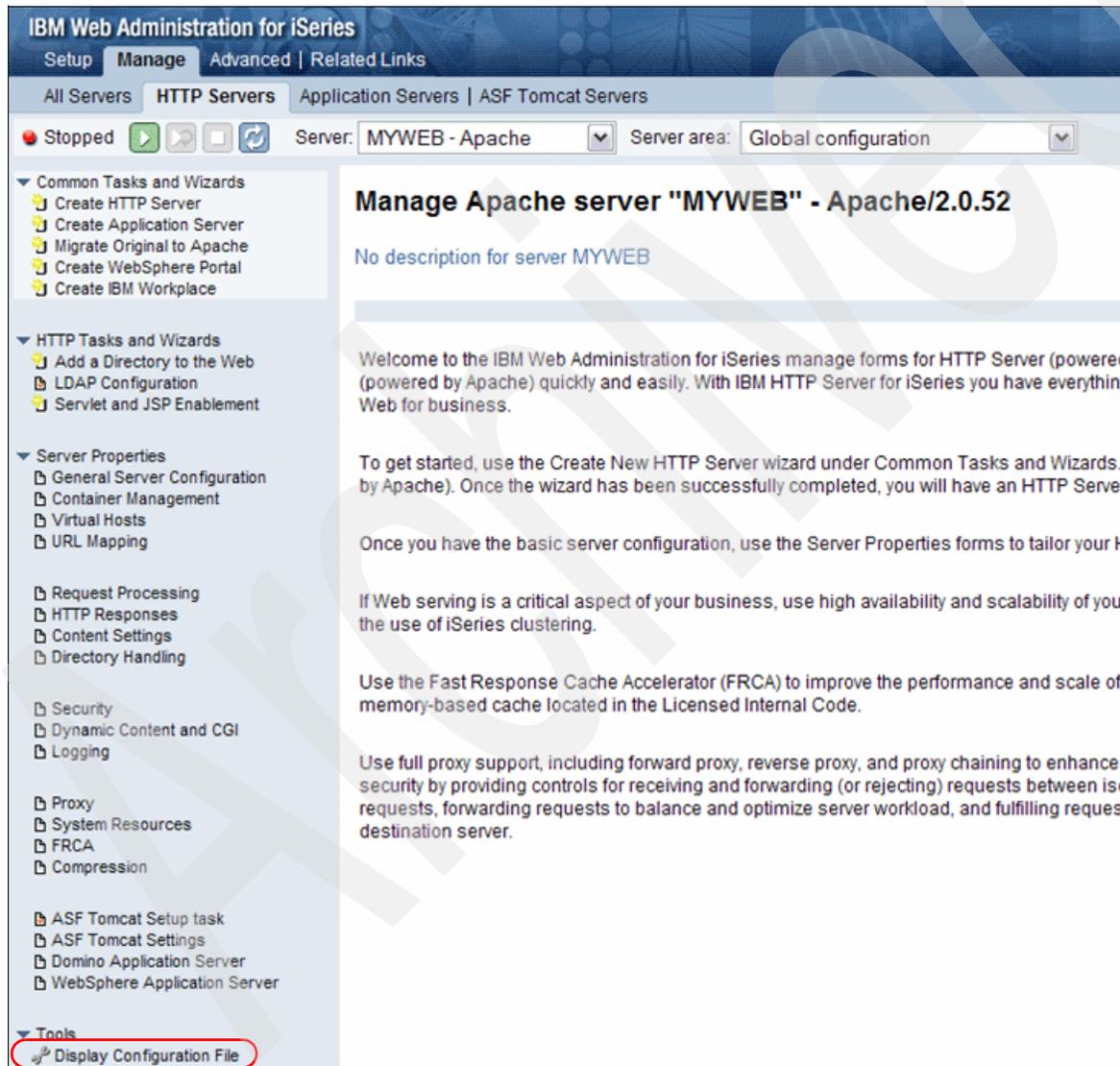


Figure 9-18 HTTP server home page

2. Look at the first line in the configuration file. It should look similar to this:

```
WebSpherePluginConfig
/QIBM/UserData/WebSphere/AppServer/V6/Base/profiles/default/config/cells/RCHAS11/nodes/I
HS_RCHAS09_MYWEB_node/servers/IHS_RCHAS11_MYWEB/plugin-cfg.xml
```

3. Edit the plugin-cfg.xml file by using either the EDTF command in OS/400 or by using a mapped drive and a PC text editor.

Look for the *LogLevel* (Figure 9-19). Change the level from *Error* to *Trace*.

```
*****Beginning of data*****  
<?xml version="1.0" encoding="ISO-8859-1"?>  
<!--HTTP server plugin config file for the webserver RCHA  
<Config ASDisableNagle="false" AcceptAllContent="false" A  
  <Log LogLevel="Error" Name="/QIBM/UserData/WebSphere/A
```

Figure 9-19 Plugin-cfg.xml

4. Restart your HTTP server. The server tracing should start.
There is a log file in the log directory of your profile, for example, /QIBM/UserData/WebSphere/AppServer/V6/Base/profiles/default/logs/IHS_SYSTEM_PROFILE.
5. Disable the trace by editing the plugin-cfg.xml file and changing the LogLevel back to Error.

9.6 Performance monitoring

When faced with a WebSphere Application Server performance problem, it is important that you understand the underlying causes of the performance degradation. Several factors can influence your WebSphere Application Server V6 performance, including:

- ▶ Memory utilization
- ▶ Job threads
- ▶ Transaction times
- ▶ Servlet response
- ▶ Database connectivity

WebSphere Application Server V6 contains a built-in component known as *Performance Monitoring Infrastructure (PMI)* to assist you in monitoring and tuning the performance of your WebSphere Application Server V6 environment. In the section that follows, we briefly discuss PMI.

9.6.1 Performance Monitoring Infrastructure overview

PMI is the core monitoring infrastructure for WebSphere Application Server. It is integrated into WebSphere Application Server V6 and is automatically started when you enable it. It collects performance data from your active application servers. You can then analyze this data, using Tivoli Performance Viewer and Performance Advisor tools. Typically, these tools recommend configuration changes and settings that improve the performance of your WebSphere Application Server V6 environment. In 9.6.2, "Tivoli Performance Viewer" on page 146, we explain how you can use Tivoli Performance Viewer tool to analyze your performance data.

PMI collects a comprehensive set of data that can be used to analyze application runtime behavior and resource consumption. It collects the following information and more:

- ▶ Database connection pool size
- ▶ Servlet response time
- ▶ Enterprise JavaBeans (EJB) method response time
- ▶ Java virtual machine Garbage Collection time

You can use this data to better understand the runtime resource utilization and the performance characteristics of your various application components. By using this information, you can identify and address any performance bottlenecks in your application server.

You can dynamically enable, disable, and control the monitoring of individual components. Table 9-1 shows an overview of the four predefined statistic sets that are built into PMI. You can enable any of these statistic sets to collect specific performance data that you want to focus on.

Table 9-1 PMI statistic sets

Statistic set	Description
None	All statistics are disabled.
Basic	The statistics specified in J2EE 1.4, as well as top statistics, such as CPU usage and live HTTP sessions, are enabled. This is the default setting. It provides basic performance data about the runtime and application components.
Extended	All the statistics covered by the Basic statistic set are enabled. In addition, other key statistics from various WebSphere Application Server components are also collected. These include Workload Management and dynamic caching. This statistic set provides detailed performance data about various runtime and application components.
All	All statistics are enabled.
Custom	You can selectively specify the individual statistics that you want to enable or disable. This setting allows fine-grain control over the detail of the monitored data that you want to collect.

Note: PMI must be active if you want to collect performance data. For any reason, if you disable PMI, you must enable it before you start the application server that you want to monitor. If you enable PMI on an active application server, you must restart the server for PMI to start collecting the performance data.

You can find more information about PMI in the WebSphere Application Server Information Center at the following Web address:

http://publib.boulder.ibm.com/infocenter/wsdoc400/topic/com.ibm.websphere.iseries.doc/info/ae/ae/cprf_pmidata.html

9.6.2 Tivoli Performance Viewer

After you enable PMI to collect your performance data, you can use Tivoli Performance Viewer to analyze this data and adjust your server settings to address performance concerns. Previously known as *Resource Analyzer*, Tivoli Performance Viewer is incorporated into the WebSphere Administrative Console.

Tivoli Performance Viewer provides you with a graphical view of your PMI data like the example in Figure 9-20.

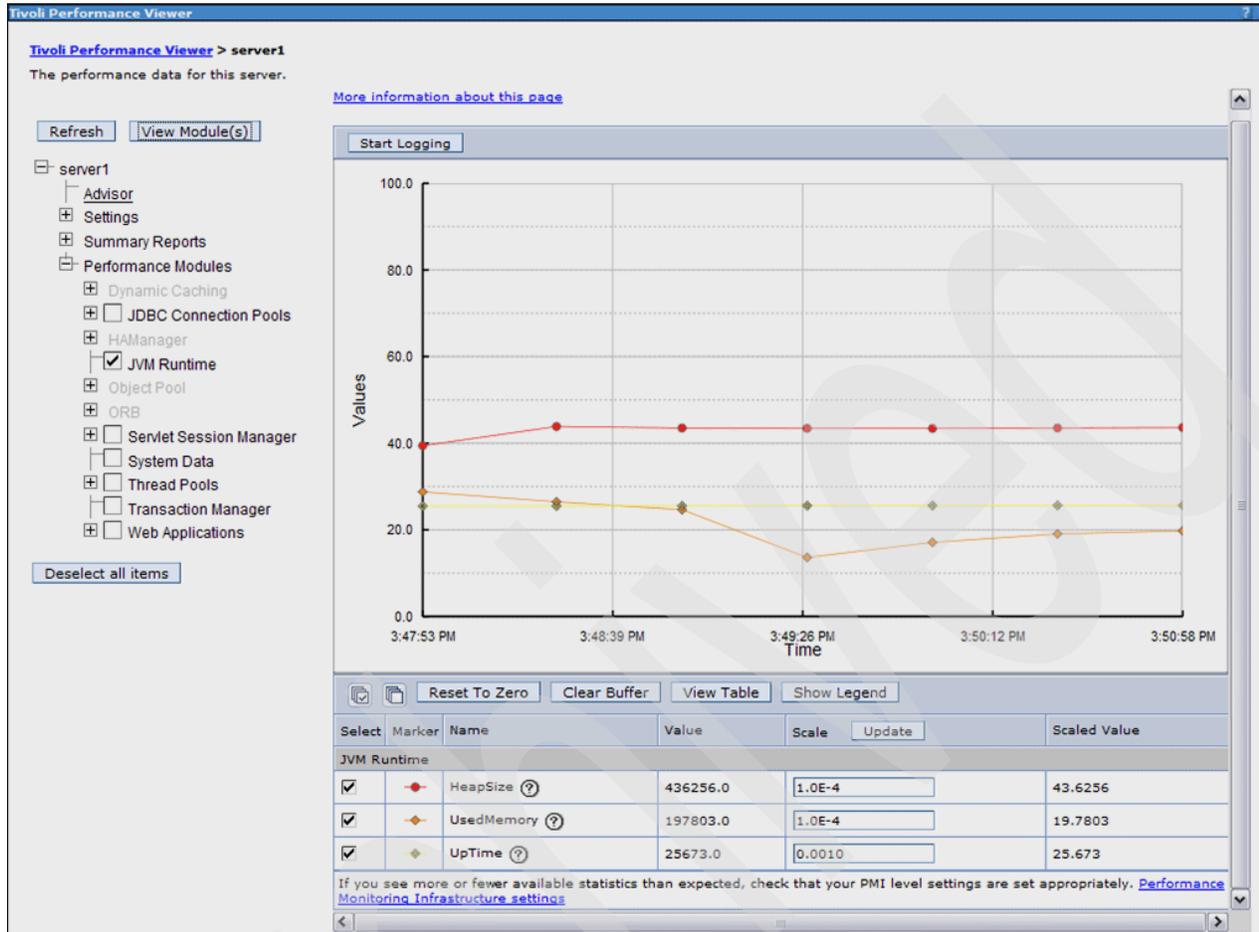


Figure 9-20 Graphical view of Tivoli Performance Viewer

Tivoli Performance Viewer uses the PMI data to analyze the runtime state of your application server and provides tuning advice to assist you in optimizing the resource utilization of your application server. These tuning recommendations are managed through the Tivoli Performance Viewer Performance Advisor functionality.

Important: You must make additional changes to the JVM properties to display graphics correctly in Tivoli Performance Viewer. Read the Technote at the following Web address:

<http://www-1.ibm.com/support/docview.wss?uid=swg21214681>

Tivoli Performance Viewer Advisor

You can use Tivoli Performance Viewer Advisor to obtain advice and assistance to tune your application server for optimal performance. By using and analyzing the data that is collected by PMI, Tivoli Performance Viewer Advisor provides information and recommendations about inefficient settings.

To access and use Tivoli Performance Viewer Advisor:

1. Launch the Administrative Console of your selected application server from Web Administration for iSeries as shown in Figure 9-21. In the left navigation frame, under Tools, select **Launch Administrative Console**.

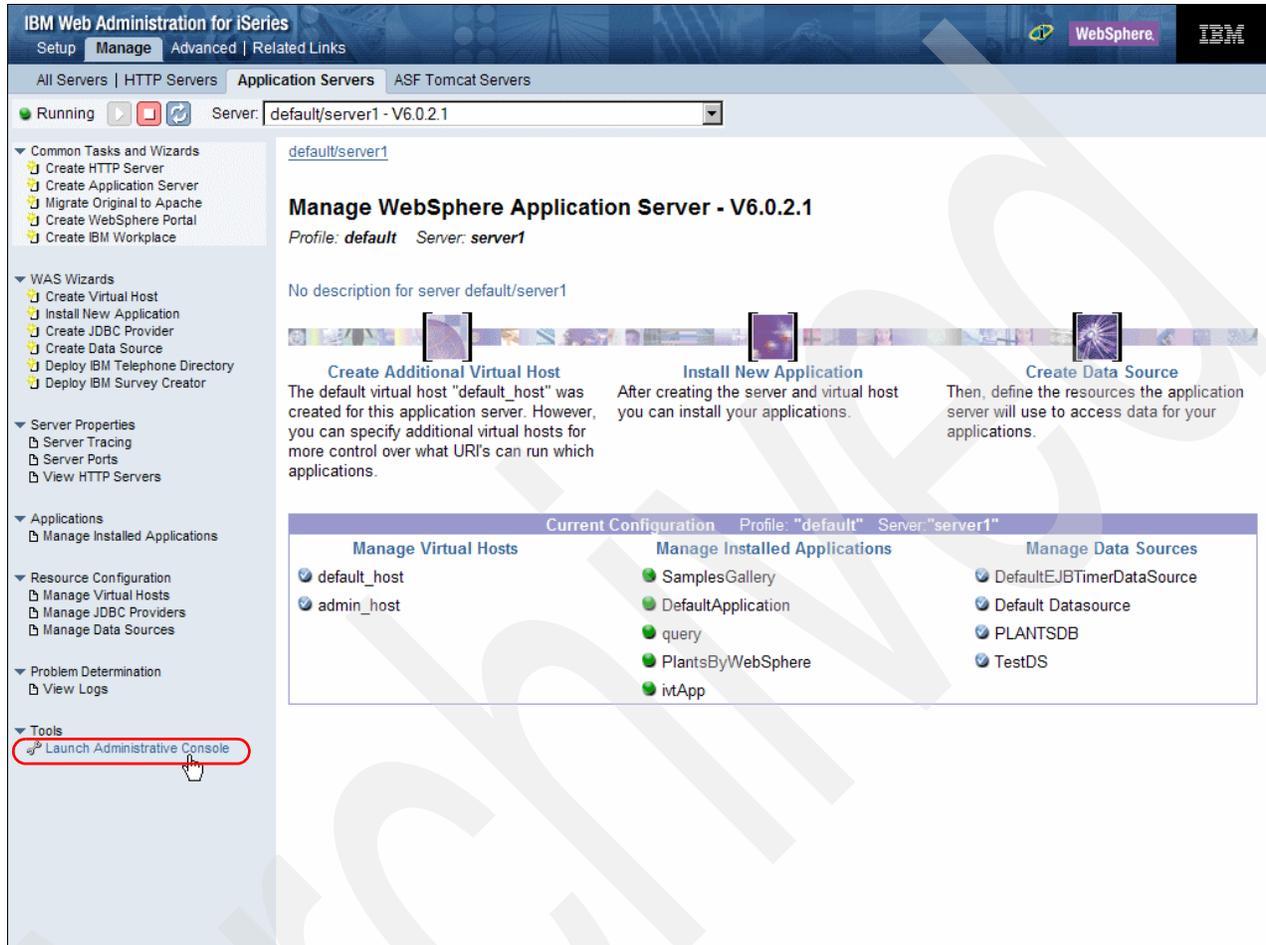


Figure 9-21 Launch Administrative Console

2. Log in.
3. In the Administrative Console navigation tree, select **Monitoring and Tuning** → **Performance Viewer** → **Current Activity** as shown in Figure 9-22.

Note: The performance data is collected and viewed in real-time on the application server that you selected. Therefore, the overall performance of this server can potentially be affected by this performance monitoring process.

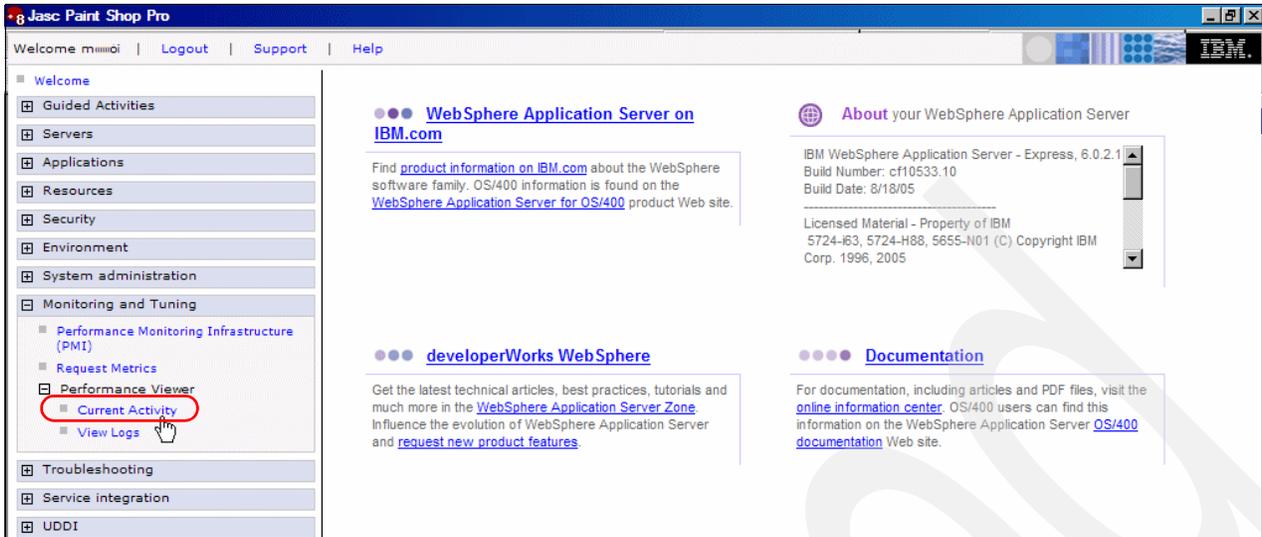


Figure 9-22 Select Performance viewer

4. Select the check box next to your server name, **server1** in this example, and click **Start Monitoring** as shown in Figure 9-23.

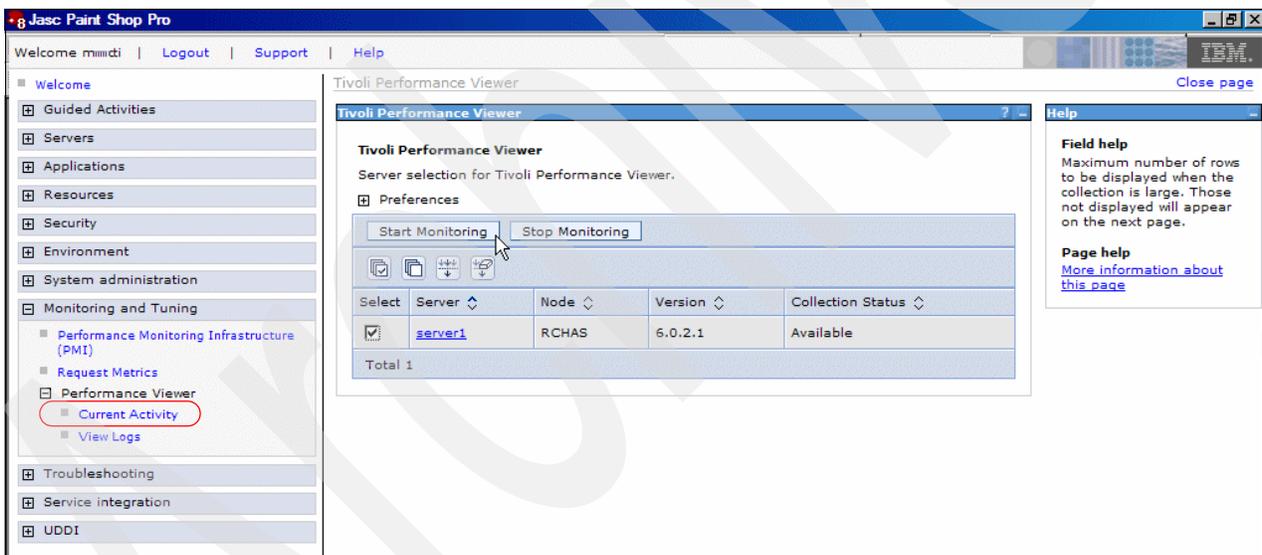


Figure 9-23 Start server monitoring

5. After the monitor is successfully started, you see a message banner similar to the one in Figure 9-24.



Figure 9-24 Monitor started

- Click the server name, **server1** in our example, and click **Advisor** in the server tree structure (see Figure 9-25).

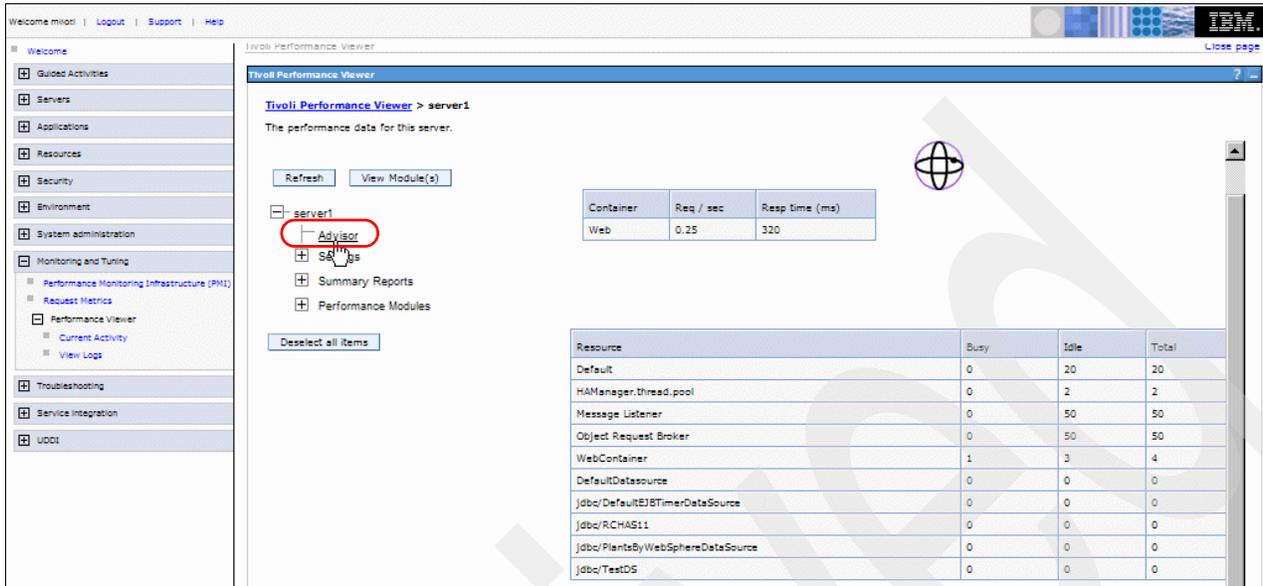


Figure 9-25 Tivoli Performance Viewer Advisor summary display

This pane contains a summarized version of the current server performance, together with messages from Tivoli Performance Viewer Advisor in the lower section of the pane. Read the information contained in these messages, because they can recommend how to tune your server performance.

Click any of these messages to obtain detailed information and advice from Tivoli Performance Viewer Advisor about the detected condition. Figure 9-26 shows an example of a detailed message.

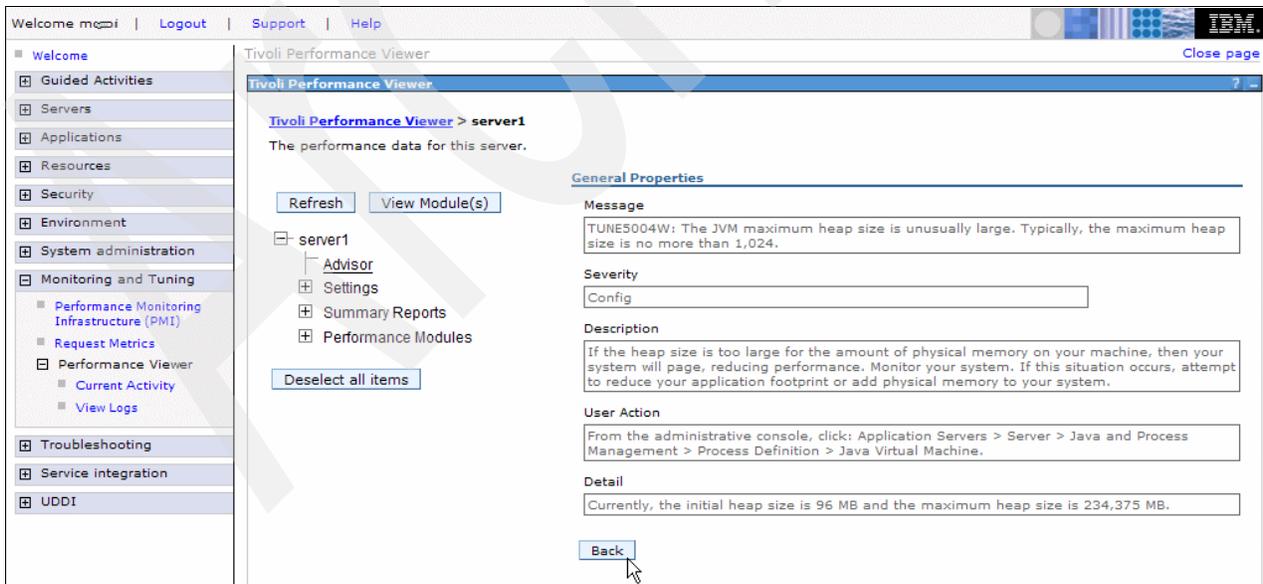


Figure 9-26 Tivoli Performance Viewer Advisor message detail

You should consider the information and recommendations in these messages to take the necessary corrective actions.

7. On the left side of the page, expand the server tree structure to select and analyze various performance reports, as well as detailed performance module information. Figure 9-27 shows an example of the available options.

Select the summary reports and performance modules that you require and click **View Module(s)** to display the detailed performance data.

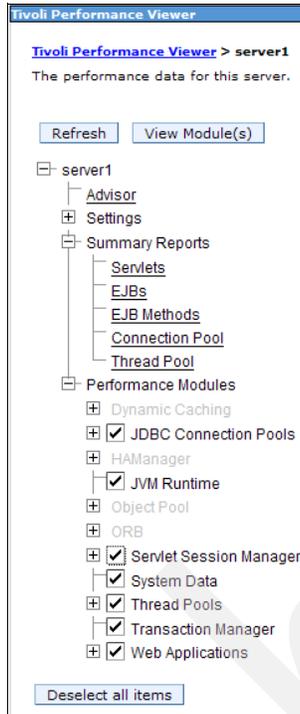


Figure 9-27 Performance data report modules

8. After you complete your performance analysis, click **Logout** to exit the Administrative Console.

You can find more detailed information about Performance Monitoring and Tivoli Performance Viewer in the WebSphere Information Center at the following Web address:

<http://publib.boulder.ibm.com/infocenter/wsdoc400/index.jsp>

When you reach the Information Center, navigate to **WebSphere Application Server for OS/400, Version 6** → **Monitoring** → **Monitoring overall system health**.

Archived



Backup and recovery

This chapter discusses backup and recovery for WebSphere Application Server. It describes the target of your backup strategy, how to back up your configuration and applications, and provides a detailed description of recovery procedures.

This chapter also discusses the following topics:

- ▶ Integrated file system directory structure
- ▶ Execution environment
- ▶ Backup and recovery for WebSphere Application Server

Note: In this chapter, we presume that you use the default values for the WebSphere subsystem name, integrated file system directories for WebSphere, and so on. Any customization of these default values are outside of the scope of this chapter.

10.1 Integrated file system directory structure

WebSphere Application Server uses the integrated file system of the iSeries to store product, configuration, and WebSphere Application Server application data. This section provides information about the location of the files for WebSphere Application Server - Express V6.

10.1.1 Product directories

WebSphere Application Server is stored in the following directories:

- ▶ /QIBM/ProdData/WebSphere/AppServer/V6/Base

This is the root directory for the WebSphere Application Server product (see Figure 10-1). Product data that is shared by all WebSphere Application Server instances is stored here.

- ▶ /QIBM/ProdData/WebSphere/AppServer/V6/Base/bin

This directory contains the Qshell scripts that are offered by the WebSphere Application Server product.

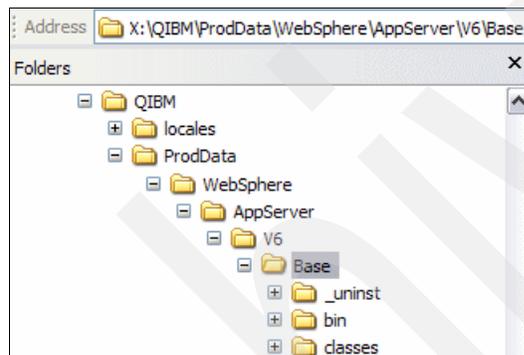


Figure 10-1 Product directory structure

Important: /QIBM/ProdData/* is the production directory. You must keep it intact without any modification. All the user data is kept in the /QIBM/UserData/* directory.

10.1.2 User data directories

WebSphere Application Server uses the following directories to store your application, configuration, and so on.

- ▶ /QIBM/UserData/WebSphere/AppServer/V6/Base/profiles

This is the root directory of the user data. When you create a new WebSphere Application Server instance, it is stored in this directory. The *default* directory is created by installing the WebSphere Application Server (see Figure 10-2).

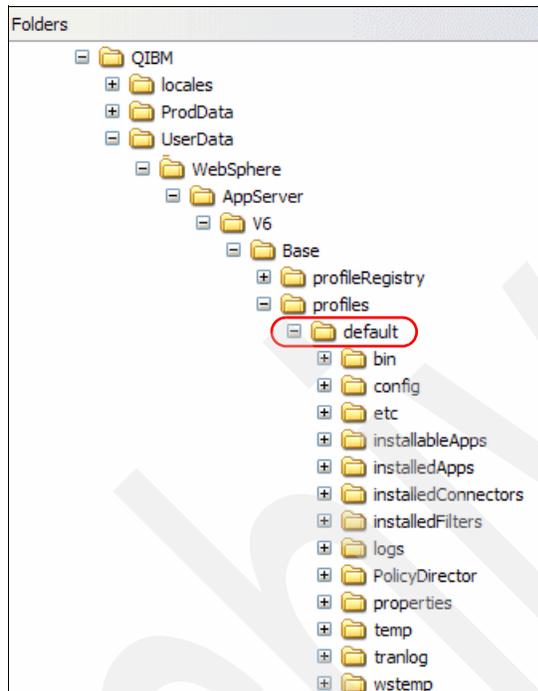


Figure 10-2 Directory structure of an instance

- ▶ /QIBM/UserData/WebSphere/AppServer/V6/Base/profiles/*profile_name*/config

This directory contains a collection of the Extensible Markup Language (XML) documents that describe the configuration parameters of the WebSphere Application Server instance. All configuration data in this directory is split into three levels (see Figure 10-3):

- Cell level
- Node level
- Server level

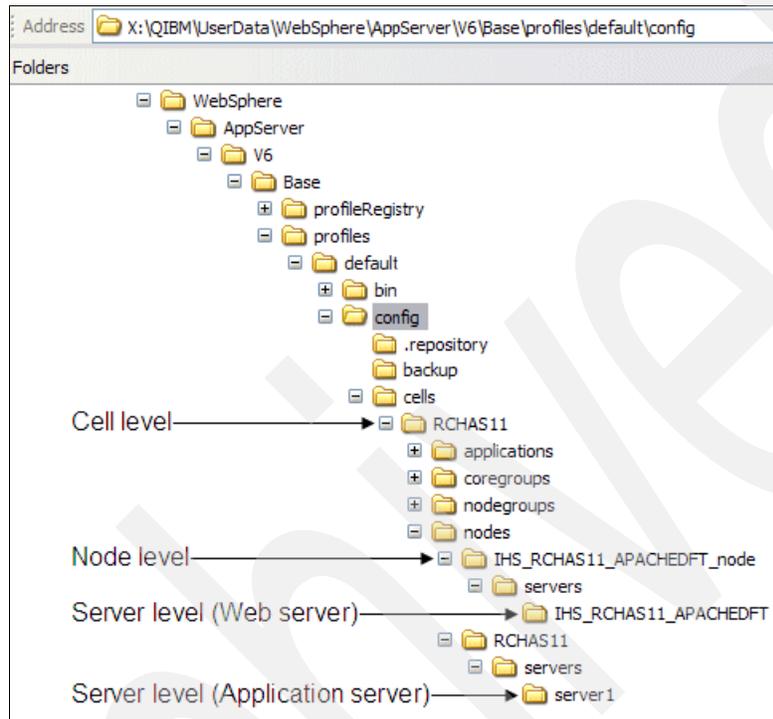


Figure 10-3 Configuration repository directories

10.2 Execution environment

This section provides information about the execution environment that WebSphere Application Server - Express V6 uses on your iSeries server.

10.2.1 Library

WebSphere Application Server is stored in the QWAS6 product library.

10.2.2 Subsystems

WebSphere Application Server uses the QWAS6 subsystem. The subsystem description for QWAS6 is located in the QWAS6 library. The application server, node agent, and deployment manager processes run in this subsystem.

10.2.3 Job queue

WebSphere Application Server uses the QWASJOBQ job queue that located in the QWAS6 library. The application server, node agent, and deployment manager processes are all submitted to this job queue. This job queue is associated with the QWAS6 subsystem.

10.2.4 Job description

WebSphere Application Server uses the QWASJOBQ job description that located in the QWAS6 library. The application server, node agent, and deployment manager processes use this job description when submitted to run in the QWAS6 subsystem.

Important: You can modify the job description *if* the values *do not meet* your requirements. However, you must not change the *Allow multiple threads* value (see Figure 10-4). Because the processes contain a Java virtual machine (JVM) that is multithreaded, this value must be *YES.

```
Display Job Description
System: RCHAS11
Job description: QWASJOBQ Library: QWAS6
Device recovery action . . . . . : *SYSVAL
Time slice end pool . . . . . : *SYSVAL
Job message queue maximum size . . . . . : *SYSVAL
Job message queue full action . . . . . : *WRAP
Allow multiple threads . . . . . : *YES
Initial ASP group . . . . . : *NONE
Spooled file action . . . . . : *SYSVAL
Text . . . . . : WebSphere Application Serv
er job description
```

Figure 10-4 QWASJOBQ job description

10.2.5 Output queue

WebSphere Application Server uses the QWASOUTQ output queue that is located in the QWAS6 library. By default, this output queue stores job logs for the application server, node agent, and deployment manager processes. You might want to clear the output queue periodically if the number or size of the spooled files become large.

10.2.6 User profiles

WebSphere Application Server uses the following special user profiles:

- ▶ **QEJB:** This profile is shipped as part of the OS/400 operating system. This user profile is only used when accessing validation list objects used for storing the encoded passwords used with WebSphere Application Server.
- ▶ **QEJBSVR:** This profile is created on your iSeries when you install WebSphere Application Server. This profile is the default profile under which all application servers run. It owns directories and files used by WebSphere Application Server. If you have specified another profile under which you run your application server, see “Run application servers under specific user profiles” in the WebSphere Information Center at the following Web address:

http://publib.boulder.ibm.com/infocenter/wsdoc400/topic/com.ibm.websphere.iseries.doc/fo/ae/ae/tsec_isprfchg.html

10.3 Backup and recovery for WebSphere Application server

This section provides detailed descriptions of backup and recovery for the WebSphere Application Server. Be sure that your iSeries backup strategy includes all items related to the WebSphere applications, not only the product but also all objects related to your application.

The WebSphere Application Server uses many iSeries resources that you should consider adding to your backup and recovery procedures. You can save and restore of the WebSphere Application Server resources using the same iSeries commands as for other iSeries resources. For more detailed information about iSeries system save and restore facilities, see “Backup and recovery” in the iSeries Information Center at the following Web address:

<http://publib.boulder.ibm.com/infocenter/series/v5r3/topic/rzaiu/rzaiuicbackup.htm>

Consider the following areas of the WebSphere Application Server for backup and recovery.

- ▶ Licensed product
- ▶ Administrative configuration
- ▶ Servlets
- ▶ JavaServer Pages (JSP) files
- ▶ Enterprise beans
- ▶ Security configuration and data

WebSphere Application Server resources can be saved while the WebSphere Application Server environment is active. When backing up database data, you might have to shut down some or all services if a snapshot cannot be obtained. This occurs if there are requests that obtain locks or have open transactions against the database being saved.

10.3.1 Frequency of the backup

How often you back up resources depends largely on when or how often you expect them to change. Use the following categories to determine how you should fit WebSphere Application Server resources into your backup plan:

- ▶ WebSphere Application Server licensed products

This category covers the licensed products of your WebSphere Application Server and related products. You should save these products after applying the PTFs.

- ▶ WebSphere Application Server environment configuration

This category covers the resources that define your WebSphere Application Server operating environment. After you do the initial setup, this information should change infrequently. You might back up this information only when you change these settings and not include these resources in regularly scheduled backups. Items in this group are:

- The administrative configuration
- HTTP configuration
- Servlet configuration files
- Security properties files

- ▶ WebSphere Application Server applications

This category covers the applications that you run using WebSphere Application Server. You should back up these applications the same way that you back up other applications on your system. You can back up these resources every time you add or change an application or include resources in a regularly scheduled backup. Items in this group are:

- Servlet source and class files
- JSP source and generated class files
- Deployed enterprise bean Java archive (JAR) files

- ▶ WebSphere Application Server application data

This category covers the data stores used by your WebSphere Application Server applications. Unless your applications serve only static information, these resources are usually quite dynamic. You should back up these data stores the same way that you back up other business data on your system. These resources are suited for inclusion in a regularly scheduled backup. Items in this group are:

- Servlet user profile data
- Enterprise bean database data
- Database files accessed by your applications

10.3.2 Backup and recovery of objects in the QSYS library

In this section, we explain how to back up the WebSphere Application Server related objects that exist in the QSYS library.

Licensed products

WebSphere Application Server on iSeries uses some additional licensed products. Consider these products when you define your backup plan. While you save these products, no instances or WebSphere jobs should be running.

These are the products that you must consider in your backup plan:

- ▶ Operating System/400 (5722SS1)
- ▶ IBM Developer Kit for Java (5722JV1)
- ▶ OS/400 Qshell (5722SS1 option 30)
- ▶ HTTP Server
 - IBM HTTP Server for iSeries (5722DG1)
 - Lotus Domino 6.5 for iSeries (5733L65)
- ▶ WebSphere Application Server for OS/400 V6 (5733W60)
 - Option *BASE, 1

For all of these products, you should use the Save Licensed Program (SAVLICPGM) command. Using this command, you can save both libraries and integrated file system directories associated with WebSphere Application Server licensed product (see Figure 10-5).

```

                                Save Licensed Program (SAVLICPGM)

Type choices, press Enter.

Product . . . . . > 5733W60      Character value
Device . . . . . > *SAVF        Name, *SAVF
                                + for more values
Optional part to be saved . . . *BASE      *BASE, 1, 2, 3, 4, 5, 6, 7...
Release . . . . . *ONLY        Character value, *ONLY
Language for licensed program . > *ALL     Character value, *PRIMARY...
Object type . . . . . *ALL     *ALL, *PGM, *LNG
Check signature . . . . . *SIGNED *SIGNED, *ALL, *NONE
Save file . . . . .           Name
  Library . . . . . *LIBL      Name, *LIBL, *CURLIB
Target release . . . . . *CURRENT *CURRENT, *PRV, V5R1M0...
Clear . . . . . *NONE        *NONE, *ALL, *AFTER, *REPLACE
Data compression . . . . . *DEV   *DEV, *NO, *YES
License acceptance required . . *NO    *NO, *YES

                                Bottom
F3=Exit  F4=Prompt  F5=Refresh  F12=Cancel  F13=How to use this display
F24=More keys

```

Figure 10-5 SAVLICPGM example

Note: The SAVLICPGM command is supported in WebSphere Application Server V6.0.2 or later.

The advantage of saving WebSphere Application Server as a licensed product is that you can avoid the time for program temporary fix (PTF) installation, because this backup contains all PTFs that are applied up to the backup time.

For the restore procedure, use the Restore Licensed Program (RSTLICPGM) command (see Figure 10-6). You must be sure that all licensed products are restored before you try to use the WebSphere Application Server product.

```

Restore Licensed Program (RSTLICPGM)

Type choices, press Enter.

Product . . . . . > 5733W60      Character value
Device . . . . . > *SAVF        Name, *SAVF
                                + for more values
Optional part to be restored . . *BASE      *BASE, 1, 2, 3, 4, 5, 6, 7...
Type of object to be restored . . *ALL       *ALL, *PGM, *LNG
Language for licensed program . . *PRIMARY   Character value, *PRIMARY...
Output . . . . . *NONE          *NONE, *PRINT
Release . . . . . *FIRST        Character value, *FIRST
Replace release . . . . . *ONLY   Character value, *ONLY, *NO
Save file . . . . .
  Library . . . . . *LIBL        Name, *LIBL, *CURLIB

More...
F3=Exit  F4=Prompt  F5=Refresh  F12=Cancel  F13=How to use this display
F24=More keys

```

Figure 10-6 RSTLICPGM example

HTTP configuration

Changes to the HTTP configuration are often made to support WebSphere Application Server to serve servlets and JSP requests and to enable WebSphere Application Server security. Consider saving your HTTP configuration as a part of your WebSphere Application Server backup and recovery.

HTTP server instances for IBM HTTP Server for iSeries (powered by Apache) are members of the QATMHINSTC file in the library QUSRSYS. To save this file, you can use the following command, for example:

```
SAVOBJ OBJ(QATMHINSTC) LIB(QUSRSYS) DEV(*SAVF) OBJTYPE(*FILE) SAVF(WSALIB/WSASAVF)
```

Note: The following information applies to IBM HTTP Server for iSeries (powered by Apache). If you are using Lotus Domino HTTP Server, see the Lotus Documentation Library at the following Web address:

<http://www.notes.net/notesua.nsf?OpenDatabase>

The restore procedure should be done using the Restore Object (RSTOBJ) command. To restore from your backup, use the following command:

```
RSTOBJ OBJ(QATMHINSTC) SAVLIB(QUSRSYS) DEV(*SAVF) OBJTYPE(*FILE) SAVF(WSALIB/WSASAVF)
```

User profiles

Consider saving the user profiles as a part of your WebSphere Application Server backup and recovery. When using local operating system security, back up your OS/400 user profiles, using OS/400 save procedures for user profiles.

For more information, see “Backup and recovery” in the iSeries Information Center at the following Web address:

<http://publib.boulder.ibm.com/infocenter/iseriess/v5r3/topic/rzaiu/rzaiuicbackup.htm>

Validation lists

Passwords are stored as encrypted data in validation list objects when the OS/400 password encoding algorithm is used. The default validation list is /QSYS.LIB/QUSRSYS.LIB/EJSADMIN.VLDL. You can change it in the Administrative Console by specifying it as a system property for the application server.

Perform the save procedure by using the Save Object (SAVOBJ) command. For example, use the following command to save the validation lists:

```
SAVOBJ OBJ(EJSADMIN) LIB(QUSRSYS) DEV(*SAVF) SAVF(WALIB/WSASAVF)
```

For the restore procedure, use the Restore Object (RSTOBJ) command. For example, use the following command to restore the validation lists from your backup:

```
RSTOBJ OBJ(EJSADMIN) SAVLIB(QUSRSYS) DEV(*SAVF) OBJTYPE(*VLDL) SAVF(WALIB/WSASAVF)
```

Database data

Enterprise beans often use a database for back-end persistence. Container-managed entity beans always use a database for back-end persistence. If you are using enterprise beans, back them up the same way as any of your business data.

The collection for container-managed entity beans persistence is determined by either the schema name specified during deployment or the schema specified on the data source associated with the enterprise bean. Any persistent store used by session and bean-managed beans is defined by the bean implementation. For database tables, you can choose to save the entire collection or an individual table as shown with the following examples:

- ▶ The following command saves the entire collection:

```
SAVLIB LIB(EJB) DEV(*SAVF) SAVF(WALIB/WSASAVF)
```

- ▶ The following command saves the sampleApp application only:

```
SAVOBJ OBJ(MYBEANTBL) LIB(EJB) DEV(*SAVF) OBJTYPE(*FILE) SAVF(WALIB/WSASAVF)
```

It might be possible to save database objects while WebSphere Application Server is active, if the save operation can obtain a snapshot of the data store. You might have to shut down your application server if a snapshot cannot be obtained. This occurs if there are requests that obtain locks or have open transactions against the database being saved.

For more information, see the “Backup and recovery” in the iSeries Information Center at the following address:

<http://publib.boulder.ibm.com/infocenter/iseries/v5r3/topic/rzaiu/rzaiuicbackup.htm>

10.3.3 Backup and recovery of the application in integrated file system directory

For an easy backup procedure, we recommend that you to back up the *entire profiles directory* in the integrated file system of the iSeries.

Saving the entire profiles directory, you can save all user data that exists in the integrated file system. This directory contains:

- ▶ Server configuration files (administrative configuration and HTTP configuration)
- ▶ Security configuration (security property files and key files)
- ▶ Enterprise Applications (HTML, servlets, JSP files, enterprise bean JAR files, and so on)
- ▶ Other resources (log files, temporary files, and so on)

To save the entire profiles directory in the integrated file system, enter this command:

```
SAV DEV('/QSYS.lib/wsalib.lib/wsasavf.file')
OBJ('/QIBM/UserData/WebSphere/AppServer/V6/Base/profiles/*')
```

Note: This command is wrapped for display purposes in this redbook. Enter it as on one command line.

For the restore procedure, use the Restore (RST) command. For example, use the following command to restore the entire profiles directory from your backup:

```
RST DEV('/QSYS.lib/wsalib.lib/wsasavf.file')
OBJ('/QIBM/UserData/WebSphere/AppServer/V6/Base/profiles/*')
```

For more information about how to save and restore each directory unit, see “Backup and recovery considerations for WebSphere Application Server” in the WebSphere Information Center at the following Web address:

<http://publib.boulder.ibm.com/infocenter/wsdoc400/topic/com.ibm.websphere.iseries.doc/info/ae/ae/snrmain.htm>

Exporting EAR files

Another option that you can use to back up your application files is to export your enterprise application that is already installed. Using this option, you can save the exported EAR file to tape, keep this file in an integrated file system directory, or do both. The exporting process can be done while the enterprise application is running. You can do that from the Administrative Console. To export EAR files, perform the following steps:

1. Start the Administrative Console. Point your browser to:

```
http://host_name:port/ibm/console
```

Here, *host_name* is your iSeries host name, and *port* is the Administrative Console port.

2. On the Welcome page (Figure 10-7), enter your user ID and click **Log in**.

Note: The user ID is not required to be an OS/400 user profile. This user ID is used only to track which users make changes to the application server configuration.



Figure 10-7 Administrative Console login

3. On the next page, in the left navigation area, expand **Applications** and click **Enterprise Applications**.
4. In the Enterprise Application pane on the right, select the check box next to the enterprise application that you want to export, and click **Export** (see Figure 10-8).

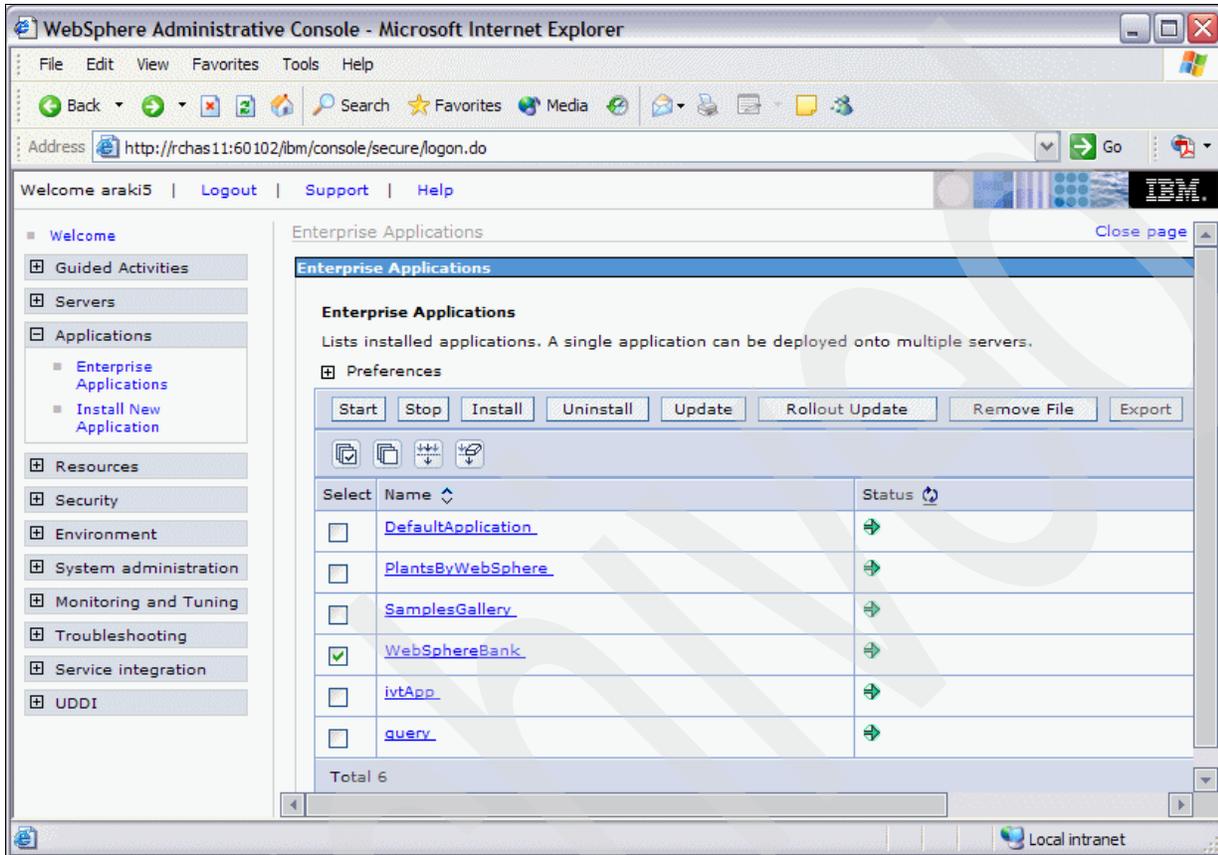


Figure 10-8 Enterprise Applications list

5. Click the enterprise application that you want to export (see Figure 10-9).

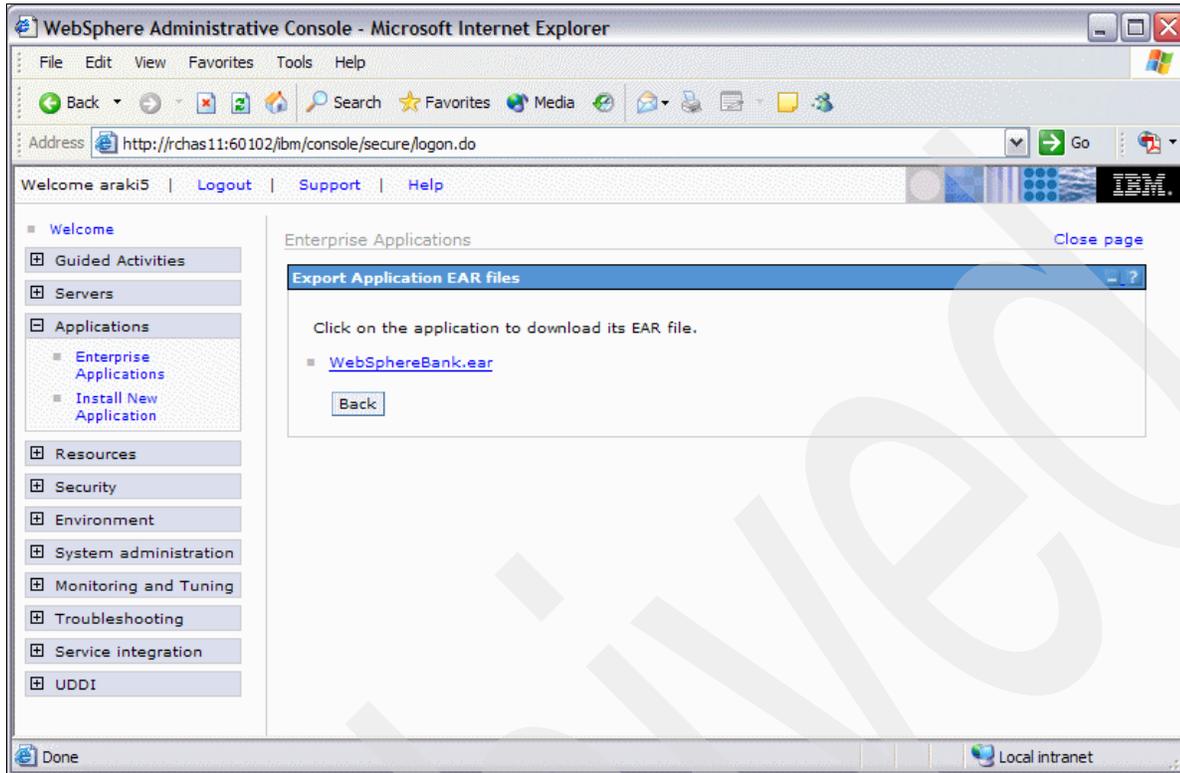


Figure 10-9 Export Application EAR files pane

6. In the File Download window (Figure 10-10), click **Save** and choose the location for the EAR file.

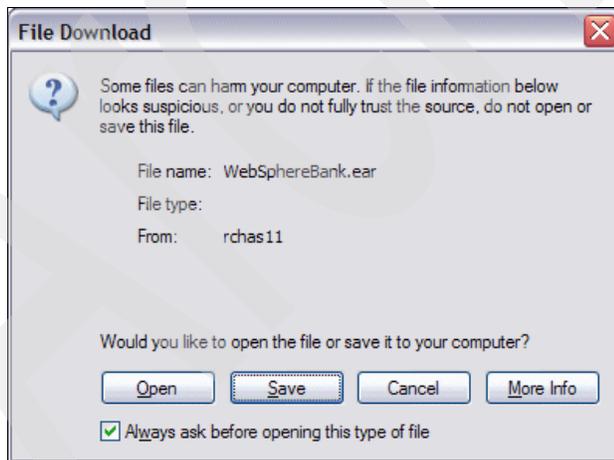


Figure 10-10 File Download window

10.3.4 Recovery from a failure

The recovery procedures depend on the kind of failure. In this section, we describe the general steps to recover your WebSphere configuration, assuming that you already recovered the microcode and operating system from your iSeries. For additional information about recovery on iSeries, refer to *Backup and Recovery*, SC41-5304.

► WebSphere Application Server licensed product

To recover WebSphere Application Server, you must restore it from the last licensed product backup. Refer to 10.3.2, “Backup and recovery of objects in the QSYS library” on page 159, to review the products that you must restore.

If you do not have any of these backups available, you must install WebSphere Application Server from the distribution media, and you must install all licensed products that are required to WebSphere Application Server and all PTFs.

► WebSphere Application Server application

After you restore the WebSphere Application Server licensed product, you can recover your application, such as the administrative configuration for your application, servlets, JSPs, HTTP configuration, security, and so on.

Be sure that all restored files are owned by the user profile used for all the jobs related to the WebSphere Application Server instance. By default, the QEJBSVR user profile must be the owner of all instances files.

Tip: You can use the **chgown** command from Qshell to change the owner for a specific directory including all files in it, for example:

```
chgown -R QEJBSVR /QIBM/UserData/WebSphere/AppServer/V6/Base/profiles/default
```

This command makes QEJBSVR the owner for all files inside the default directory.

► In addition, you should grant private authority to the QTMHHTTP and QNOTES user profiles (if they exist) to certain directories. To grant authority, enter the following commands in the order shown:

- a. CHGAUT OBJ('profilePath/config') USER(QTMHHTTP) DTAAUT(*X)
- b. CHGAUT OBJ('profilePath/config/cells') USER(QTMHHTTP) DTAAUT(*X)
- c. CHGAUT OBJ('profilePath/logs') USER(QTMHHTTP) DTAAUT(*RWX)
- d. CHGAUT OBJ('profilePath/etc') USER(QTMHHTTP) DTAAUT(*RX)
- e. CHGAUT OBJ('profilePath/etc/plugin-key.kdb') USER(QTMHHTTP) DTAAUT(*RX)
- f. CHGAUT OBJ('profilePath/etc/plugin-key.sth') USER(QTMHHTTP) DTAAUT(*RX)

Here, *profilePath* is the path to this profile directory in integrated file system, for example, /QIBM/UserData/WebSphere/AppServer/V6/Base/profiles/default.

You perform the same steps for the QNOTES profile.

► If you have a Web server definition, you should also enter the following commands in the order shown:

- a. CHGAUT OBJ('webServerPath') USER(QTMHHTTP) DTAAUT(*X)
- b. CHGAUT OBJ('webServerPath/plugin-cfg.xml') USER(QTMHHTTP) DTAAUT(*X)

Here, *webServerPath* is the path to your Web server definition directory, for example, /QIBM/UserData/WebSphere/AppServer/V6/Base/profiles/default/config/cells/*cellName*/nodes/*nodeName*/servers/*webServerName*.

You perform the same steps for the QNOTES profile.

► WebSphere Application Server application data

According to the nature of the failure, you must consider how to restore the databases associated with your application. This backup must be a part of your normal backup strategy.



Maintenance

This chapter discusses maintenance of the WebSphere Application Server. It explains the following topics:

- ▶ **Updating WebSphere Application Server system**
In this section, we explain how to obtain the PTF information required for WebSphere Application Server and other related products.
- ▶ **Updating WebSphere Application Server application**
In this section, we describe how to update your WebSphere Application Server application using the Administrative Console.

11.1 Updating WebSphere Application Server system

You must update your WebSphere Application Server with the required level of fixes: cumulative program temporary fixes (PTFs) and WebSphere Application Server group PTFs.

11.1.1 Cumulative PTFs

A cumulative PTF is a packaging of PTFs for all System i products. A new cumulative package is available about every three to four months.

To determine the prerequisite cumulative PTF package level for the version of WebSphere Application Server that you plan to install, complete the following steps:

1. Go to the WebSphere Application Server product Web site at the following address:

<http://www.ibm.com/servers/eserver/series/software/websphere/wsappserver/services/service.html>

2. Select the link for your OS/400 release level.
3. On the resulting page, click the **Cumulative Package** link to see the minimum cumulative PTF package that is required.

To determine if the correct OS/400 cumulative PTF package is installed on your server, complete following steps:

1. Sign on to your System i platform.
2. Enter the Display PTF Status (DSPPTF) command on the OS/400 command line.
3. In the Display PTF Status screen, you see the PTFs that have been applied to your System i (see Figure 11-1).

```
Display PTF Status                                     System:  RCHAS11
Product ID . . . . . : 5722999
IPL source . . . . . : ##MACH#B ##SERV#T
Release of base option . . . . . : V5R3M0 L00

Type options, press Enter.
  5=Display PTF details  6=Print cover letter  8=Display cover letter

   PTF                               IPL
Opt ID      Status                    Action
TL04209    Cover letter only          None
TLP0088    Temporarily applied        None
TLP0087    Superseded                  None
TLP0086    Superseded                  None
TLP0085    Superseded                  None
TLP0084    Superseded                  None
TLP0083    Superseded                  None
TLP0082    Superseded                  None
TLP0081    Superseded                  None

More...

F3=Exit  F11=Display alternate view  F17=Position to  F12=Cancel
```

Figure 11-1 Display PTF Status

In this example, the first PTF that is listed with a status of Temporarily applied correlates to the cumulative PTF that is installed on your System i platform. That is, PTF ID TL04209 indicates that cumulative PTF package C04209530 is installed on this V5R3 server. (The last three digits of the CUM number correspond to the release level.)

You must order and install the OS/400 cumulative PTF package periodically for preventive purposes. For more information about ordering PTF, see the Fixes Web site at the following address:

<http://www.ibm.com/servers/eserver/support/series/fixes/index.html>

For more information about how to install the cumulative PTF, see “Install cumulative PTF packages” in the iSeries Information Center at the following Web address:

<http://publib.boulder.ibm.com/infocenter/series/v5r3/topic/rzam8/rzam8fixinstallcum.htm>

Note: Installing the cumulative PTF package requires you to restart your System i platform. If it is not convenient to restart your server at the time that you apply the new PTF package, you can load and apply the PTFs and then specify that any PTFs that require an initial program load (IPL) are applied at the next normal IPL of the server.

11.1.2 Group PTFs

PTFs are also distributed as group PTFs for the System i platform. These group PTFs include all PTFs that are related to a particular System i product. This group PTF includes the latest WebSphere Application Server PTFs that bring the product up to the latest WebSphere Application Server for System i level. Group PTFs also contains fixes for other software components:

- ▶ IBM DB2 Universal Database for iSeries
- ▶ IBM Developer Kit for Java
- ▶ IBM HTTP Server

To find information about the latest group PTF, complete following steps:

1. See the WebSphere Application Server product Web site at the following address:
<http://www.ibm.com/servers/eserver/series/software/websphere/wsappserver/services/service.html>
2. Select the link for your OS/400 release level.
3. On the resulting page, you can see the latest available PTF version for the WebSphere Application Server product. Click the **Installed Group PTFs** link to see the PTFs that are included in the WebSphere Application Server Group PTF.

To display the Group PTFs installed on your server, complete following steps:

1. Sign on to your System i platform.
2. Enter the Work with PTF Groups (WRKPTFGRP) command in V5R3 on the OS/400 command line.

3. In the Work with PTF Groups Status display (Figure 11-2), you see a list of the group PTFs that are applied to your System i platform.

You can download the group PTF as explained in Appendix C, “Downloading PTFs using Fix Central” on page 207.

```
Work with PTF Groups                                     System: RCHAS11
Type options, press Enter.
4=Delete 5=Display 6=Print 8=Display special handling PTFs
9=Display related PTF groups

Opt PTF Group      Level Status
   SF99530         5032 Installed
   SF99529          61  Installed
   SF99503           5  Installed
   SF99301           8  Installed
   SF99295           4  Installed
   SF99288           6  Installed
   SF99287          12  Installed
   SF99282           3  Installed
   SF99275           8  Installed
   SF99272           3  Installed
   SF99269           7  Installed
   SF99185           6  Installed
   SF99173           2  Installed

More...

F3=Exit  F6=Print  F11=Display descriptions  F12=Cancel
F22=Display entire field
```

Figure 11-2 PTF Groups status

When you install the group PTF, the latest fix pack (or refresh pack) is placed in the product installation directory. You must then install the fix pack (or refresh pack). For detailed instructions about how to install the fix pack (or refresh pack) after you install the group PTF, see “Installing the WebSphere Application Server V6 fix pack” on page 40.

11.2 Updating the WebSphere Application Server application

To update your application files deployed on a server, you can choose from several methods:

- ▶ Administrative Console update wizard
- ▶ The `wsadmin` scripts
- ▶ Administrative programs (Java Management Extensions (JMX™))
- ▶ WebSphere rapid deployment

In this section, we explain how to update your WebSphere Application Server application files using the Administrative Console update wizard. If you want to use the other methods, see “Ways to update application files” in the WebSphere Information Center at the following Web address:

http://publib.boulder.ibm.com/infocenter/wsdoc400/topic/com.ibm.websphere.iseries.doc/info/ae/ae/crun_app_upgrade.html

11.2.1 Fine-grained application update

In the previous version of the WebSphere Application Server, the update could only be initiated if the deployer had the entire enterprise archive (EAR) file that was intended to update the deployed application. It was not possible to patch a deployed application using partial contents.

The fine-grained update feature in WebSphere Application Server makes the addition, update, and deletion of the partial application possible. You can execute these options using the administrative tools, such as Administrative Console and `wsadmin` provided with WebSphere Application Server. For the unit of the update, the following methods are supported:

- ▶ Replace an entire application (.ear file)
- ▶ Replace, add, or remove a single module (.war, EJB jar, or connector .rar file)
- ▶ Replace, add, or remove a single file
- ▶ Replace, add, and remove multiple files by uploading a compressed file describing the actions to take

Further, in some situations, the application can be updated without stopping a server. If the application is running while being updated, WebSphere Application Server automatically stops the application, or only its affected components, updates the application and restarts the application or components.

Updating using the Administrative Console

You can update deployed applications or modules using the Administrative Console. Updating consists of adding a new file or module to an installed application, or replacing or removing an installed application, file, or module. After replacement of a full application, the old application is uninstalled. After replacement of a module, file, or partial application, the old installed module, file, or partial application is removed from the installed application.

If you do not have the latest backup of the WebSphere Application Server application, you should back it up before you update your application. For more information about backup, see 10.3.3, “Backup and recovery of the application in integrated file system directory” on page 162.

To update the application:

1. Start the Administrative Console. Point your browser to:

```
http://host_name:port/ibm/console
```

Here, *host_name* is your System i host name, and *port* is the Administrative Console port.

2. In the User ID field, enter your user ID and click **Log in**.
3. On the Administrative Console page, in the left navigation frame, click **Applications** → **Enterprise Applications**.

4. In the Enterprise Applications pane on the right, you see a list of the installed applications (Figure 11-3). Select the check box next to enterprise application that you want to update. In this example, we choose **WebSphereBank**. Then click the **Update** button.

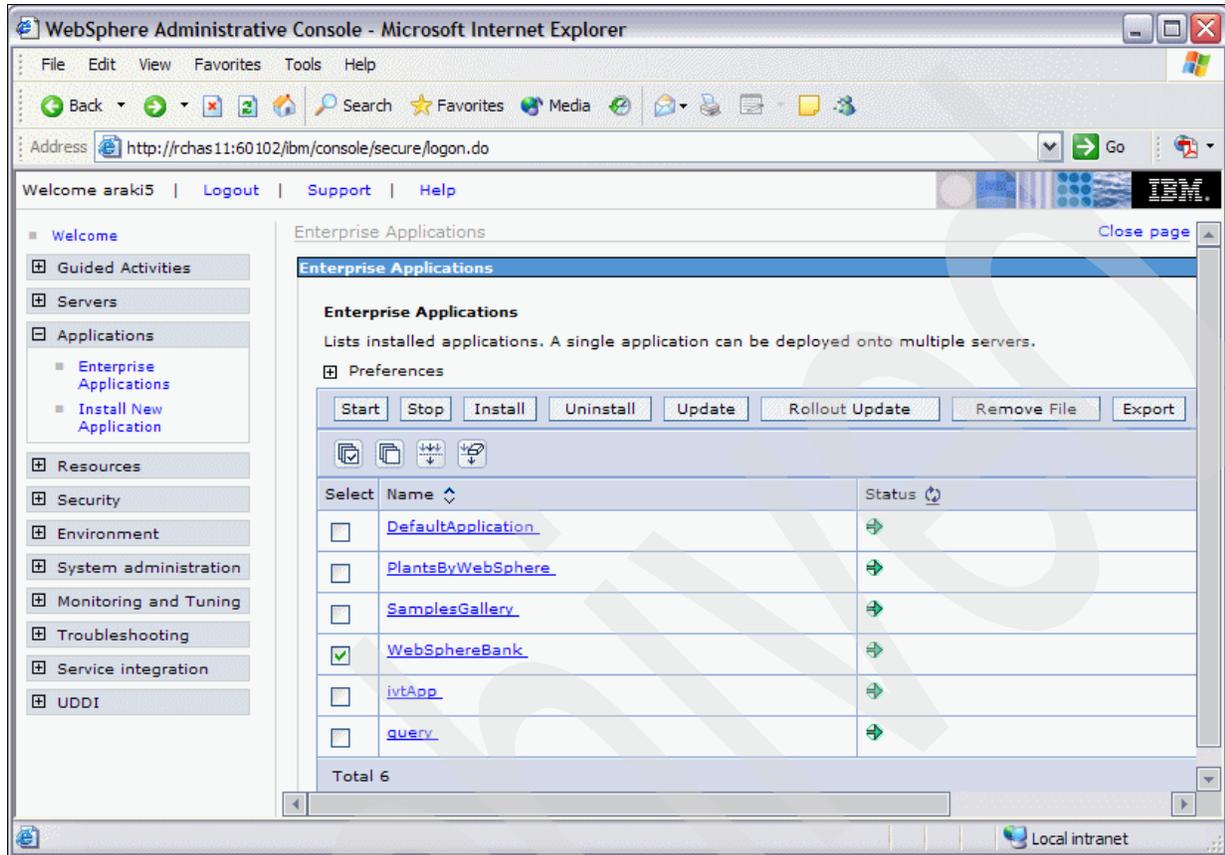


Figure 11-3 Enterprise Applications list

The Preparing for the application installation pane is displayed as shown in Figure 11-4.

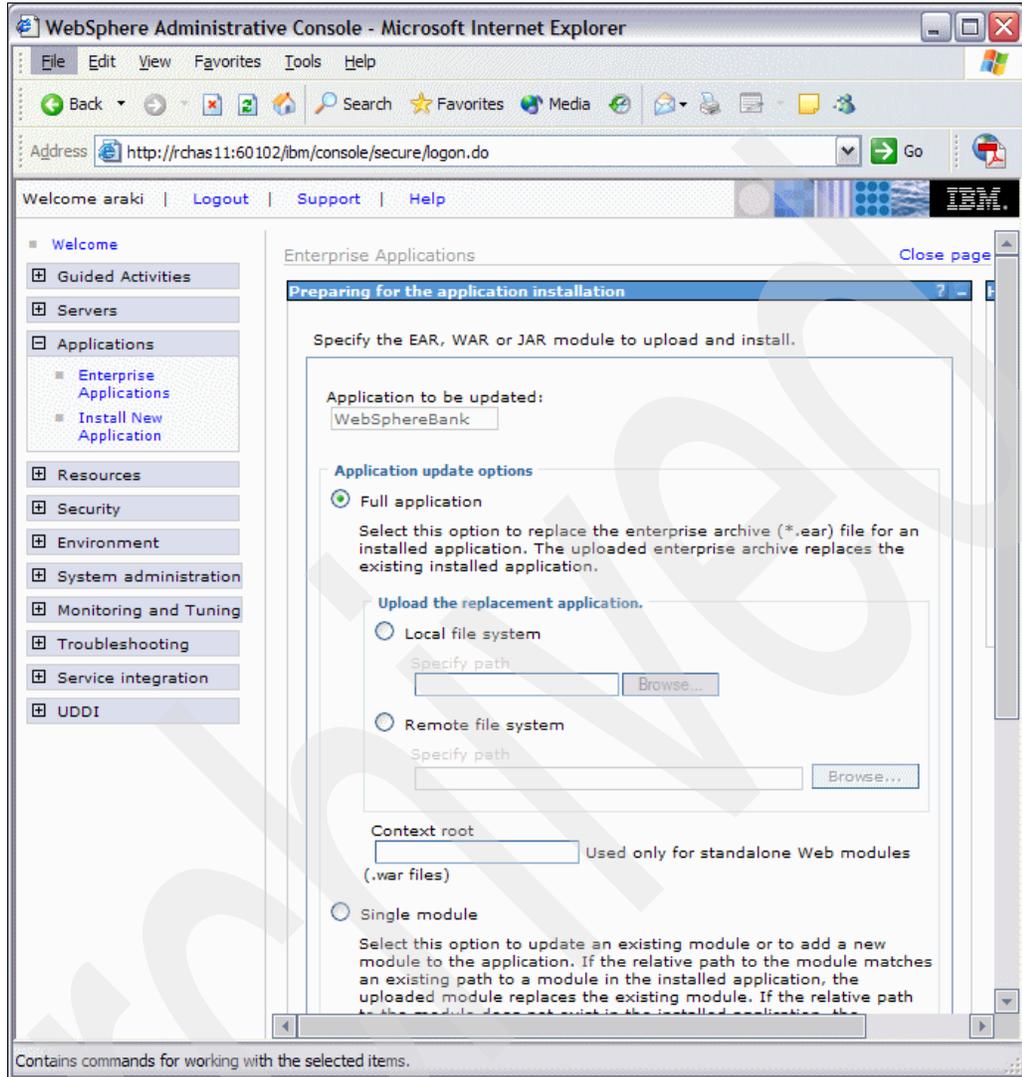


Figure 11-4 Preparing for the application installation

Full application

The Full application option replaces the entire application with the new version. To replace a full EAR file:

1. On the Preparing for the application installation panel (see Figure 11-4), complete these steps:
 - a. Select the **Full application** option.
 - b. Select either the **Local file system** or **Remote file system** option. In this example, we select the Local file system option (Figure 11-5).
 - c. Click the corresponding **Browse** button. Navigate to the new EAR file, select it, and click **OK**.
 - For the *Local file system*, you look on your workstation where you run the Web browser.
 - For the *Remote file system*, you look on your System i platform where you run WebSphere Application Server.

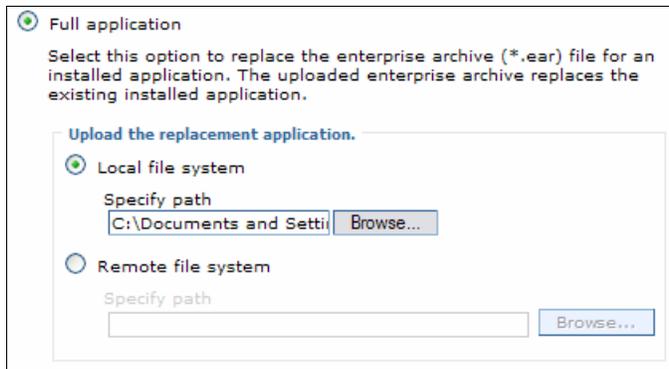


Figure 11-5 Selecting the Full application option

2. The update wizard, which is similar to the installation wizard, provides fields for specifying or editing application binding information. Complete the steps in the update wizard as necessary. In the Summary pane, click **Finish**.
3. In the next pane, click the **Save to Master Configuration** link (see Figure 11-6).

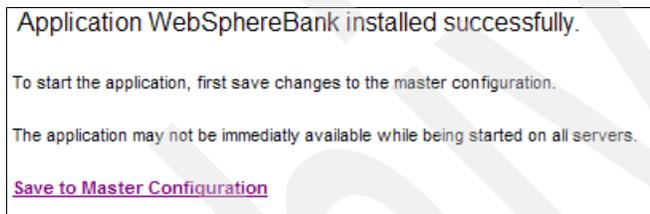


Figure 11-6 Save to Master Configuration

4. In the next pane, click **Save** (see Figure 11-7).

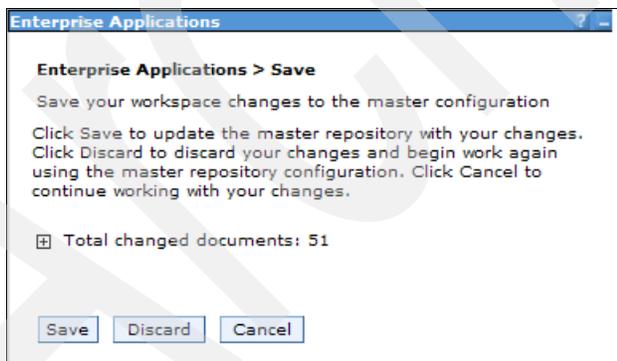


Figure 11-7 Changes to the master configuration

When the full application is updated, the old application is uninstalled, and the new application is installed.

Single module

The Single module option is used to replace a module or add a module to an installed application, such as a Web module (.war), enterprise bean module (EJB .jar), or resource adapter module (connector .rar).

To replace or add a module:

1. On the Preparing for the application installation panel (see Figure 11-4 on page 173), follow these steps:
 - a. Select the **Single module** option (see Figure 11-8).
 - b. In the Relative path to module field, enter the relative path to the module. To find the relative path, look at the integrated file system directory for your application.

Single module

Select this option to update an existing module or to add a new module to the application. If the relative path to the module matches an existing path to a module in the installed application, the uploaded module replaces the existing module. If the relative path to the module does not exist in the installed application, the uploaded module is added to the application.

Relative path to module.

Path to the existing module, or to the desired path for the new module.

Upload the new or replacement module.

Local file system

Specify path

Remote file system

Specify path

Context root
 Used only for standalone Web modules (.war files)

Figure 11-8 Single module option

As an example, see the *PlantsByWebSphere* applications in Figure 11-9. The relative path for this application, starts from the *plantsbywebsphere.ear* directory. As a result, the relative path for the *PlantsByWebSphere.war* is just *PlantsByWebSphere.war*. If you go in the *PlantsByWebSphere.war* directory, you will find many files and directories. One of the files is *login.jsp*, and its relative path is *PlantsByWebSphere.war/login.jsp*.

```
QSH Command Entry

$
> cd
/qibm/userdata/websphere/appserver/v6/base/profiles/default/installedApps/rchas11/plantsbywebsphere.ear
$
> ls
Database          PlantsByWebSphereEJB.jar
META-INF          PlantsGallery.war
PlantsByWebSphere.war
$

===>

F3=Exit  F6=Print  F9=Retrieve  F12=Disconnect
F13=Clear  F17=Top  F18=Bottom  F21=CL command entry
```

Figure 11-9 *PlantsByWebSphere* application

You have two options:

- To replace a module, the value must match the path of the module to be updated in the installed application.
 - To add a new module to the installed application, the value must not match the path of a module in the installed application. The value specifies the desired path for the new module.
- c. Select the updated EAR file using either the **Local file system** or **Remote file system** option.
 - d. If you are installing a standalone Web module, specify a value in the Context root field. The context root is combined with the defined servlet mapping (from the .war file) to compose the full URL that users type to access the servlet. For more information, see “Context root” on page 68.
 - e. Click **Next**.
2. The update wizard, which is similar to the installation wizard, provides fields for specifying or editing application binding information. Complete the steps in the update wizard as necessary. In the Summary panel, click **Finish**.
 3. In the next pane, select the **Save to Master Configuration** link.
 4. To apply the changes to the master configuration, click **Save**.

After a single module is added or updated, when configuration changes are saved, the new or updated module is stored in the deployed application in the WebSphere Application Server configuration repository. If the application is running on the node when the module is added or updated, then one of the following actions occurs:

- ▶ For updates to a Web module, the running Web module is stopped, Web module files are updated, and then the Web module is started.
- ▶ For adding a new module, the added module is started on the application servers where the application is running after it is expanded on the node. An application restart is not necessary.
- ▶ If the class loader policy for the application is set to *Single* so that all modules share a class loader, then the entire application is stopped and restarted for module level changes.
- ▶ If the security provider configured with WebSphere Application Server does not support dynamic updates, then the entire application is stopped and restarted for module level changes.
- ▶ For all other updates to a module, the entire application is stopped, the module files are updated, and then the entire application is started.

Single file

Use the Single file option to update a file used by the application that is not an .ear, .war, .rar or, in some instances, a .jar file. You can use this option to add or update .jar files that are not defined as modules in the application. To update an .ear file, use the *Full application* option. To update a .war file, .rar file, or .jar file that is defined as a module in the application, use the *Single module* option.

To replace or add a file:

1. On the Preparing for the application installation panel (see Figure 11-10), select the **Single file** option.
2. In the Relative path to file field, enter the relative path to the file (see the relative path discussion in the previous section).

You have two options:

- To replace a file, the value must match the path of a file to be updated.
- To add a new file to the installed application, the value must not match the path of a file in the installed application. The value specifies the desired path for the new file.

Note: The relative path of the file must start from the root of the .ear file. For example, if the file is located at com/company/greeting.class in the module hello.jar, specify a relative path of hello.jar/com/company/greeting.class.

Single file

Select this option to update an existing file or to add a new file to the application. If the relative path to the file matches an existing path to a file in the installed application, the uploaded file replaces the existing file. If the relative path to the file does not exist in the installed application, the uploaded file is added to the application.

Relative path to file.
TestWeb.war/WEB-INF/classes/LoginChe

Path to the existing file, or to the desired path for the new file.

Upload the new or replacement files.

Local file system

Specify path
C:\Documents and Settings\... Browse...

Remote file system

Specify path
Browse...

Figure 11-10 Select the Single file option

After a single file is added or updated, when configuration changes are saved, the new or updated file is stored in the deployed application in the WebSphere Application Server configuration repository. If the application is running on the node when the file is added or updated, then one of the following actions occurs:

- ▶ When files are added at application metadata scope (META-INF directory) or updated at any application scope or in non-Web modules, the entire application is stopped, the file is added or updated, and then the entire application is restarted.
- ▶ When files are added at application non-metadata scope (outside of the META-INF directory but not in any module), the changes are saved in the file system without restarting the running application.
- ▶ When files are added or updated to Web module metadata (META-INF or WEB-INF directory), the running Web module is stopped, the Web module file is added or updated, and then the Web module is started.
- ▶ For all other files in Web modules, the file is added or updated on the node's file system without stopping the application or any of its components.

Partial application

Using the Partial application option, you can update the multiple files or modules of an installed application by uploading a compressed file. Depending on the contents of the compressed file, a single use of this option can replace files in, add new files to, and delete files from the installed application. Each entry in the compressed file is treated as a single file, and the path of the file from the root of the compressed file is treated as the relative path of the file in the installed application.

For packaging the files, consider these points:

- ▶ To replace a file, a file in the compressed file must have the *same relative path* as the file to be updated in the installed application.
- ▶ To add a new file to the installed application, a file in the compressed file must have a *different relative path* than the files in the installed application.
- ▶ To remove a file from the installed application, specify metadata in the compressed file using a file named *META-INF/ibm-partialapp-delete.props* at any archive scope. The *ibm-partialapp-delete.props* file must be an ASCII file that lists files to be deleted in that archive with one entry for each line. The entry can contain a string pattern such as a regular expression that identifies multiple files. The file paths for the files to be deleted must be relative to the archive path that has the *META-INF/ibm-partialapp-delete.props* file.

For example, to delete a file named *utils/config.xmi* from the root of the *my.ear* file, include the line *utils/config.xmi* in the *META-INF/ibm-partialapp-delete.props* file.

- ▶ To remove a file from a module in the EAR file, specify metadata in the compressed file using a file named *module-uri/META-INF/ibm-partialapp-delete.props* file. For example, to remove *logs/log1.dat* from the *SampleApp.war* module, specify the line *logs/log1.dat* in the *SampleApp.war/META-INF/ibm-partialapp-delete.props* file.

As an example, there is an application EAR file (*Application.ear*) that is running in the WebSphere Application Server. We update the *Application.ear* file using partial application compressed file *Application.zip* (see Figure 11-11).

In this case, the partial application update option performs the following actions:

- ▶ **Deletes** the *img/File2.jpg* file from the application, but not from any modules
- ▶ **Adds** the *a/b/File2.class* inside the *Module1.jar* file
- ▶ **Deletes** the *g/h/File** files from the *Module1.war* module
- ▶ **Replaces** the *Module2.war* module in the deployed application
- ▶ **Adds** the *Module3.war* module in the deployed application

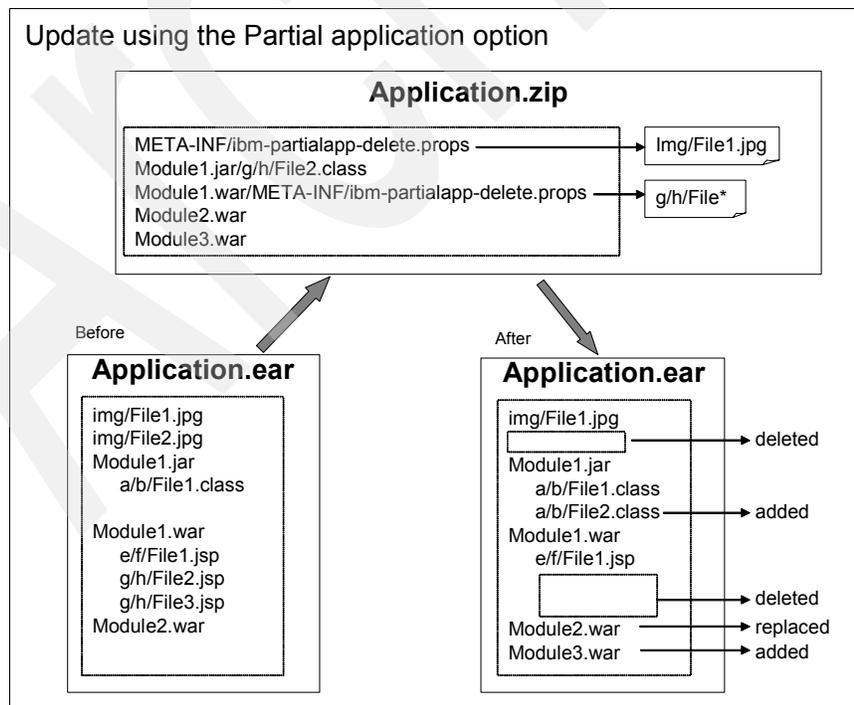


Figure 11-11 Updating partial application example

To perform the actions specified in the compressed file, complete the following steps:

1. On the Preparing for the application installation pane (see Figure 11-12), select the **Partial application** option. Select the compressed file using either the **Local file system** or **Remote file system** option.

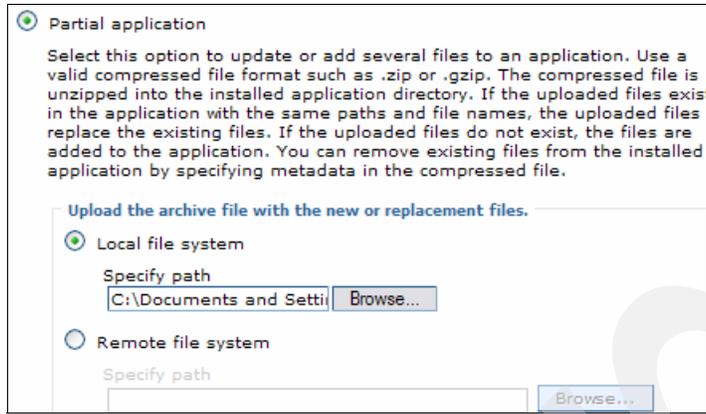


Figure 11-12 Selecting the Partial application option

2. In the Updating Application pane, click **OK**.
3. The update wizard, which is similar to the installation wizard, provides fields for specifying or editing application binding information. Complete the steps in the update wizard as needed. In the Summary pane, click **Finish**.
4. In the next pane, select the Save to **Master Configuration** link.
5. To apply the changes to the master configuration, click **Save**.

11.2.2 Removing a file from an application

You can also easily remove a file from an EAR file or from a module in an EAR file. To remove a file from an EAR file, complete the following steps:

1. In the Administrative Console window, in the left navigation frame, click **Applications** → **Enterprise Applications**.
2. In the right pane, you see the installed applications (see Figure 11-3 on page 172). Select the check box next to the enterprise application and click **Remove File**.
3. In the next pane, select a file from the Select the file to be removed drop-down list and click **OK** (see Figure 11-13).



Figure 11-13 Removing a file from an application

4. To apply the changes to the master configuration, click **Save**.

11.2.3 Uninstalling applications

After an application is no longer needed, you can uninstall it. Uninstalling an application deletes the application from the WebSphere Application Server configuration repository, and it deletes the application binaries from the file system of all nodes where the application modules are installed.

To uninstall an application:

1. In the Administrative Console window, click **Applications** → **Enterprise Applications**.
2. In the right pane, you see the installed applications (see Figure 11-3 on page 172). Select the check box next to the enterprise application and click **Uninstall**.
3. In the next pane, click **OK**.
4. To apply the changes to the master configuration, click **Save**.



Installing Workload Estimator

In this appendix, we provide you with detailed information about how you can download, install and run the Workload Estimator tool on your PC. Doing this enables you to perform server sizing estimates even if you are not connected to the Internet.

In our examples, the PC runs the Microsoft Windows XP Professional operating system with Service Pack 2 installed and uses Mozilla Firefox Version 1.07 as the Web browser.

Prerequisite software

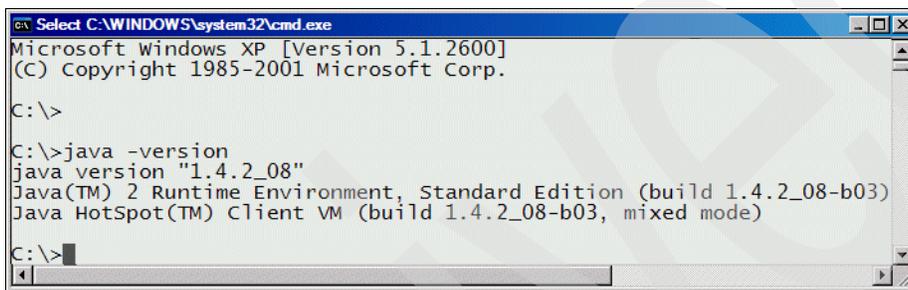
The Workload Estimator tool requires a supported version of the Java 2 Runtime Environment (JRE), as well as a supported release of the Apache Tomcat Web server (Apache Tomcat). In the sections that follow, we explain how you can install the prerequisite software on your PC.

Installing a supported JRE version

The following steps help you to install a supported JRE:

1. Enter the following command from the command prompt on your PC, as shown in Figure A-1 to verify your current JRE version.

```
java -version
```



```
Microsoft Windows [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\>

C:\>java -version
java version "1.4.2_08"
Java(TM) 2 Runtime Environment, Standard Edition (build 1.4.2_08-b03)
Java HotSpot(TM) Client VM (build 1.4.2_08-b03, mixed mode)

C:\>
```

Figure A-1 Verifying the JRE version

If your current JRE is a supported version, you can proceed directly to “Installing Apache Tomcat” on page 183

2. If you do not have a supported version, download the required JRE from the following Web address:

http://www.ibm.com/support/docview.wss?rs=0&q1=jre+windows&uid=psg1MIGR-56888&loc=en_US&cs=utf-8&cc=us?=en

Click the **ibm-java2-jre-ibmpc-142.exe** link shown in Figure A-2, read and accept the License Agreement, and save the executable file to a directory of your choice on your PC.

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Support & downloads

Downloads and drivers
 Troubleshooting
 Hints and tips
 Parts information
 User's guides and manuals
 Product information
 Operating system installation
 Important information
 Submit a request
 Warranty
 Site help
 Site feedback
 Search PC support
 Support phone list

IBM 32-bit Runtime Environment for Java 2 (JRE)

▼ Applicable countries and regions

The IBM Java2 JRE is only for updating IBM Personal Computing products manufactured prior to 1 Apr 2005.

Required for installation:

- Computer must be an IBM system. This program will not install on non-IBM systems.
- Computer must have been manufactured prior to 1 Apr 2005.
- Computer must be running Microsoft Windows Me, 2000, or XP. Or must be updated with the latest WMI classes if running an older Microsoft operating system.
- User must have Administrator level access.

Document options

Printable version

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File details

Version: 1.4.2 SR 4-1 and 5.0
Release Date: 2006/02/09

File link	File size	File description
ibm-java2-ire-ibmpc-142.exe	47,745,752	IBM 32-bit SDK for Windows, Java 2 Technology Edition, Version 1.4.2 Service Release 4-1
ibm-java2-ibmpc-ire-50-win-i386.exe	51,489,897	IBM 32-bit SDK for Windows, Java 2 Technology Edition, Version 5.0

Additional information

Related links

- Accessories and upgrades
- Business Partner support
- Training
- Find a service provider

Figure A-2 Web page for downloading IBM Java 2 JRE

3. To start the installation process, run the executable file directly from the directory where you previously saved it.
4. After you complete the installation process, verify your installed version of the JRE as shown in Figure A-1.

Installing Apache Tomcat

The latest supported versions of Apache Tomcat is available from The Apache Software Foundation (ASF) at the following Web address:

http://jakarta.apache.org/site/downloads/downloads_tomcat.html

The following steps helps you to install Apache Tomcat on your PC:

1. Download the required Apache Tomcat Windows Executable file from the previous Web site and save it to a local PC directory of your choice.
2. To start the installation of Apache Tomcat, launch the executable file directly from the directory where you have saved it.

3. In the Welcome panel, click **Next** (see Figure A-3).

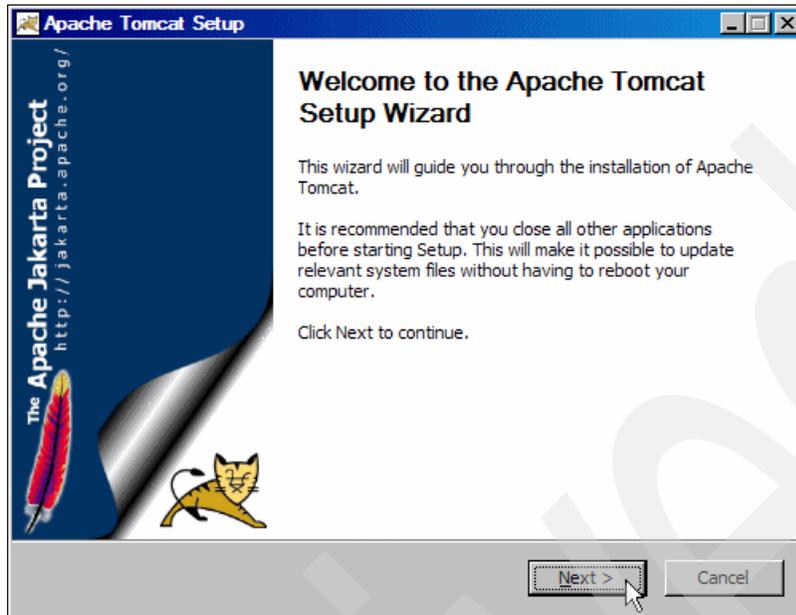


Figure A-3 Apache Tomcat setup

4. Read the license agreement and click **I Agree** as shown in Figure A-4.

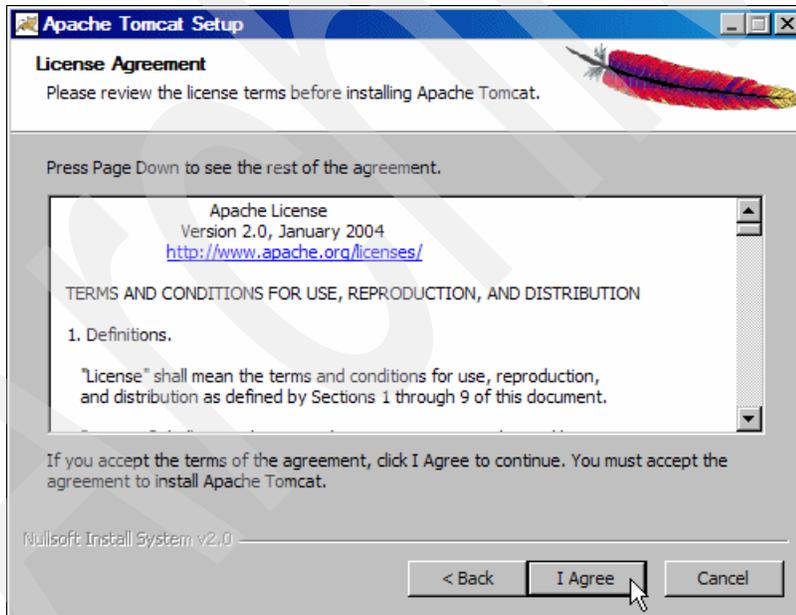


Figure A-4 Apache Tomcat license agreement

- In the Choose Components panel (Figure A-5), for Select the type of install, select **Normal**. You might also select additional components to install if you require. Click **Next**.

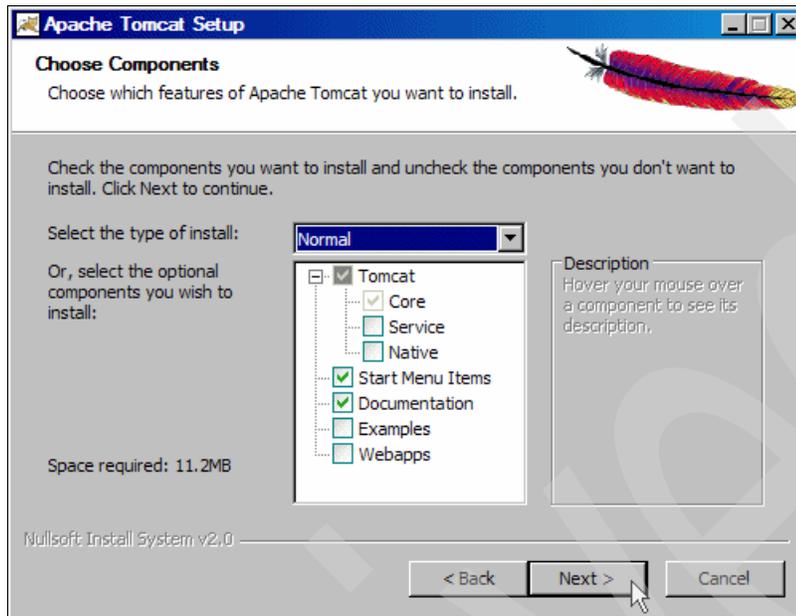


Figure A-5 Apache Tomcat component options

- In the Choose Install Location panel (Figure A-6), for Destination Folder, specify the name of the directory where you want to install Apache Tomcat. You can change the destination folder to any directory of your choice. We recommend that you write down the name of this directory, because you must specify this directory name later during the installation of the Workload Estimator software.
Click **Next**.

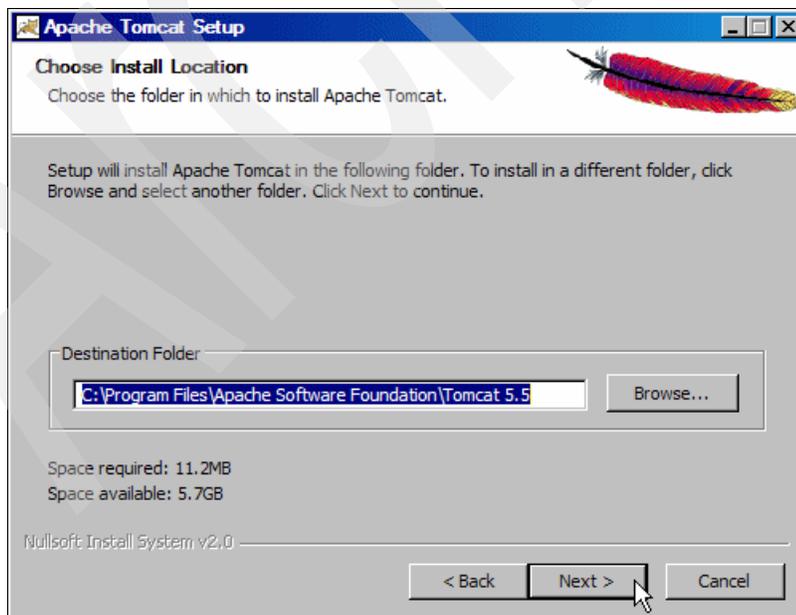


Figure A-6 Apache Tomcat destination directory

7. In the Configuration panel (Figure A-7), enter the port number and administrator login information.

Ensure that the port number that you specify here is not used by other services and applications running on your PC. For security reasons, we recommend that you secure the Apache Tomcat administrator ID with a password.

Click **Next**.

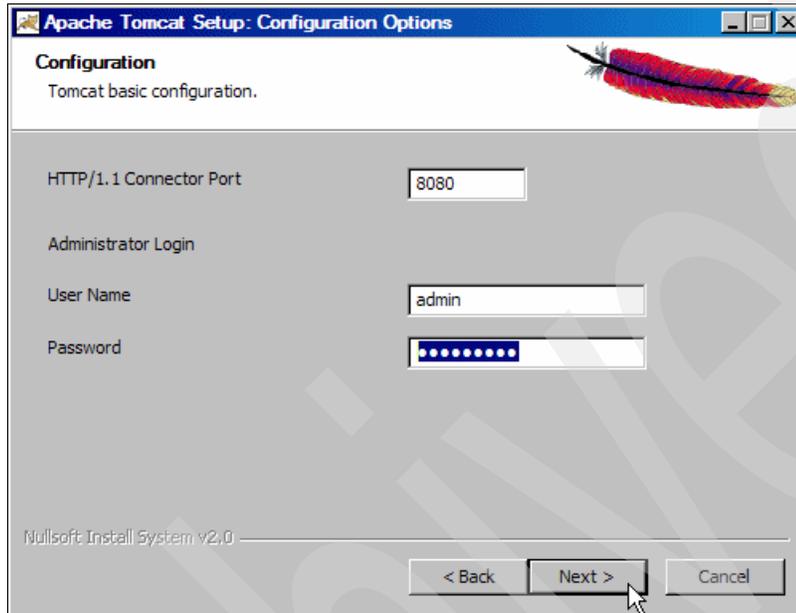


Figure A-7 Apache Tomcat configuration

8. In the Java Virtual Machine panel (Figure A-8), specify the location of your JRE and click **Install**.

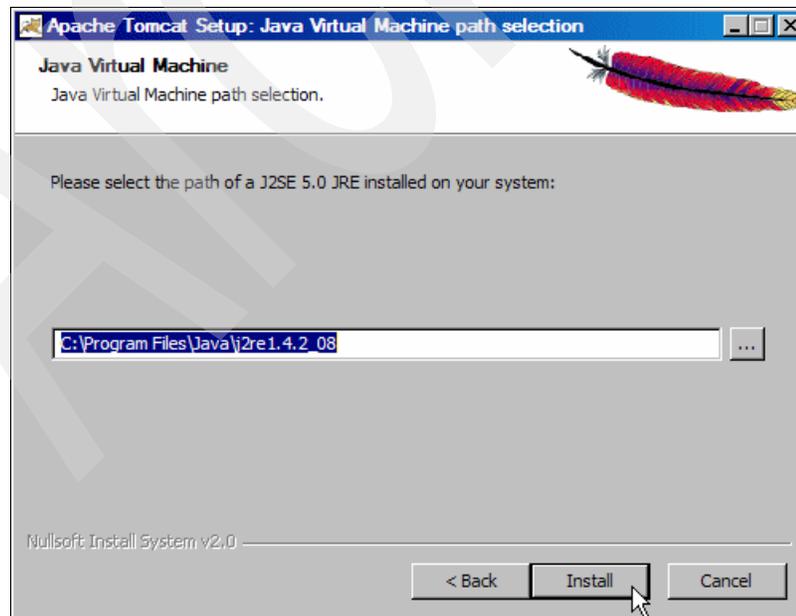


Figure A-8 Apache Tomcat Java virtual machine location

9. To complete the Apache Tomcat installation, click **Finish** as shown in Figure A-9.

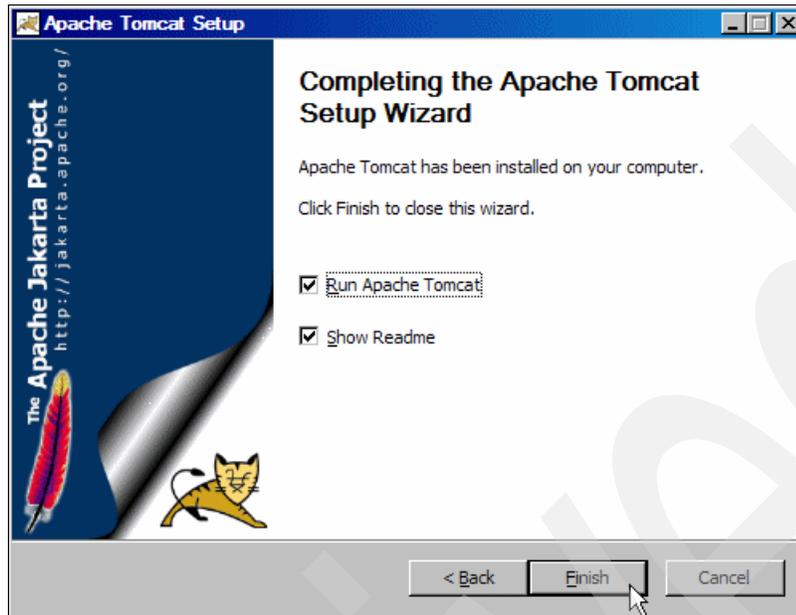


Figure A-9 Apache Tomcat installation completion

Now that you have successfully installed your JRE and Apache Tomcat, you can proceed with the installation of the Workload Estimator tool.

Installing Workload Estimator

The following steps guide you through the installation of Workload Estimator:

1. Go to the IBM Systems Workload Estimator Web site at the following address:
<http://www-912.ibm.com/supporthome.nsf/document/16533356>
2. Select the **Download the IBM Systems Workload Estimator** option as shown in Figure 2-1 on page 11 to download the Workload Estimator tool to a local directory on your PC.
3. Extract the contents of the Workload Estimator.zip file to a local directory of your choice on your PC.

Read and follow the instructions in the Installing.html file in that directory. This file contains important information that assists you with installing and running Workload Estimator successfully.

4. To start the installation process, run the **IBMServerWorkloadEstimator.exe** program in the directory where you extracted Workload Estimator.

5. In the Welcome panel (Figure A-10), click **Next** to proceed with the installation process.

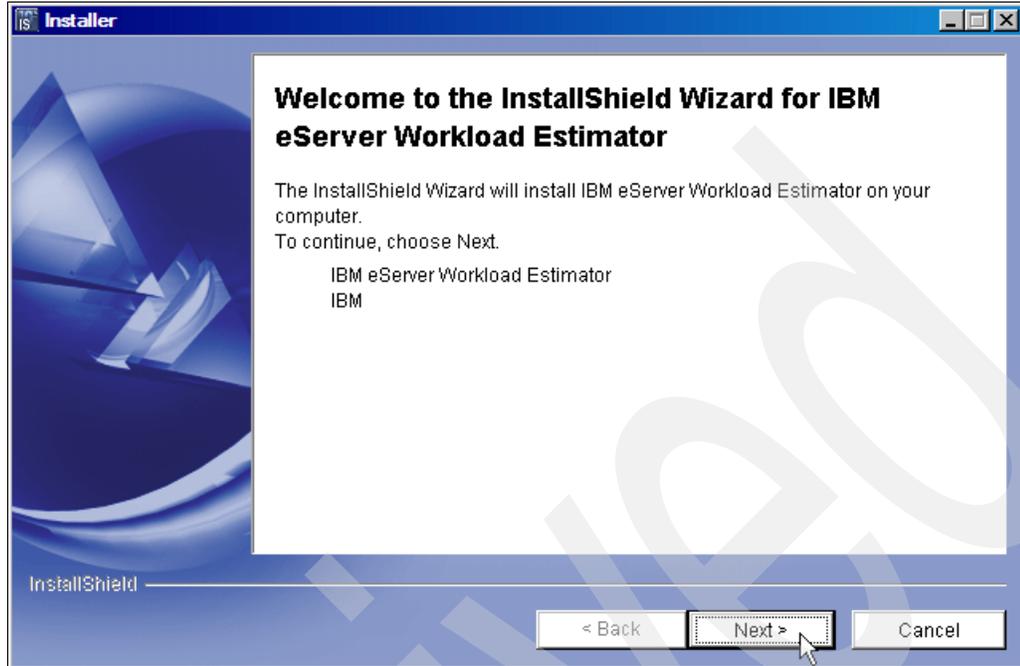


Figure A-10 Workload Estimator installation

6. Read the license agreement and click **I accept the terms of the license agreement**. Click **Next** to continue with the installation. See Figure A-11.

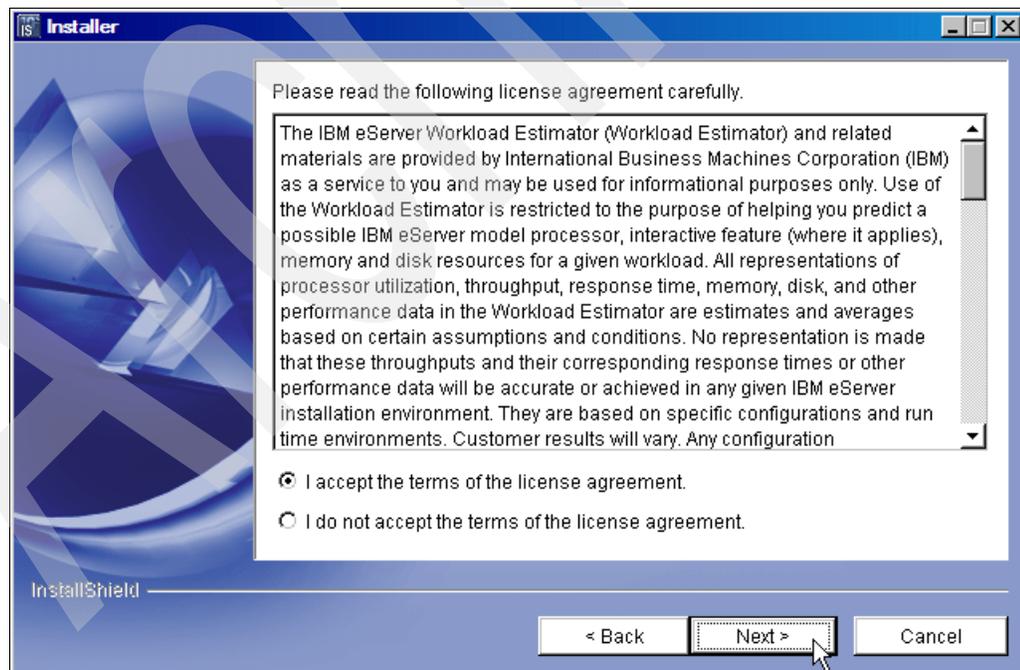


Figure A-11 Workload Estimator license agreement

7. In the next panel (Figure A-12), specify the name of the directory where you want Workload Estimator to be installed and click **Next**.

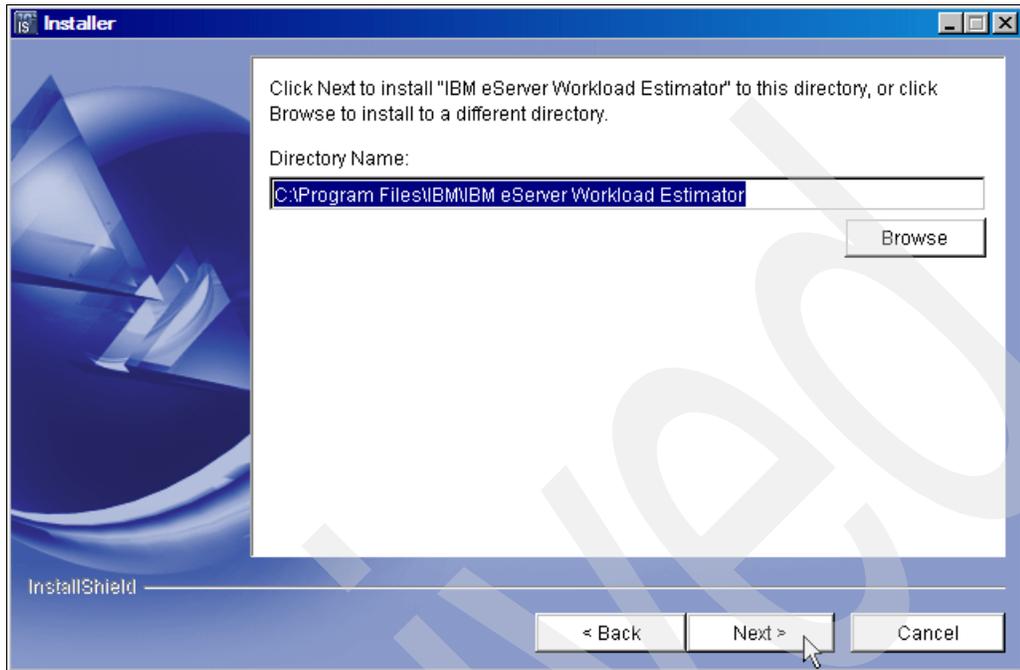


Figure A-12 Workload Estimator installation directory

8. In the Tomcat 4.x Installation Directory panel (Figure A-13), specify the local directory where you previously installed Apache Tomcat. This is the same directory path that you specified in Figure A-6 on page 185. Change this default directory to suit your Apache Tomcat configuration. Click **Next**.

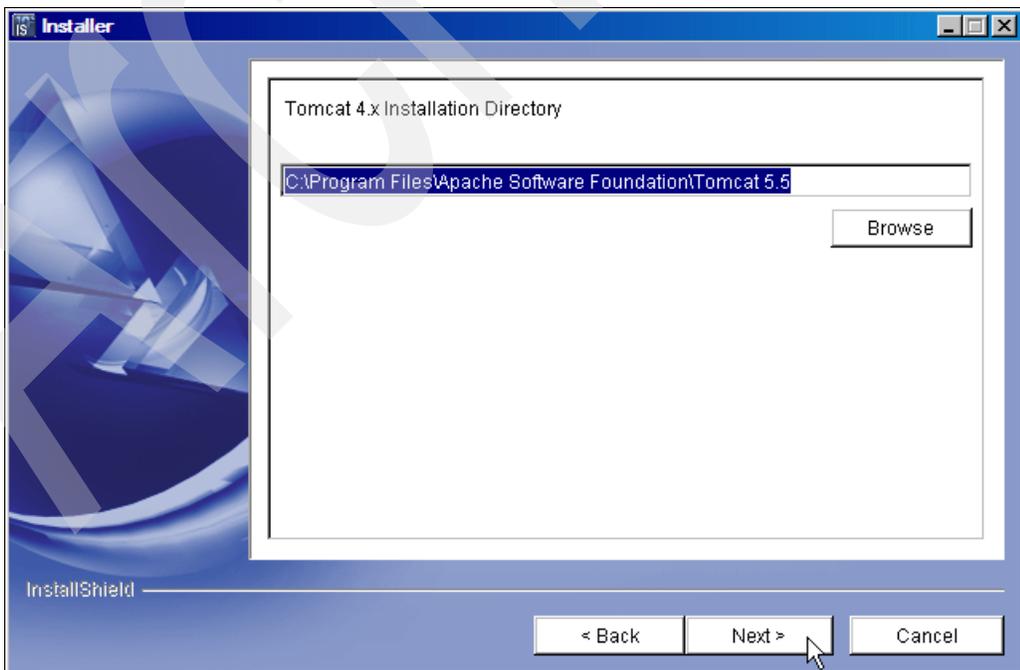


Figure A-13 Apache Tomcat directory path

9. Click **Finish** to complete the Workload Estimator installation, as shown in Figure A-14.

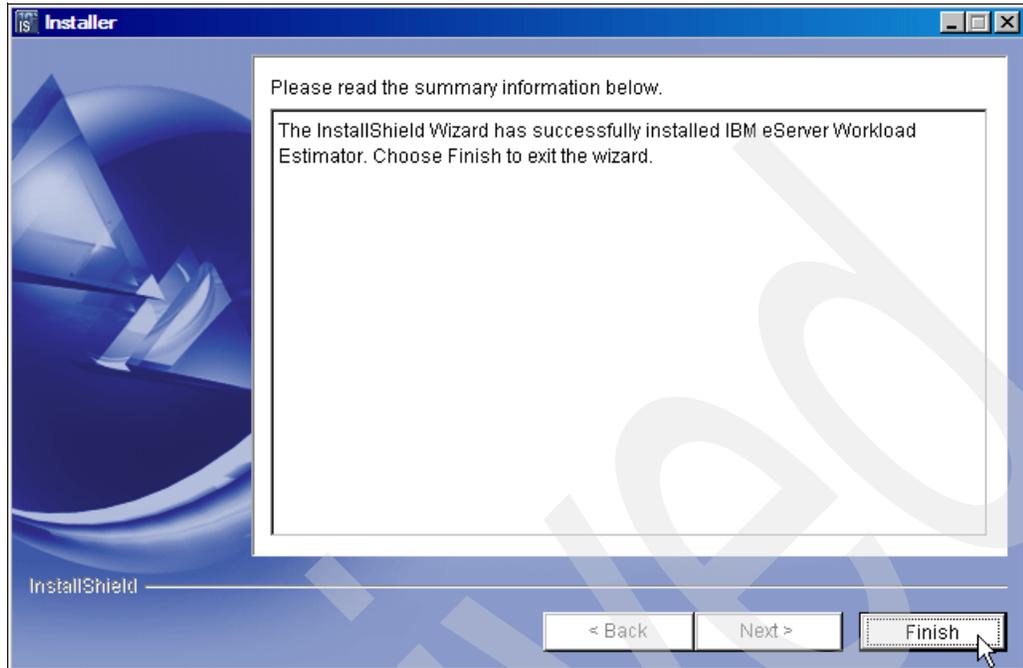


Figure A-14 Workload Estimator installation completion

Your Workload Estimator tool is now ready for use.

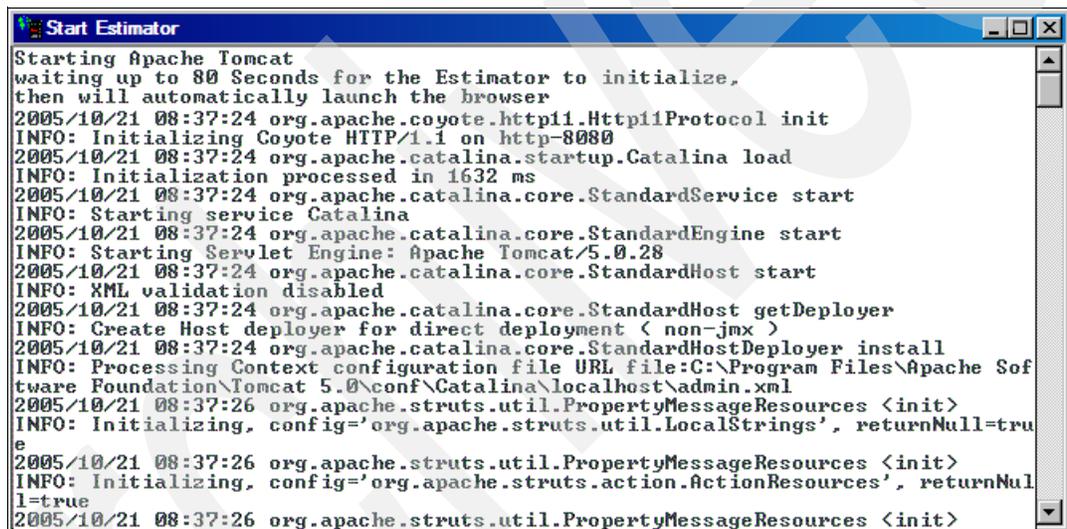
Making decisions about hardware requirements using Workload Estimator

You can use Workload Estimator to guide you in making informed decisions about your server hardware requirements to accommodate your WebSphere Application Server V6 implementation. To begin using Workload Estimator:

1. To start Workload Estimator, launch the `startestimator.bat` file directly via the icon located in the Windows Programs folder on your PC. You see a window similar to the one in Figure A-15.

Note: Workload Estimator automatically starts Apache Tomcat if it is not already active. Do not manually close the window shown in Figure A-15 or you will terminate Apache Tomcat, which prevents Workload Estimator from functioning properly.

It might take a while for Apache Tomcat and Workload Estimator to start, depending on the hardware configuration of your PC.



```
Start Estimator
Starting Apache Tomcat
waiting up to 80 Seconds for the Estimator to initialize,
then will automatically launch the browser
2005/10/21 08:37:24 org.apache.coyote.http11.Http11Protocol init
INFO: Initializing Coyote HTTP/1.1 on http-8080
2005/10/21 08:37:24 org.apache.catalina.startup.Catalina load
INFO: Initialization processed in 1632 ms
2005/10/21 08:37:24 org.apache.catalina.core.StandardService start
INFO: Starting service Catalina
2005/10/21 08:37:24 org.apache.catalina.core.StandardEngine start
INFO: Starting Servlet Engine: Apache Tomcat/5.0.28
2005/10/21 08:37:24 org.apache.catalina.core.StandardHost start
INFO: XML validation disabled
2005/10/21 08:37:24 org.apache.catalina.core.StandardHost getDeployer
INFO: Create Host deployer for direct deployment ( non-jmx )
2005/10/21 08:37:24 org.apache.catalina.core.StandardHostDeployer install
INFO: Processing Context configuration file URL file:C:\Program Files\Apache Sof
tware Foundation\Tomcat 5.0\conf\Catalina\localhost\admin.xml
2005/10/21 08:37:26 org.apache.struts.util.PropertyMessageResources <init>
INFO: Initializing, config='org.apache.struts.util.LocalStrings', returnNull=tru
e
2005/10/21 08:37:26 org.apache.struts.util.PropertyMessageResources <init>
INFO: Initializing, config='org.apache.struts.action.ActionResources', returnNul
l=true
2005/10/21 08:37:26 org.apache.struts.util.PropertyMessageResources <init>
```

Figure A-15 Starting Workload Estimator

- After both Apache Tomcat and Workload Estimator are fully initialized, you see the license agreement page, like the example in Figure A-16, displayed in your Web browser. Click **I Accept** to continue.

The screenshot shows the IBM Systems Workload Estimator License Agreement page. The page layout includes a top navigation bar with the IBM logo, a search bar, and navigation tabs for Home, Products, Services & solutions, Support & downloads, and My account. The main content area is titled "License Agreement" and contains several paragraphs of legal text. A sidebar on the right lists "Help" and "Tutorials" sections. At the bottom, there are two buttons: "I do not Accept" and "I Accept".

License Agreement

The IBM Systems Workload Estimator (Workload Estimator) and related materials are provided by International Business Machines Corporation (IBM) as a service to you and may be used for informational purposes only. Use of the Workload Estimator is restricted to the purpose of helping you predict a possible IBM eServer model processor, interactive feature (where it applies), memory and disk resources for a given workload. All representations of processor utilization, throughput, response time, memory, disk, and other performance data in the Workload Estimator are estimates and averages based on certain assumptions and conditions. No representation is made that these throughputs and their corresponding response times or other performance data will be accurate or achieved in any given IBM eServer installation environment. They are based on specific configurations and run time environments. Customer results will vary. Any configuration recommended by the Workload Estimator should be tested and verified. By accepting this information or using the Workload Estimator you agree to the terms and conditions contained herein. If you do not agree with such terms and conditions, please do not review or use the provided materials and return the materials to IBM.

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This product includes software developed by the Apache Software Foundation (<http://www.apache.org/>).

© Copyright IBM Corp. 1999,2006 All rights reserved.
US Government Users Restricted Rights - Use, duplication, or disclosure restricted by GSA ADP Schedule Contract with IBM Corp.

I do not Accept I Accept

Figure A-16 Workload Estimator license agreement page

3. In the User Demographic Information page, enter your user credentials and click **Continue**.

Note: If your browser is set to accept cookies, you are only prompted to accept the license agreement and to enter your user credentials the first time you run Workload Estimator. Subsequent runs of Workload Estimator proceed directly to the Web page shown in Figure 2-3 on page 13, unless the cookie expires or you manually delete the cookie.

4. Specify your server hardware requirement details and your workload requirements. See 2.1.1, “IBM Systems Workload Estimator” on page 10, which contains more detailed information about how to specify your workload requirements in Workload Estimator. It also shows an example of the sizing results that Workload Estimator produces.
5. You can revisit and modify any of your input parameters until you are satisfied that the input information is a representative view of your required workload.
6. To end Workload Estimator after you have completed your workload estimates, launch the **endestimator.bat** file directly via the icon in the Windows Programs folder on your PC.

Note: When you end Workload Estimator using the default endestimator.bat file, your Apache Tomcat is also ended. If you are using Apache Tomcat to support other applications, close the Workload Estimator Web page instead. Alternatively, you can modify the default endestimator.bat file to prevent it from stopping your Apache Tomcat.

Now that you have verified your server hardware requirements and are satisfied that your iSeries will be able to accommodate your workload, you can start preparing to install your WebSphere Application Server - Express V6 software.

Archived

Silent installation methods

This appendix provides details about how to install WebSphere Application Server - Express V6 by using the silent installation methods mentioned in 3.1, "Installation options" on page 28.

Silent installation from your PC workstation

The silent installation method does not require you to interactively respond to any command and action prompts during the installation process. This is why it is often referred to as *silent install mode*. The installation process reads the installation options and parameters from a preconfigured response file that is located on your PC workstation.

The following steps explain how you can use the silent installation method to install WebSphere Application Server - Express V6 on your iSeries server from a PC workstation that runs the Windows XP Professional operating system with Service Pack 2 installed:

1. Insert the WebSphere Application Server 6.0 iSeries CD-ROM into the CD-ROM drive of your PC workstation.

If the autorun feature is enabled on your PC, the InstallShield wizard automatically starts the graphical user interface (GUI) installation program. Then you see a window similar to the one shown in Figure 3-6 on page 32. You can click the **Cancel** button to terminate this application.

Note: You might have received several different CD-ROM media with your WebSphere Application Server V6 software order. Make sure that you use the CD-ROM media labelled *WebSphere Application Server 6.0 iSeries* to do your installation.

2. Read and familiarize yourself with the WebSphere Application Server software license agreement.

The license information is located on the CD-ROM media in the \WAS\docs\lfiles directory and is not displayed for you to review during this installation process. You can open the file that corresponds to your language preference directly from the CD-ROM, using any PC text editing tool of your choice.

3. Copy the IBM-supplied response file from the installation CD-ROM media to a local directory on your PC workstation. Figure B-1 shows how you can do this by using the Windows Explorer interface.

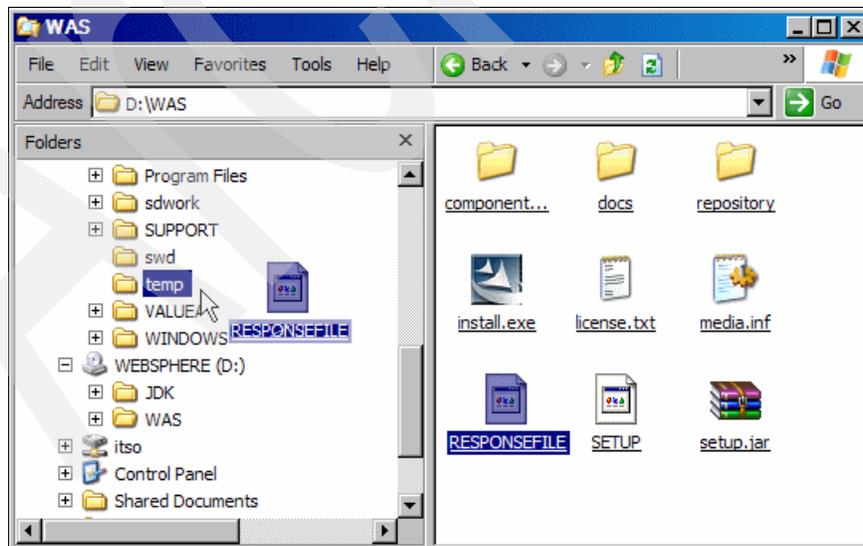


Figure B-1 Creating a response file

You can use the drag-and-drop functionality to copy the response file from the WAS directory on your CD-ROM to any directory of your choice on your PC workstation. As an

alternative, you can use the Copy and Paste functionality to do this. In this example, we use the drag-and-drop functionality to copy the file to the c:\temp directory on the PC workstation. You might also rename your new response file to a file name of your choice.

4. Use a PC text editing tool of your choice to open the newly created response file in you local PC directory. Figure B-2 shows how to do this using the WordPad text editing utility.

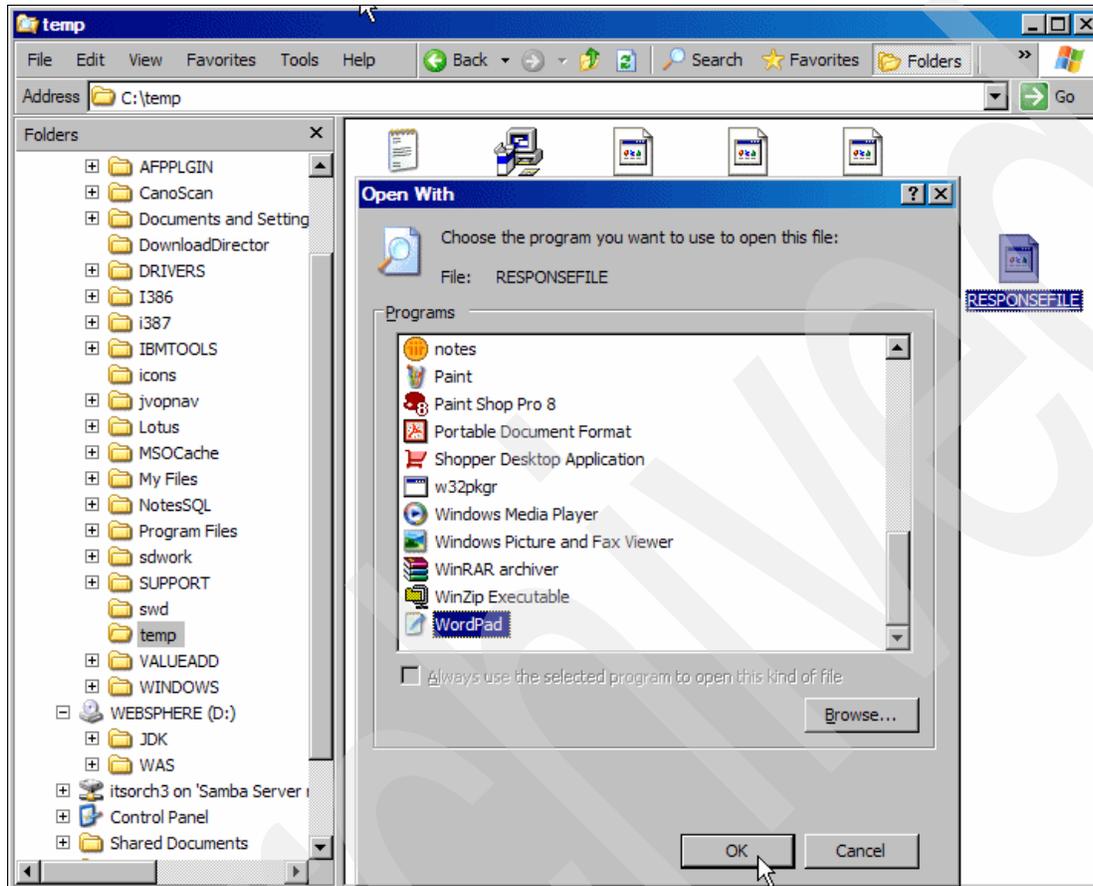


Figure B-2 Editing the response file using WordPad

5. After you read and accept the software license terms, locate the License Acceptance section in the file and modify the entry as shown in Figure B-3. By changing this value to true, you indicate, to the installation program that uses this response file, that you accept the software License terms.

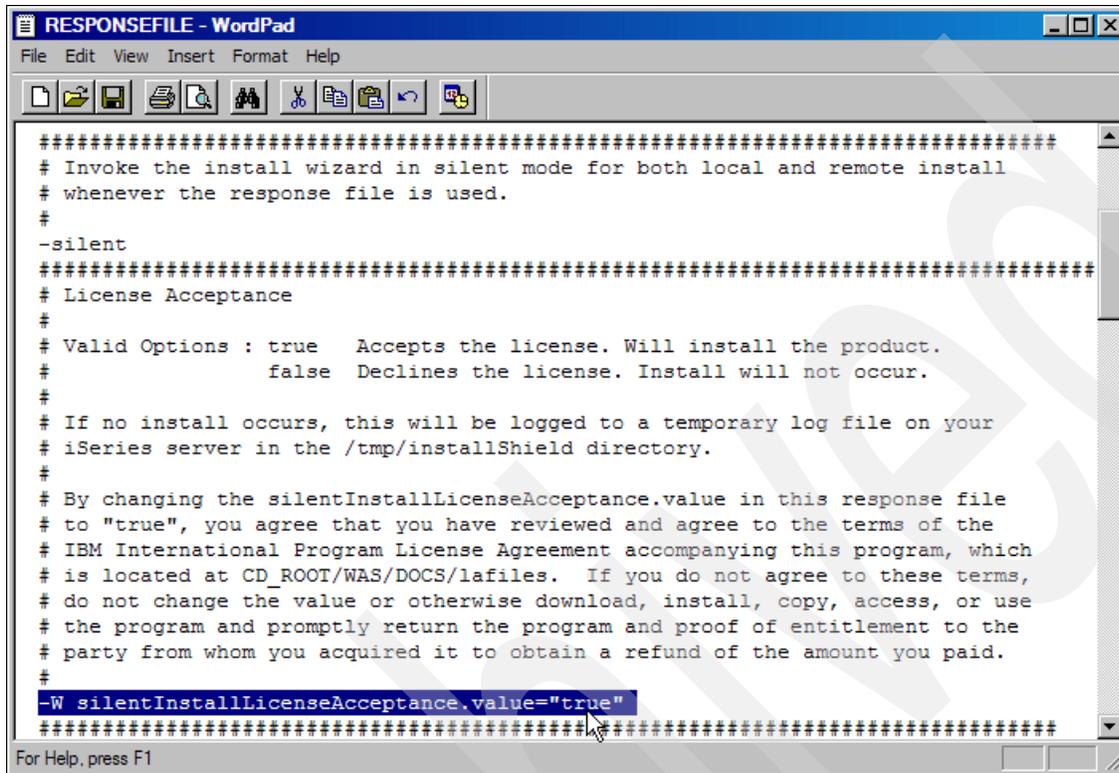


Figure B-3 Response file license acceptance

If this value is not set to “true”, the installation program will not run and you will see an error message similar to the one shown in Figure B-4.



Figure B-4 License agreement failure

Important: The installation program expects that the response file contains predefined entries and in a specific format. Do not change the default format or add any additional characters or spaces to any of these entries, because this might cause the affected parameter to be ignored or the installation can fail. You can find a detailed listing of each of the response file parameters, together with the allowed values, in “RESPONSEFILE for command-line installation” in the WebSphere Information Center at the following Web address:

<http://publib.boulder.ibm.com/infocenter/wsdoc400/index.jsp?topic=/com.ibm.websphere.iseries.doc/info/ae/ae/instresp.htm>

6. Select **File** → **Save** to save the changes that you have made to your file.

Note: If you save your file using the File → Save As menu option, the WordPad text editor automatically appends the default file extension (.txt) to your file name. You must then ensure that you specify the full name of your response file, including the file extension, when you run the installation program. Alternatively, you can rename the file afterwards and delete the file extension.

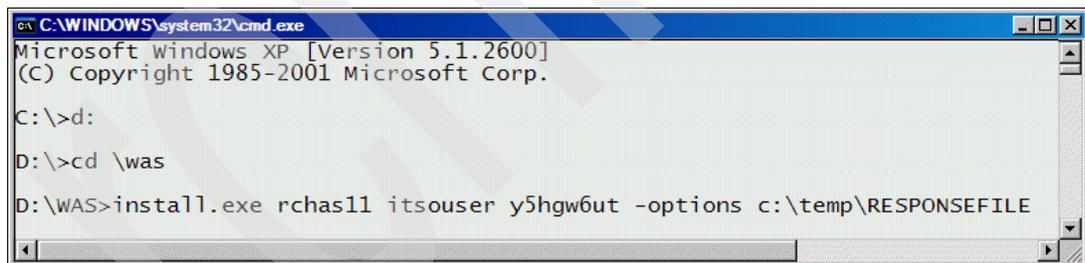
Start the command line interface on your PC workstation. Access the \WAS directory on the CD-ROM drive on your PC and start the installation program as shown in Figure B-5. The command syntax to run the installation program is as follows:

```
install.exe username password -options response file name
```

In this example, the CD-ROM drive on the PC is the D: drive and the installation program, install.exe, is located in the default \WAS directory on the CD-ROM media. The response file is located in the c:\temp directory, and the iSeries server on which we are installing WebSphere Application Server - Express V6 is called RCHAS11. We are using the iSeries user profile ITSouser, with its associated password (y5hgw6ut) to perform the installation.

Attention: As you can see from the previous example, your user password is entered and displayed in clear (readable) text in the PC command line interface. You should take the necessary precautions to safeguard your user ID and password and make sure that you close the PC command line interface as soon as the installation process has started on the iSeries server.

Then press the Enter key to start the installation.



```
C:\WINDOWS\system32\cmd.exe
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\>d:
D:\>cd \was
D:\WAS>install.exe rchas11 itsouser y5hgw6ut -options c:\temp\RESPONSEFILE
```

Figure B-5 Starting the installation from the PC command line interface

7. You return to the command prompt in the PC command line interface as soon as the installation process starts successfully on the iSeries server. Type **exit** and press the Enter key to close the PC command line interface, because you are not required to enter any further commands in the installation program.

8. View the installation log file to monitor the installation progress and to verify that the installation of WebSphere Application Server - Express V6 completed successfully. The installation log file is called *log.txt* and is located in the iSeries integrated file system directory /QIBM/ProdData/WebSphere/AppServer/V6/Base/logs.

You can view the contents of this file by using the iSeries Navigator interface. To do this, right-click the **file name** and select the **Edit** option. The file contents are displayed in a window similar to the one shown in Figure B-6.

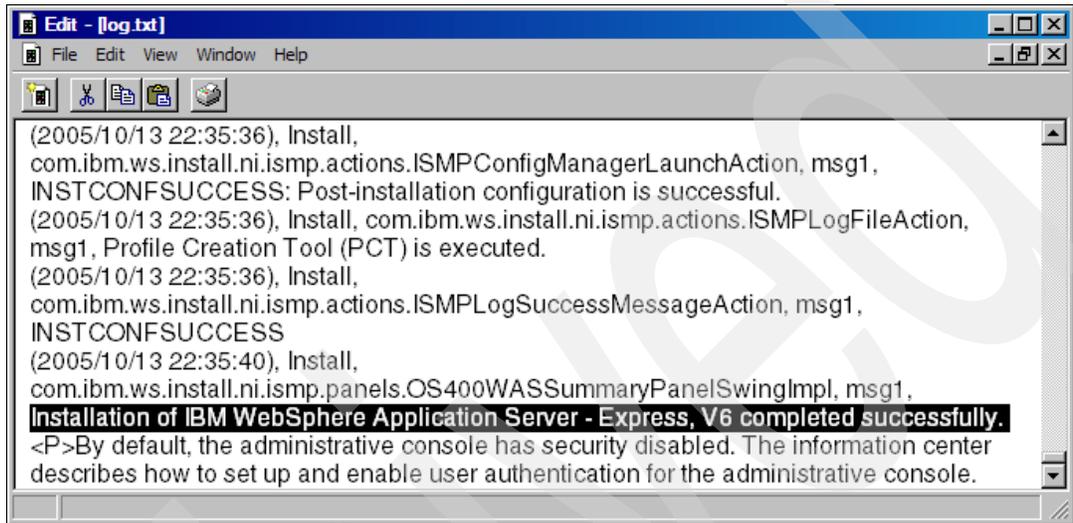


Figure B-6 Installation log file

If iSeries Navigator does not show you the option to edit the file, then change the integrated file system properties to allow editing of all file types. Figure B-7 shows how you can change this integrated file system setting.

- a. Select **your server name** → **File Systems** → **Integrated File System**. Right-click and select **Properties**.
- b. In the Integrated File System Properties window, for Enable edit menu option for, select **All files** and click **OK**.

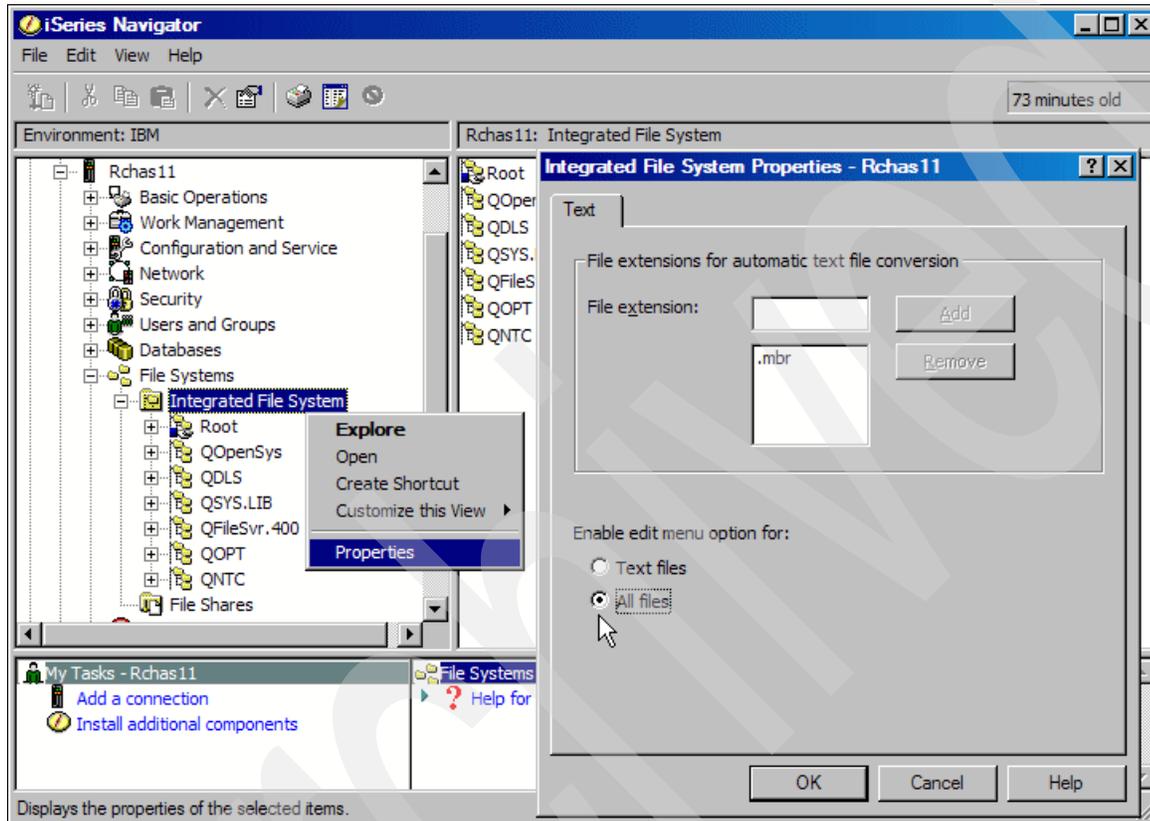


Figure B-7 Integrated file system file editing options

You can also use the Edit File (EDTF) OS/400 command to view the installation log file, for example:

```
EDTF STMF('/QIBM/ProdData/WebSphere/AppServer/V6/Base/logs/log.txt')
```

If the installation is successful, the last two lines in the file should look similar to the example in Figure B-8 with the INSTCONFSUCCESS status.

```
(Sep 7, 2005 12:04:55 PM), Install, com.ibm.ws.install.ni.ismp.actions.ISMPLogSuccessMessageAction, msg1, INSTCONFSUCCESS
(Sep 7, 2005 12:04:55 PM), Install, com.ibm.ws.install.ni.ismp.panels.OS400WASSummaryPanel, msg1, Installation of IBM WebSphere
Application Server, V6 completed successfully. <P>By default, the administrative console has security disabled. The information center
describes how to set up and enable user authentication for the administrative console.
```

Figure B-8 Installation status

If the installation is not successful, you can use this file to determine the cause of the installation failure and take the necessary corrective action.

Tip: You also have the ability to override any of the response file parameters at execution time. For example, if you only want to change one specific parameter and keep the rest of the parameters and values as they are in the response file, you are not required to edit the response file in order to modify that one particular parameter. You can “override” that specific parameter with your required value at run time. For example, if you do not want to edit the response file to accept the license terms, you can run the installation program and accept the license terms at run time by specifying the following command:

```
install.exe -W silentInstallLicenseAcceptance.value="true" -silent
```

In this example, the default values are used for all other parameters.

You have now successfully installed WebSphere Application Server - Express V6 on your iSeries server. Before you can start using your newly installed WebSphere Application Server - Express V6, there are a few post-installation steps that you must complete. We discuss these steps in more detail in 3.3, “Post-installation steps” on page 38.

Silent installation on your iSeries server

This installation method is similar to the installation method described in “Silent installation from your PC workstation” on page 196. You do not have to interactively respond to any command or action prompts during the installation process. The main difference is that this installation process is started on the iSeries and reads the installation options and parameters from a preconfigured response file in an integrated file system directory on your iSeries server.

The following steps explain how you can use this method to install WebSphere Application Server - Express V6 on your iSeries.

1. Insert the WebSphere Application Server 6.0 iSeries CD-ROM in the CD-ROM drive of your iSeries server.

Note: You might have received several different CD-ROM media with your WebSphere Application Server V6 software order. Ensure that you use the CD-ROM media labelled *WebSphere Application Server 6.0 iSeries* to do the installation.

Read and familiarize yourself with the WebSphere Application Server software license agreement. The license information is located on the CD-ROM media in the /WAS/docs/lafiles directory. It is not displayed for you to review during this installation process.

You can open this file directly from the CD-ROM, using iSeries Navigator. To do this, right-click the file name that corresponds to your language preference and select the **Edit** option.

Alternatively, you can use the EDTF OS/400 command to view the file, for example:

```
EDTF STMF('/QOPT/WEBSPPHERE/WAS/docs/lafiles/Lic_en.txt')
```

Tip: If iSeries Navigator does not show you the option to edit the file, then change the integrated file system properties to allow editing of all file types. Figure B-7 shows how you can change this integrated file system setting.

- Copy the IBM-supplied response file from the installation CD-ROM media to an integrated file system directory of your choice. Figure B-9 shows how you can use iSeries Navigator to drag-and-drop the file from the CD-ROM media to the required integrated file system directory.

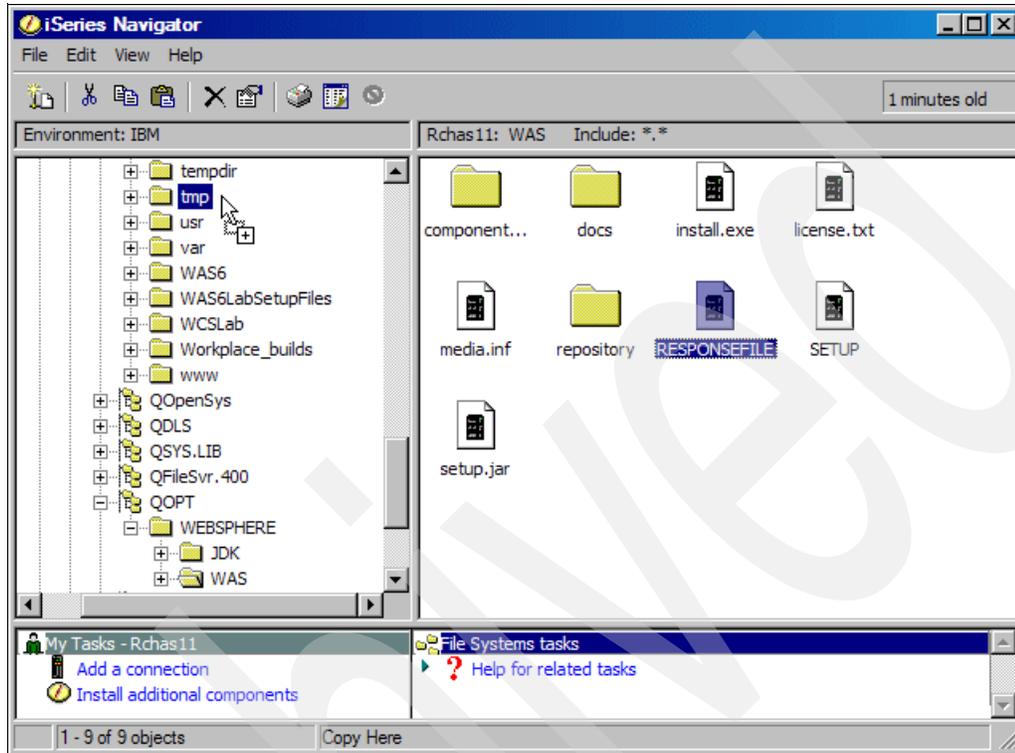


Figure B-9 Copying the response file using iSeries Navigator

You can also use the Copy (CPY) OS/400 command to create a copy of the file to the required integrated file system directory, for example:

```
CPY OBJ('/QOPT/WEBSphere/WAS/RESPONSEFILE') TODIR('/tmp')
```

Tip: After you copy the response file to your integrated file system directory, remove the read-only attribute from the copied file. Otherwise you will not be able to save any changes that you make to that file. To do this, right-click the file name, select **Properties** and ensure that the Read-only attribute is disabled (clear). Then click **OK**.

Next, use the iSeries Navigator interface or the OS/400 command EDTF to open your copy of the response file. To indicate that you have read and agree to the software license terms, locate the License Acceptance section in this file and change the parameter value to true as shown in Figure B-3 on page 198. If this value is not set to “true”, the installation program will not run and you will see an error message.

You can learn more information about all parameters if you read the comments for the parameters in the response file.

Important: The installation program expects that the response file contains predefined entries and in a specific format. Do not change the default format or add any additional characters or spaces to any of these entries, because this might cause the affected parameter to be ignored or the installation can fail. You can find a detailed listing of each of the response file parameters, together with the allowed values in “RESPONSEFILE for command-line installation” in the WebSphere Information Center at the following Web address:

<http://publib.boulder.ibm.com/infocenter/wsdoc400/index.jsp?topic=/com.ibm.websphere.iseries.doc/info/ae/ae/instresp.htm>

3. Save the changes that you made to your response file. In iSeries Navigator, select **File** → **Save**. Or press F2 if you are using the EDTF OS/400 command and exit your editing utility.
4. Ensure that you are signed on to the iSeries server with a user ID that has *ALLOBJ and *SECADM special authorities, as discussed in 3.1, “Installation options” on page 28.
5. You are now ready to start the installation of WebSphere Application Server - Express V6. Depending on your personal preference, you can choose to perform the installation via the Qshell interface, or alternatively you can start the installation directly from the OS/400 command line.

If you prefer to use the *Qshell interface*, then follow these steps:

- a. Start Qshell by using the STRQSH OS/400 command.
- b. Change your current directory to the directory on the CD-ROM which contains the installation program, for example:

```
cd /QOPT/WEBSHERE/WAS
```

- c. Start the installation program using the SETUP program as follows:

```
SETUP -options path/responsefile
```

For example, use the following command to run start the installation and to use the response file that is located in the /tmp integrated file system directory:

```
SETUP -options /tmp/RESPONSEFILE
```

- d. Information messages, similar to those shown in Figure B-10, are displayed as the installation process progresses.

Note: This process can take some time to complete. In our test environment, it took approximately 30 minutes. Depending on your hardware and server configuration, this process can take up to two hours to complete. Do not exit Qshell or enter any other commands until the installation process has completed and the command prompt (the dollar sign (\$)) is displayed.

```

IBM WebSphere Application Server Product Installation Status Report
-----
Report at date and time 2005-10-13T19:38:29-05:00
Installation
-----
Product Directory   /QIBM/ProdData/WebSphere/AppServer/V6/Base
Version Directory   /QIBM/ProdData/WebSphere/AppServer/V6/Base/properties/version
DTD Directory       /QIBM/ProdData/WebSphere/AppServer/V6/Base/properties/version/dtd
Log Directory       /QIBM/ProdData/WebSphere/AppServer/V6/Base/logs/update
Backup Directory    /QIBM/ProdData/WebSphere/AppServer/V6/Base/properties/version/backup
TMP Directory       /tmp
Installation Platform
-----
Name                IBM WebSphere Application Server
Version             6.0
Technology List
-----
EXPRESS            installed

```

Figure B-10 Messages displayed during the installation process

e. After the installation has completed, press F3 to exit Qshell.

If you prefer to use the *OS/400 command line interface*, then follow these steps:

a. Change your current directory to the directory on the CD-ROM, which contains the installation program, for example:

```
CHGCURDIR '/QOPT/WEBSHERE/WAS'
```

b. Use the RUNJAVA command to start the installation program and specify the name of the response file that the installation program should use. For example, to perform the installation using the response file that is located in /tmp integrated file system directory, specify the following command:

```
RUNJAVA CLASS(run) PARM('-options' '/tmp/RESPONSEFILE')
CLASSPATH('/QOPT/WEBSHERE/WAS/SETUP.JAR') PROP((java.version 1.4))
```

c. Information messages are displayed in the Java shell as the installation progresses.

Note: This process can take some time to complete. In our test environment, it took approximately 30 minutes. Depending on your hardware and server configuration, this process can take up to two hours to complete. Do not exit the Java Shell or enter any other commands until the installation has completed.

d. Press the F3 key to exit the Java Shell after the installation has completed.

6. View the installation log file to verify that the installation of WebSphere Application Server - Express V6 completed successfully. The installation log file is called *log.txt* and is located in the iSeries integrated file system directory /QIBM/ProdData/WebSphere/AppServer/V6/Base/logs.

You can view the contents of this file by using the iSeries Navigator interface. To do this, right-click the file name and select the **Edit** option. The file contents are displayed in an installation log file window similar to the one in Figure B-6 on page 200.

If the installation is successful, the last two lines in the file should look similar to the status window in Figure B-8 on page 201 with the INSTCONFSUCCESS status.

If the installation is not successful, you can use this file to determine the cause of the installation failure and take the necessary corrective action.

You have now successfully installed WebSphere Application Server - Express V6 on your iSeries server.

Before you can start using your newly installed WebSphere Application Server - Express V6, there are a few post-installation steps that you must complete. We explain these steps in 3.3, “Post-installation steps” on page 38.

Archived

Downloading PTFs using Fix Central

Fix Central provides a fast and easy method to obtain program temporary fixes (PTFs). By using the File Transfer Protocol (FTP) download option, you can download and install individual PTFs, group PTFs, and cumulative PTF packages from Fix Central directly onto your iSeries server. You also have the option to use the browser-based HTTP download method to receive some of the smaller PTFs that you might require.

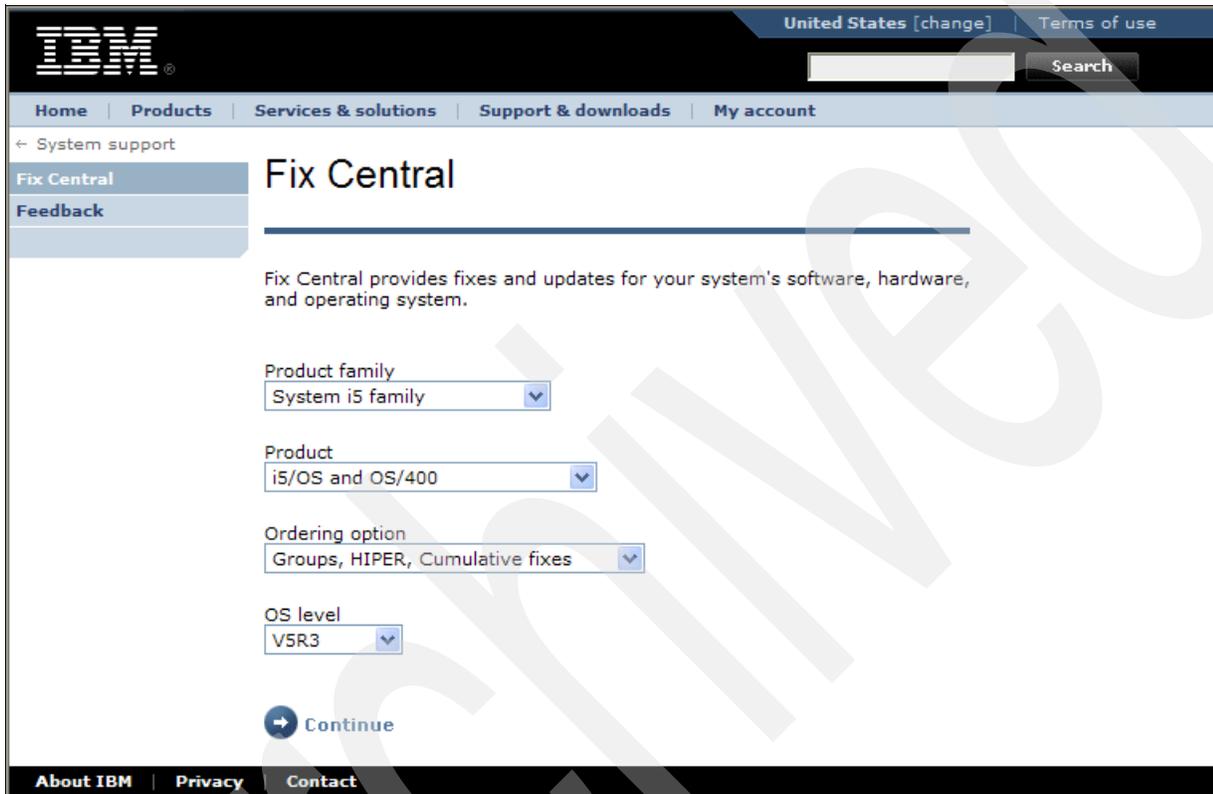
In this section, we focus on using the FTP method. We provide a step-by-step guide on how to use this Fix Central capability to download the latest WebSphere Application Server V6 Group PTF.

When you use the FTP option, you typically select the PTFs that you require and create an online order for those PTFs. The Fix Central server processes your order and stores your PTFs in a directory on a remote server. You then receive an automated e-mail notification to advise you that your PTF order is ready and that you can retrieve your PTFs from the remote server.

Ordering your PTFs

To order your PTFs:

1. Go to Fix Central at the following Web address:
<http://www.ibm.com/eserver/support/fixes/fixcentral/main/iserie>
2. Select your PTF requirements from the drop-down lists as shown in Figure C-1 and click **Continue** to proceed. Several useful options are available for the Ordering option field.



The screenshot shows the IBM Fix Central web interface. At the top, there is a navigation bar with the IBM logo, a search bar, and links for 'United States [change]' and 'Terms of use'. Below this is a secondary navigation bar with links for 'Home', 'Products', 'Services & solutions', 'Support & downloads', and 'My account'. The main content area is titled 'Fix Central' and includes a breadcrumb trail '← System support'. A left sidebar contains 'Fix Central' and 'Feedback' links. The main text states: 'Fix Central provides fixes and updates for your system's software, hardware, and operating system.' Below this are four dropdown menus: 'Product family' (System i5 family), 'Product' (i5/OS and OS/400), 'Ordering option' (Groups, HIPER, Cumulative fixes), and 'OS level' (V5R3). A 'Continue' button with a right-pointing arrow is located below the dropdowns. The footer contains links for 'About IBM', 'Privacy', and 'Contact'.

Figure C-1 Specifying the PTF requirements on Fix Central

3. On the next page, enter your IBM ID and password as shown in Figure C-2 and then click **Sign in**. If you currently do not have an IBM ID, you can register by selecting the **Need an IBM ID?** link in the frame on the right.

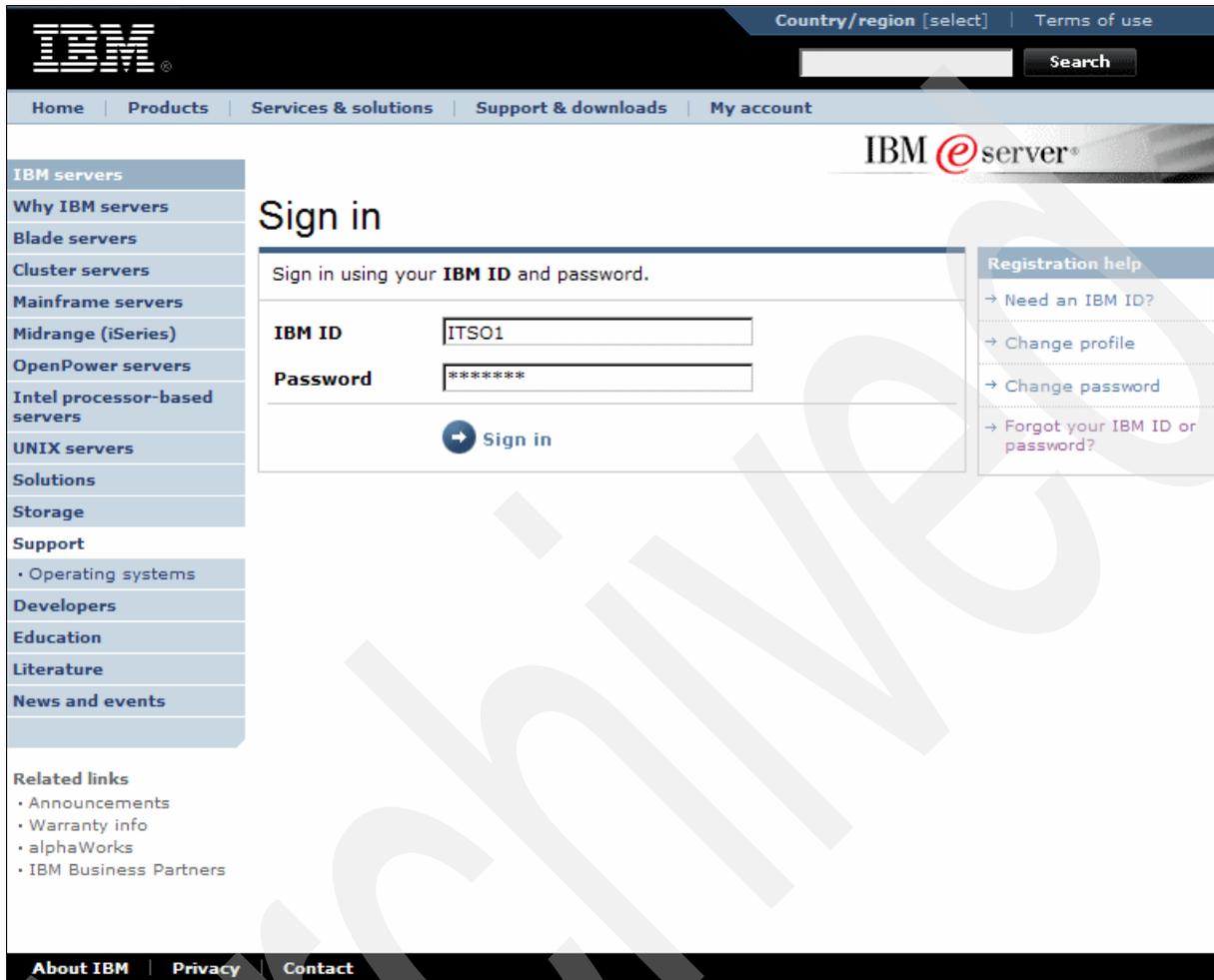


Figure C-2 Signing in to Fix Central

- On the Group, HIPER, and Cumulative page (Figure C-3), select the PTFs that you want to download from the list and click **Add to my download list**. The example in Figure C-3 shows the list of available PTFs, based on the PTF ordering options that you initially specified (see Figure C-1).

You can select multiple PTFs to download from this page by pressing and holding down the Ctrl key and selecting each of the PTFs that you want to download. Remember to click the **Add to my download list** icon to save the selected PTFs in your download basket.

If you want to view or print the PTF cover letter before you download it, select the PTF and click the **View fix details** icon.

After you add all your required PTFs to your download basket, click **Continue**.

The screenshot shows the IBM eServer support website interface. At the top, there is a navigation bar with the IBM logo, a search bar, and links for 'Country/region [select]', 'Terms of use', 'Home', 'Products', 'Services & solutions', 'Support & downloads', and 'My account'. The main content area is titled 'Group, HIPER, and Cumulative' and includes a search bar and a list of PTFs. The PTF SF99301 is highlighted in blue. Below the table, there are four buttons: 'Add to my download list', 'View my download list', 'Create new download list', and 'View fix details'. A message states 'There are no fixes in your download list.' and a 'Continue' button is at the bottom.

PTF	Level	Abstract	Last
SF99530	Current	Cumulative PTF Media Documenta	08/08/05
SF99529	64	530 Group Hiper	11/1/
SF99503	6	530 DB2 UDB for iSeries	10/14
SF99301	10	530 WebSphere App Server V6.0	11/4/
SF99298	15	530 Electronic Service Agent	10/10
SF99295	4	530 WebSphere MQ for iSeries - version	9/4/2
SF99293	3	530 WBI for WebSphere Portal V5.1	10/17

Figure C-3 Adding PTFs to the download list

5. On the Packaging options page (Figure C-4), specify any additional PTF ordering requirements that you might have.

Select **Include all requisite PTFs** to ensure that you receive all prerequisite and corequisite PTFs included with your order.

You might request PTFs for a product that you have not installed on your iSeries server yet. For example, if you are busy preparing to install WebSphere Application Server - Express V6 and want to download group PTF SF99301 beforehand, *deselect* the option **Order only the PTFs for products that exist on the system**. Otherwise your PTF download will fail. With this option selected, Fix Central checks your iSeries server to verify that the related product is installed before it adds the PTFs to your order.

Click **Continue**.

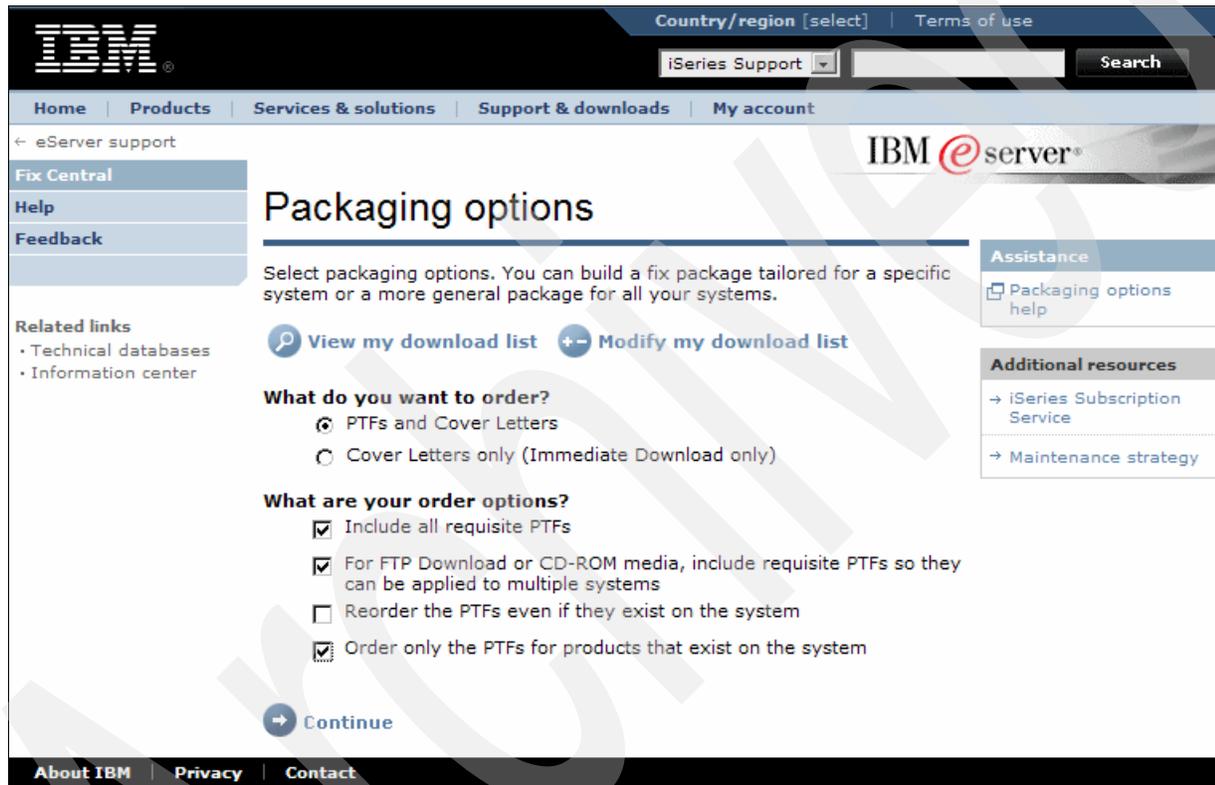


Figure C-4 PTF packaging options

6. On the Download options page (Figure C-5), specify your PTF download options.

If you are ordering large PTFs, for example group PTFs or cumulative PTF packages, you must ensure that you select the **FTP** download option and *deselect* the **HTTP** option. The HTTP option does not allow you to download PTFs that exceed a certain size limit.

Specify a directory name of your choice where you want Fix Central to store your PTFs on the remote server. You should also specify a file name so that you can easily identify which PTFs are contained in that order during the retrieval process.

Select the geographic location of your iSeries server installation. This allows Fix Central to route your order to the most appropriate remote Web server.

Click **Continue** to proceed to the next step.

The screenshot shows the IBM eServer support website's 'Download options' page. At the top, there is a navigation bar with 'Home', 'Products', 'Services & solutions', 'Support & downloads', and 'My account'. Below this is a search bar with 'iSeries Support' and a 'Search' button. The main content area is titled 'Download options' and contains the following elements:

- A left sidebar with 'Fix Central', 'Help', and 'Feedback' links, and 'Related links' for 'Technical databases' and 'Information center'.
- A main text block: 'You may select Immediate download, FTP server, or both methods. If you select both methods, Immediate download will be attempted first.'
- Two radio button options:
 - Immediate download over the Internet (HTTP)**
 - Question: 'What is the maximum size that you want to download immediately?' with a dropdown menu set to 'Maximum allowable'.
 - Question: 'What is the speed of your internet connection?' with a dropdown menu set to 'Cable Modem/DSL'.
 - Download CD-ROM image to FTP server (FTP)**
 - Text: 'Requires Virtual Optical support (in V5R2 and later) or a PC with CD writer and software.'
 - Question: 'What is the maximum size that you want to download to the FTP server?' with a dropdown menu set to 'Maximum allowable'.
 - Text: 'Customize the directory and base file name of the CD images on the FTP server. Note: The directory name will automatically be converted to lower case, but the file name may consist of mixed case characters.'
 - Form fields: 'Directory name *' with value 'ITSOa123' and 'File name *' with value 'SF99301'. Examples are provided in parentheses.
- Mail order on CD-ROM if the total size exceeds the limits you selected above**
- Where is the target system installed? ***
 - Text: 'Specify the location of the system where the PTFs will be downloaded.'
 - Radio buttons for 'Western Hemisphere: Central America - North America - South America' (selected) and 'Eastern Hemisphere: Africa - Asia - Australia - Europe'.
- A blue 'Continue' button with a right-pointing arrow.
- A footer with 'About IBM', 'Privacy', and 'Contact' links.

Figure C-5 PTF download options

7. Complete you iSeries logon information as shown in Figure C-6. This information is required to verify connectivity between your iSeries server and the Fix Central remote server.

Click **Next** to continue.

Country/region [select] | Terms of use

iSeries Support [dropdown] [input] Search

Home | Products | Services & solutions | Support & downloads | My account

eServer support

Fix Central

Help

Feedback

IBM eServer®

Sign on to your iSeries or AS/400 system that is the target system for the fixes.

Related links

- Technical databases
- Information center

iSeries name or TCP/IP address: 10.1.1.2

User ID: its001

Password: *****

View or update your shipping information for this order.

< Back | Next > | Cancel | Your Privacy | Help

About IBM | Privacy | Contact

Figure C-6 Fix Central iSeries logon information

8. Complete your contact details as shown in Figure C-7. Ensure that you specify a valid e-mail address. This is the e-mail address that Fix Central uses to advise you about the status of your order and when your PTFs are ready for retrieval. Click **Next**.

The screenshot shows the IBM eServer support website interface. At the top, there is a navigation bar with the IBM logo, a search bar, and a dropdown menu for 'iSeries Support'. Below the navigation bar, there are links for 'Home', 'Products', 'Services & solutions', 'Support & downloads', and 'My account'. The main content area is titled 'eServer support' and features a sidebar with 'Fix Central', 'Help', and 'Feedback' links. A message at the top of the form states: 'Please verify the shipping information. All fields with asterisks are required.' The form fields are as follows:

* Company	IBM Corporation
* Contact	ITSO - Rochester
Contact telephone numbers:	
* Primary	1-800-426-4968
Alternate	
* E-mail address:	itso@ibm.com
* Verify e-mail address:	itso@ibm.com
Mailing address:	
* Street address	3605 Highway 52N
* City/State	Rochester, MN
* Country	United States
* Zip code	55901
* National language version	2924

At the bottom of the form, there are buttons for '< Back', 'Next >', 'Cancel', 'Your Privacy', and 'Help'. The footer of the page contains links for 'About IBM', 'Privacy', and 'Contact'.

Figure C-7 PTF order contact information

- In the final step of the ordering process, you see the Summary page (Figure C-8) is displayed. This page contains your order confirmation and a list of the PTFs that are included in your order.

The screenshot shows the IBM eServer Summary page. At the top, there is a navigation bar with the IBM logo, a search bar, and links for Home, Products, Services & solutions, Support & downloads, and My account. The main content area is titled "Summary" and includes a section for "Your order will be sent to the FTP server" with a brief explanation. Below this is "System information" showing System Name: 10.1.1.2 and Elapsed Time: 6 minutes 33 seconds. There are two tables: "Requested PTFs" and "Additional PTFs", both listing PTF numbers, status (FTP Server), and product descriptions (5722ss1). A "Contact information" section provides details for IBM Corporation in Rochester, MN. On the right side, there are utility links like "Assistance", "Summary Page Help", "FAQs on Fixes", "Print this page", and "Printable page".

Figure C-8 PTF order summary

At this point, your ordering process is complete and you can close your Web browser.

Remember to check your e-mail inbox for a messages pertaining to your order status. You typically receive two automated e-mail messages. The first one confirms receipt of your order and contains a Web address where you can view the current status of your order. The next e-mail message contains detailed instructions on how to retrieve your PTFs from the Fix Central remote server.

Downloading your PTFs

To retrieve the PTFs directly into an integrated file system directory on your iSeries server, you must ensure that your PC workstation can access the integrated file system directory that you want to use. The following steps briefly explain how you can do this using iSeries Navigator.

1. Right-click the integrated file system directory where you want to save the PTFs and select **Sharing** → **New Share**, as shown in Figure C-9.

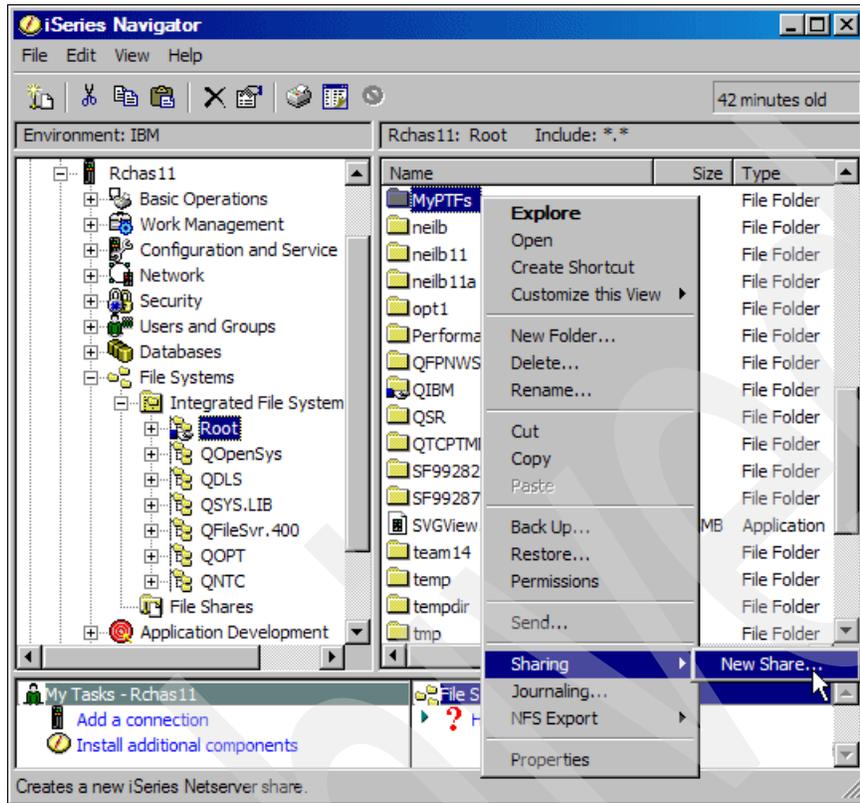


Figure C-9 Enabling integrated file system directory sharing

2. In the iSeries NetServer™ File Share window (Figure C-10), specify the name and a brief description for your shared directory. Make sure that you allow read and write access to this directory. Then click **OK**.

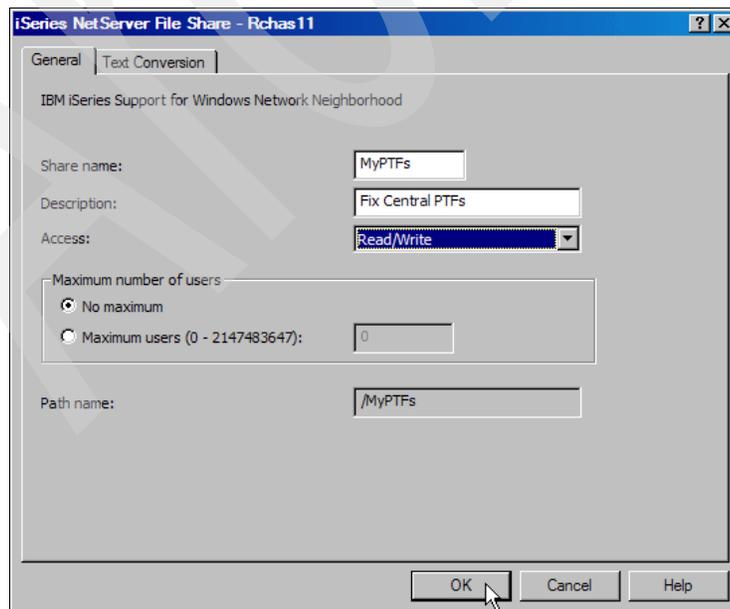


Figure C-10 Creating the integrated file system shared directory

Notice how the display icon for your newly shared directory changes, similar to the one shown here .

3. Open a Windows Explorer session on your PC and select the **Tools** → **Map Network Drive** option.
4. In the Map Network Drive window (Figure C-11), complete the following steps:
 - a. From the Drive list, select an unassigned drive letter. We selected drive letter **Q**.
 - b. In the Folder field, specify the full path name of your shared directory on the iSeries server. Make sure that you use the Windows operating system format when you specify this path.
 - c. If your Windows logon information differs from your iSeries user ID and password, then click the **different user name** link and specify your iSeries user ID and password.
 - d. Click **Finish** to complete your drive mapping process.

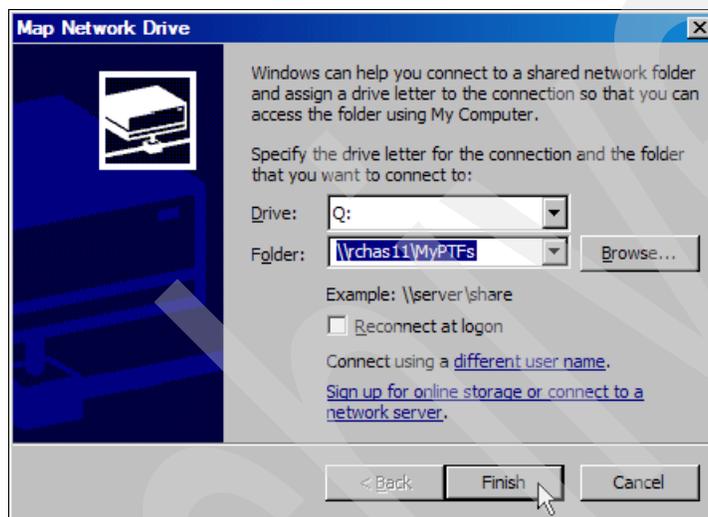


Figure C-11 Mapping a network drive in Windows Explorer

To download your PTFs from the Fix Central remote server to your iSeries server:

1. Check your e-mail inbox for a message that confirms that your PTFs are ready to be retrieved.

2. Click the FTP link that is published in the body of this e-mail message. For our test PTF order, the e-mail message referred us to the following link to retrieve our PTFs:

ftp://as3ku6p:kbp9tg3k@inetsd01.boulder.ibm.com/b6332000/itsoa123/c

This link takes you directly to the directory on the remote FTP server where your PTFs are located. Figure C-12 shows a typical example of the contents of this directory.

Carefully read the text (.txt) files in this directory. These files contain important information about the PTFs, including detailed instructions about how to apply the PTFs on your iSeries server. Click the file name to open the text file directly in your Web browser, or you can download the files to your PC or into an integrated file system directory for later viewing.

To download the file, right-click the file name, select the **Save Link As** option. Specify the name of the PC folder or the mapped integrated file system directory where you want to save the file.

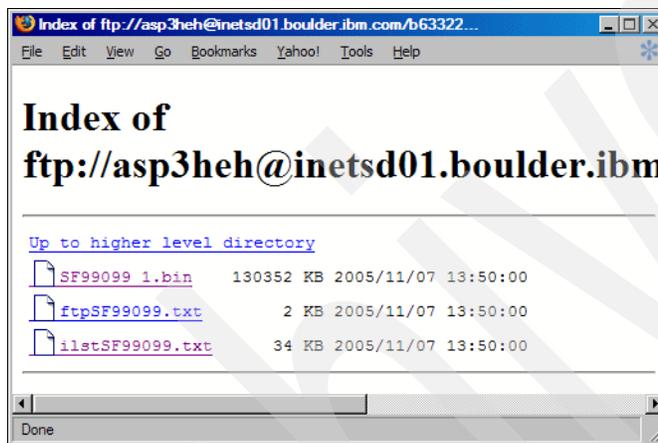


Figure C-12 Contents of the Fix Central FTP download directory

3. Click the binary (.bin) file and select the **Save to Disk** option, as shown in Figure C-13. The binary file contains the actual PTFs.

Important: Your download directory might contain multiple binary files. If this is the case, you must retrieve each one of these files separately. Each binary file corresponds to a single CD-ROM image that you normally received if you order your PTFs on CD-ROM media.

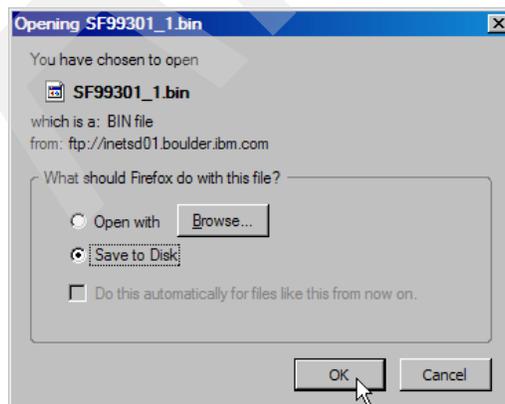


Figure C-13 Saving the PTF CD-ROM image to disk

4. Save the file to the mapped network drive that you previously created (see Figure C-11 on page 217).

Now that you have successfully retrieved all your PTFs from the Fix Central remote server, you can install the PTFs on your iSeries server.

Installing your PTFs

You can install your PTFs by using an *image catalog*:

1. Make sure that you have a *virtual optical device* configured on your iSeries that you can use to install your PTFs. You can verify that you already have a virtual optical device configured by using the following OS/400 command:

```
WRKDEVD DEVD(*OPT)
```

Then identify the virtual optical device by its associated device type, which is 632B.

2. If you do not already have a virtual optical device configured, you can use the CRTDEVOPT OS/400 command to create one, for example:

```
CRTDEVOPT DEVD(OPTVRT01) RSRCTYPE(*VRT) ONLINE(*YES) TEXT('Virtual Optical device')
```

3. Make sure that the virtual optical device is active by using the Vary Configuration (VRYCFG) OS/400 command, for example:

```
VRYCFG CFGOBJ(OPTVRT01) CFGTYPE(*DEV) STATUS(*ON)
```

4. Create an image catalog by using the Create Image Catalog (CRTIMGCLG) OS/400 command and associate the image catalog with the integrated file system directory that contains your PTFs, for example:

```
CRTIMGCLG IMGCLG(WAS_PTFGRP) DIR('/MyPTFs') TEXT('WebSphere Application Server Group PTF')
```

5. Add your PTFs to the image catalog by using the Add Image Catalog Entry (ADDIMGCLGE) OS/400 command, for example:

```
ADDIMGCLGE IMGCLG(WAS_PTFGRP) FROMFILE('/MyPTFs/SF99301_1.bin') TOFILE(*fromfile)
```

The image catalog entry corresponds to the CD-ROM image of the PTFs that you have downloaded.

Note: If your PTFs consist of multiple CD-ROM images or if your PTFs consists of more than one *.bin* file, then you must add each of these *.bin* files to the image catalog.

6. Load the image catalog in the virtual optical device by using the Load Image Catalog (LODIMGCLG) OS/400 command, for example:

```
LODIMGCLG IMGCLG(WAS_PTFGRP) DEV(OPTVRT01) OPTION(*LOAD)
```

7. Verify that your CD-ROM images are loaded in the correct sequence in the image catalog by using the Verify Image Catalog (VFYIMGCLG) OS/400 command, for example:

```
VFYIMGCLG IMGCLG(WAS_PTFGRP) TYPE(*PTF) SORT(*YES)
```

This command automatically sorts the CD-ROM images that contains the PTFs in the correct order. This step is especially important if your PTFs consist of multiple CD-ROM images.

- Install your PTFs by using the installation method as recommended in the documentation of your PTFs. Figure C-14 shows an example of the input parameters to install a group PTF using an image catalog.

```

                                Install Options for Program Temporary Fixes
                                System:  RCHAS11
Type choices, press Enter.

Device . . . . . OPTVRT01      Name, *SERVICE, *NONE
Automatic IPL . . . . . Y        Y=Yes
                                   N=No
Prompt for media . . . . . 1     1=Single PTF volume set
                                   2=Multiple PTF volume sets
                                   3=Multiple volume sets and *SERVICE
Restart type . . . . . *SYS      *SYS, *FULL
Other options . . . . . N        Y=Yes
                                   N=No

F3=Exit  F12=Cancel

```

Figure C-14 Installation options for the group PTF

You can find additional information about installing PTFs from an image catalog, see in the “Install fixes from an image catalog” in the iSeries Information Center at the following Web address:

<http://publib.boulder.ibm.com/infocenter/iseriess/v5r3/index.jsp?topic=/rzam8/rzam8fixinstallimage.htm>

For information about how to download and install PTFs by using different methods than the ones described here, see “Installing fixes from the FTP Server” at the following Web address:

<http://www-912.ibm.com/supporthome.nsf/document/27321011>



Configuring a remote HTTP server

This appendix walks you through the required steps to get an IBM HTTP Server (powered by Apache) on one iSeries server or partition working with WebSphere on another iSeries server or partition. You create both pieces and then set them up to test the snoop servlet. Overall, you create two WebSphere profiles and one HTTP server.

High level view for the configuration

Running the HTTP server on a remote system is not a requirement. However, this configuration option has several good reasons to implement it:

- ▶ *Security:* It is good practice to place your HTTP server in the demilitarize zone (DMZ). You install a firewall between HTTP server and WebSphere Application Server.
- ▶ *Performance:* If you do not have enough resources, you might experience a performance problems running HTTP server on the same system with WebSphere.
- ▶ *Failover support:* You can configure two or more HTTP servers for your WebSphere configuration to make sure at least one of them is up.
- ▶ *Maintenance:* You can apply new versions and fixes on a per-system basis.

To support a remote HTTP server, you must install the Web server plug-in component, which is part of the WebSphere installation (see Figure D-1). This component provides the necessary files and Web server plug-ins for running remote HTTP servers to access WebSphere Application Server. Part of the installation is the integrated file system directory structure similar to WebSphere V6 core product files.

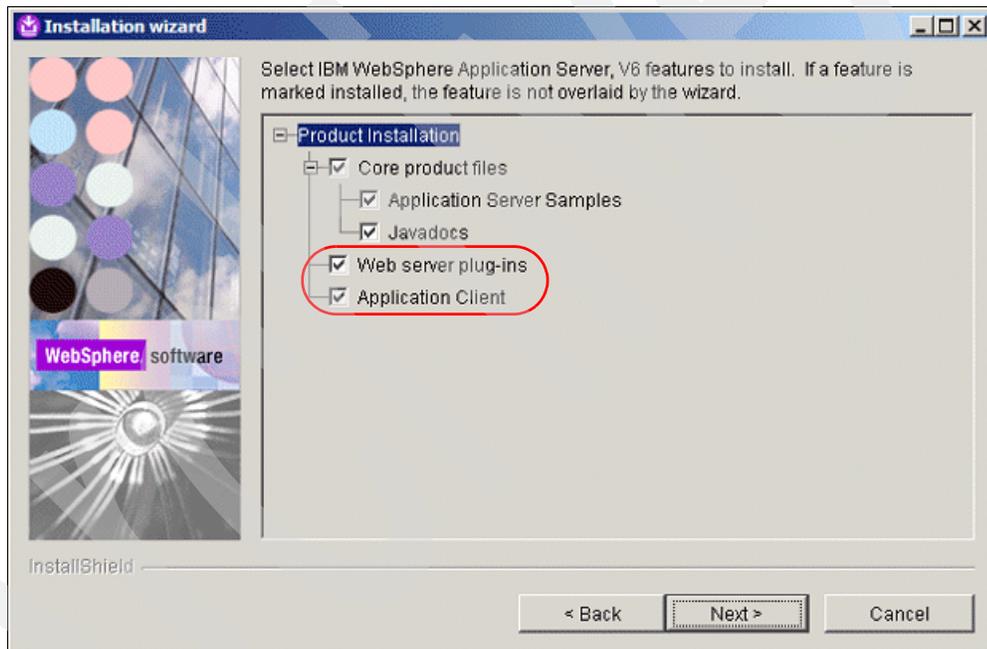


Figure D-1 Selecting Web server plug-in

Figure D-2 shows a typical architecture with a remote HTTP server.

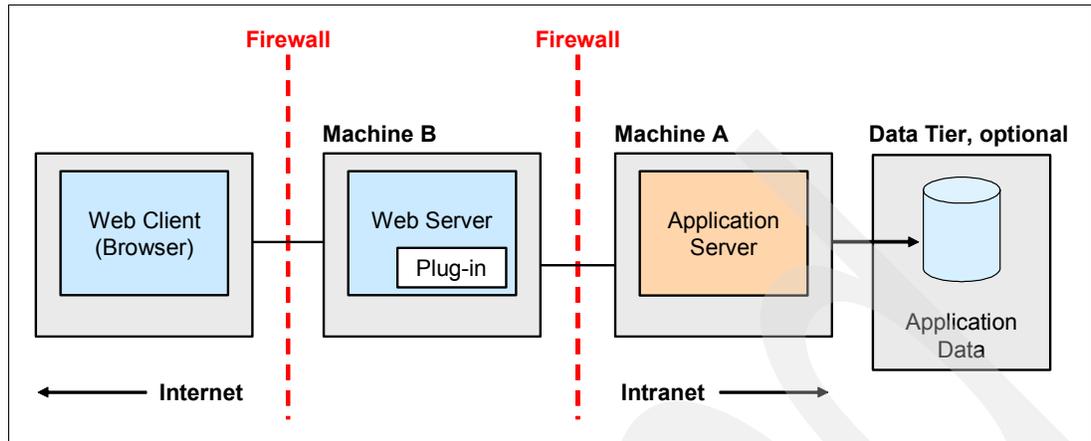


Figure D-2 Remote HTTP server architecture

In the following sections, we explain how to set up this configuration.

Important: Pay special attention to which machine you perform each step: machine A (WebSphere system) or machine B (HTTP server system).

Creating the HTTP server

In this section, you create an HTTP server and a remote HTTP WebSphere profile on machine B, the *remote* HTTP server. They take in the requests from the end users and pass them onto the back-end WebSphere system to process the requests.

First create the WebSphere profile to point the HTTP server to. This is all done on machine B (see Figure D-2):

1. Log into a 5250 screen
2. Start into Qshell using the `strqsh` command.
3. Change directories:

```
cd /qibm/proddata/websphere/appserver/v6/base/bin
```

4. Create the remote WebSphere profile that you link with the HTTP server. Enter the following command:

```
wasprofile -create -profileName remotehttp -templatePath http
```

When it is finished, you see the following message:

```
INSTCONFSUCCESS: Success: The profile now exists
```

5. Create the HTTP server and point it to the remote WebSphere profile.
6. Log into the IBM Web Administration for iSeries page at:

```
http://systemname:2001/HTTPAdmin
```

Here *systemname* is the remote system.

7. Create the HTTP server as you did in 6.2, “Creating an IBM HTTP Server (powered by Apache)” on page 80. Name it `remotehttp` and choose an available IP port for it. Write down this port because you will need it later.

8. After the HTTP server is created, point it to the profile created in step 4 on page 223. On the HTTP server page in the left navigation frame, click the **WebSphere Application Server** link.
9. In the pane on the right, select **WebSphere Application Server, V6.0**. From the drop-down list, select the WebSphere instance **remotehttp**. Click **OK**.

Now you have a remote HTTP server that will be configured to work with a new application server.

Under the cover, the new script is created. The name of this script for our example is *configureIHS_RCHAS03_REMOTEHHTTP*.

The name of this script consists of three parts:

- ▶ *configureIHS*: IHS stands for IBM HTTP Server. If you create a remote HTTP server on a Windows machine, these three letters are IIS, which correspond to *Internet Information Services*.
- ▶ *RCHAS03*: This is the host name of the system where we created the HTTP server, machine B in Figure D-2.
- ▶ *REMOTEHHTTP*: This is the name of our HTTP server.

Based on this explanation, you should be able to construct the name of this script on *your* system. The script is located on machine B in the directory */QIBM/UserData/WebSphere/AppServer/V6/Base/profiles/remotehttp/config/IHS_RCHAS09_REMOTEHHTTP*.

The highlighted parts of this directory name depend on *your* choice for the HTTP server and WebSphere profile names.

Creating the application server

You now create the application server on machine A in Figure D-2. This server hosts the actual application server where you deploy your application.

Create an application server using the following steps (you might also look at 6.3, “Creating a WebSphere Application Server” on page 84):

1. Log into the IBM Web Administration for iSeries page if you are not already there.
2. Select the **Manage** tab and the **Application Servers** subtab.
3. In the left navigation frame, expand **Common Tasks and Wizards** and click **Create Application Server** (Figure D-3).

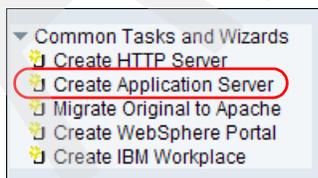


Figure D-3 Create Application Server

4. In the right pane, you see an information page that explains what the wizard does for you. Read this information and click **Next**.

5. In the next pane, you choose the version of WebSphere you want to create a server for. There is a choice for every version of WebSphere that you have installed. You might only see WebSphere 6, if that is the only version you have. Select **V6.0** and click **Next**.
6. In the next pane, provide a name for your application server. You can name it anything you want and then give it a description. Click **Next**.
7. In the Select HTTP Server Type pane (Figure D-4), select the **Do not want to associate an external HTTP server** and click **Next**.

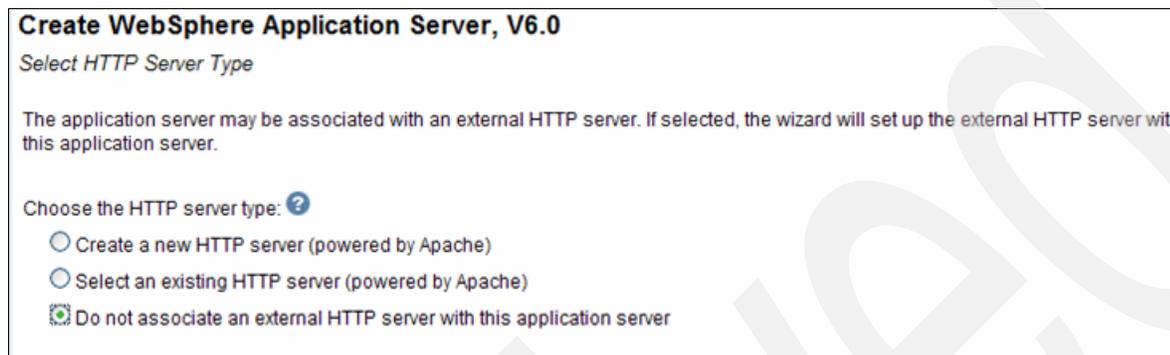


Figure D-4 Select HTTP Server Type pane

8. In the next pane, set up the ports for WebSphere to use. You give it a starting port, and it uses the next 14 IP ports after that (15 ports are used overall). It needs these ports for internal communications as well as setting up the internal HTTP server to respond to requests. Click **Next**.
9. In the Select Business and Sample Applications pane, select only **Default Applications** and click **Next**.
10. You are not using SSO on this server. In the next pane, leave **Do not configure Identity Tokens** selected and click **Next**.
11. When you reach the Summary pane, you might want to print it out for your records. This pane gives you the URLs to test your new server. Click **Finish**.
12. Your server is now being created. This can take up to 10 minutes depending on the size of your system. When it is finished, it is displayed with a *Stopped* status, with both applications (DefaultApplication.ear and query) in the *Stopped* status as well.
13. Start your application server.

Configuring the HTTP and application server to work together

Now that you have the HTTP server created on *machine B* and the WebSphere profile created on *machine A*, configure them so they can communicate with each other. First you update the virtual hosts of the application server to listen on the port that you used when creating the HTTP server.

1. Log into the IBM Web Administration for iSeries page on *machine A* (see Figure D-2 on page 223). Select the **Manage** tab and the **Application Servers** subtab. Then from the Server list, select your new application server.
2. In the left navigation frame, click **Manage Virtual Hosts**.
3. In the pane that is displayed on the right, select **default_host** and click the **Properties** button.

- In the Virtual Host Properties pane (Figure D-5), click **Add** and use an asterisk (*) for the host name. Then type the port that you chose for your HTTP server when you created it. Click **Continue**.

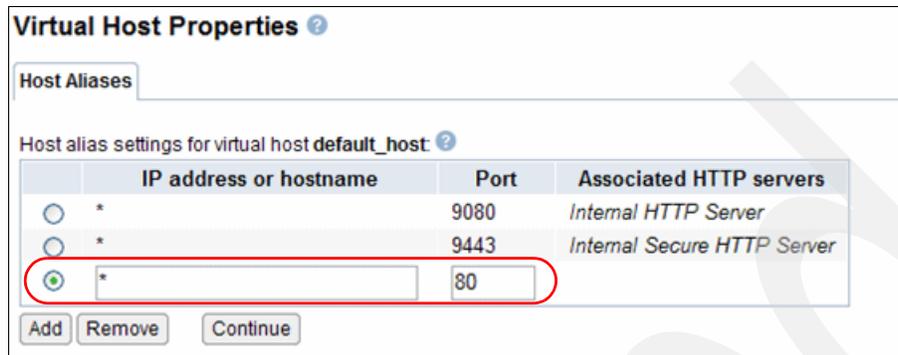


Figure D-5 Adding a new port

- Copy the script from the remote HTTP server box (machine B) to the WebSphere system (machine A) and run it. It is easier to use a mapped drive, but you can use FTP or any other method that you are comfortable with. Also make sure that the application server on machine A is started before continuing.

Copy the script on *machine B*, the HTTP server (see the script name and directory in “Creating the HTTP server” on page 223). Then paste it on machine A, the WebSphere system, to the directory `/QIBM/UserData/WebSphere/AppServer/V6/Base/profiles/profile/bin`, where *profile* is the name of your WebSphere profile that you selected in step 6 on page 225.

- Log onto the 5250 session on the WebSphere system (machine A) and go into Qshell:

```
strqsh
```

- Change the directory to where you copied the script:

```
cd /QIBM/UserData/WebSphere/AppServer/V6/Base/profiles/<profile>/bin
```

- Run the script by typing its name and pressing Enter, for example:

```
configureIHS_RCHAS03_REM0TEHTTP
```

9. This script updates the WebSphere profile configuration with the information about the remote HTTP server. When it is finished, you see a message like the example in Figure D-6.

```
Get the current target mapping for the application DefaultApplication.ear.

Computed the current target mapping for the application DefaultApplication.ear.
Start updating the target mappings for the application DefaultApplication.ear.
Target mapping is updated for the application DefaultApplication.ear.

Processing the application query.
Get the current target mapping for the application query.
Computed the current target mapping for the application query.
Start updating the target mappings for the application query.
Target mapping is updated for the application query.

Start saving the configuration.

Configuration save is complete.
$
```

Figure D-6 Configuration script complete

10. Log into your WebSphere console. You can use either method of starting as explained in 7.2, “Accessing the console” on page 88.
11. In the left navigation frame, click **Servers** and then **Web Servers**.
12. When you see your remote HTTP server, click its name.
13. On the right side, under the Additional Properties section, click the **Remote Web server management** link.
14. In the next pane, enter a user ID and password for the *remote HTTP server system* (machine B) and click **OK** (see Figure D-7).

The screenshot shows a configuration window titled "Remote Web server management" under a "Configuration" tab. It contains the following fields and controls:

- Port:** A text input field containing "2001".
- Use secure protocol:** An unchecked checkbox.
- User ID:** A text input field containing "itso".
- Password:** A text input field containing "*****".
- Buttons:** "Apply", "OK", "Reset", and "Cancel" buttons are located at the bottom of the dialog.

Figure D-7 Configuring remote system access

By specifying these parameters, we enable the application server on machine A to remotely administer some of the functions of the HTTP server on machine B (see Figure D-2 on page 223).

Important: To enable this remote administration, verify two preconditions:

- ▶ The *ADMIN HTTP server instance has been started on the HTTP system, machine B.
- ▶ If you have a firewall in between the two servers, open the 2001 port for the HTTP protocol in the firewall. This allows the requests to pass the firewall.

15. You see a messages box at the top, similar to the example in Figure D-8. Click **Save**.

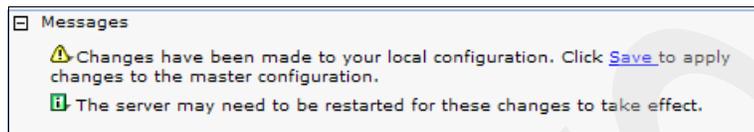


Figure D-8 Save Message

16. Another box is displayed. Click **Save** again.

17. Click the **Logout** link at the top of the page.

18. Restart your application server to apply all the changes.

19. After the application server is up again, log into the WebSphere Administrative Console.

20. In the navigation frame, expand **Servers** and click **Web servers**.

21. Select your Web server and click the **Generate Plug-in** button. This generates the plug-in file.

22. Select the check box again and click **Propagate Plug-in**. This sends the plug-in file to the remote system. You can verify this by looking in the integrated file system of the remote HTTP server system (machine B). The directory for our example is `/QIBM/UserData/WebSphere/AppServer/V6/Base/profiles/remotehttp/config/IHS_RCHAS09_REMOTEHTTP`.

This is the same directory where the script has been generated on machine B (see “Creating the HTTP server” on page 223).

Note: From now on, your application server will automatically propagate the plug-in file to the remote HTTP server system every time the plug-in file is updated. This is the default behavior.

23. Start the HTTP server on the remote system, machine B.

24. Test the snoop application by going to:

```
http://remoteHTTPsystem:remoteport/snoop
```

Here *remoteHTTPsystem* is the host name of the remote iSeries server or partition, machine B. *remoteport* is the port that you selected for your HTTP server.

Your configuration is now completed. You can install additional applications to your WebSphere Application Server.



Configuring a remote Internet Information Services server

This appendix provides instructions for you to configure a remote Internet Information Services (IIS) with a WebSphere profile running on iSeries.

Installing a WebSphere Web server plug-in

In this section, we presume that you have installed the IIS server on your Windows system. For our example, we use Windows 2003 Server with IIS Version 6.0.

Follow these instructions:

1. Insert a WebSphere Application Server V6.0 CD in a CD or DVD drive on your Windows workstation.
2. The launchpad should start automatically. If it does not start, open Windows Explorer and click the CD/DVD drive letter.
3. Double-click **launchpad.bat**.
4. In the Launchpad window (Figure E-1) that opens, click **Web Server plug-ins Installation**.

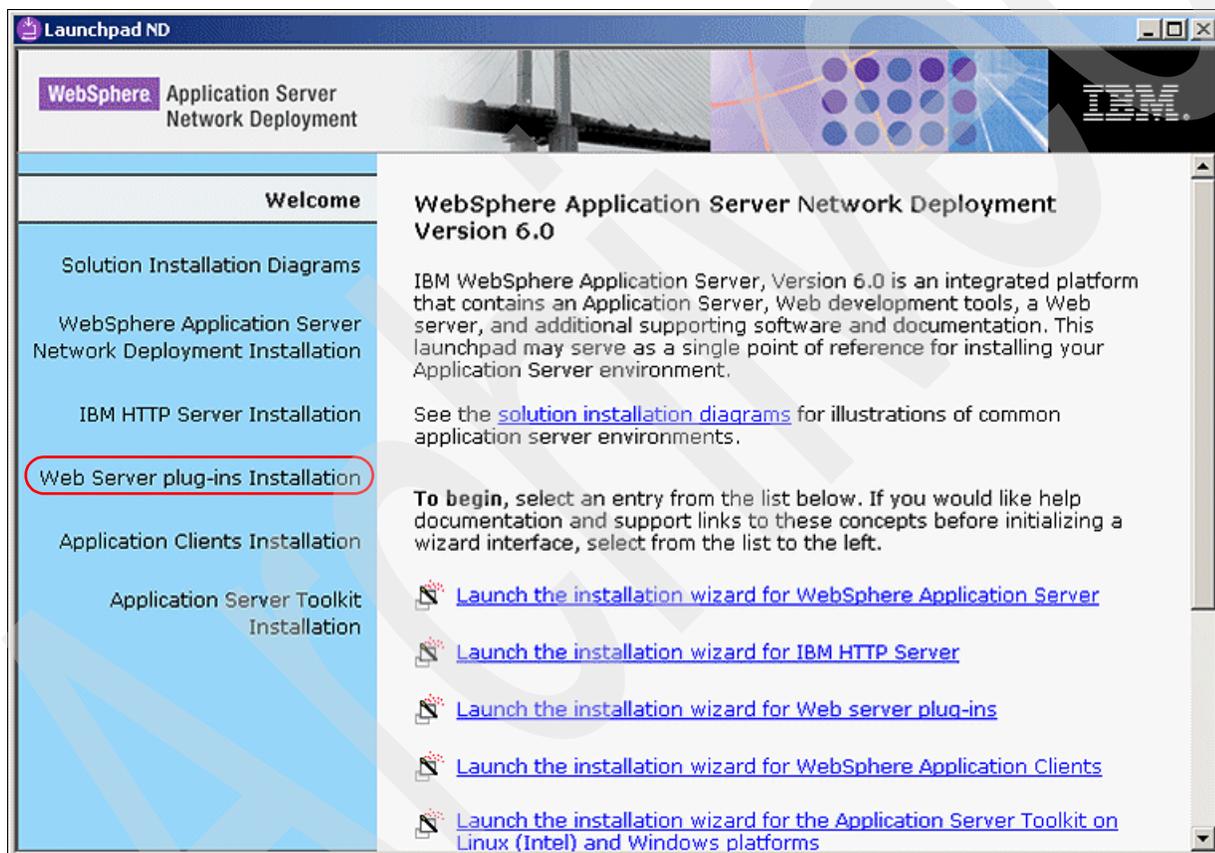


Figure E-1 Launchpad window

5. In the right panel, you can review some help documents. When you are done, click **Launch the installation wizard for the Web server plug-ins** (see Figure E-2).

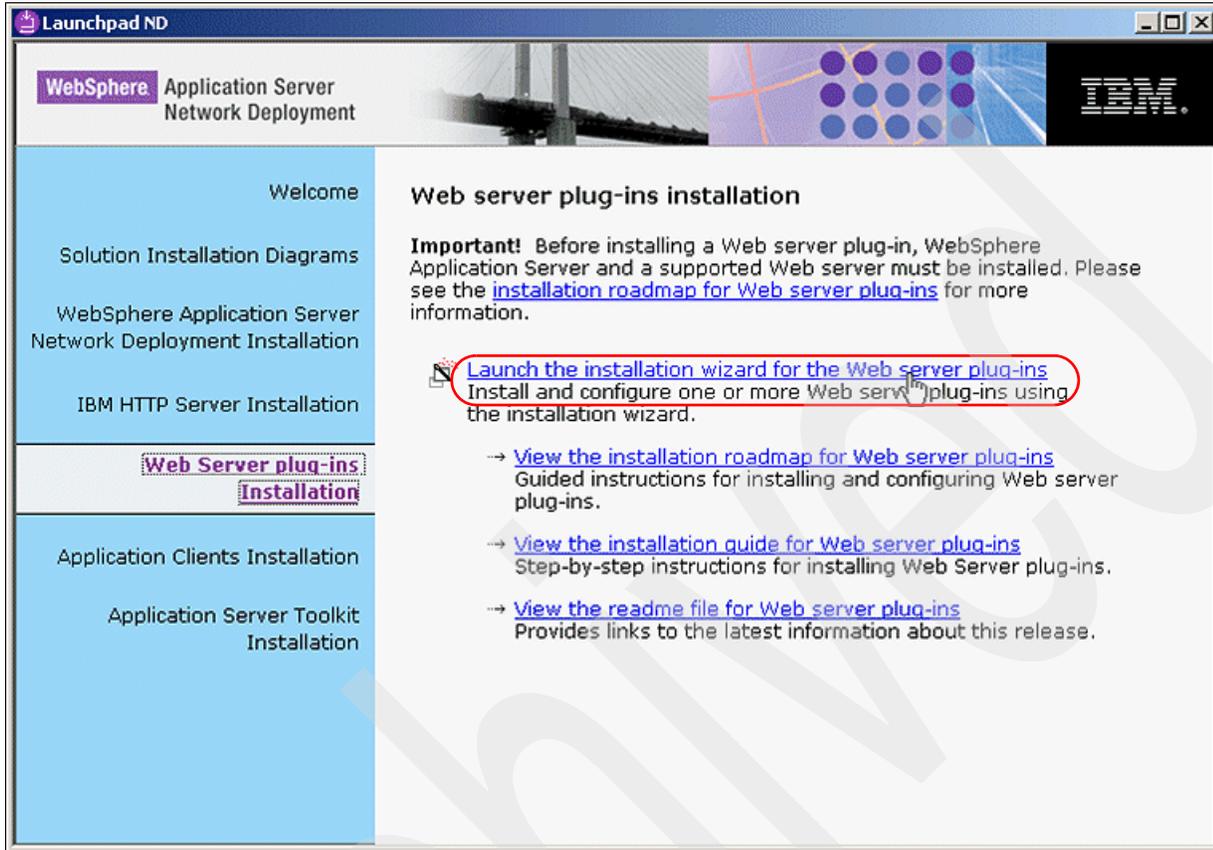


Figure E-2 Launching the wizard

6. In the first panel of the wizard, deselect the check boxes (if they are selected) and click **Next**.
7. In the next panel, read the license agreement. If you agree to the terms of this agreement, click **Next**.

8. The wizard now checks the system for prerequisites. If the check is successful, you see a message like the example in Figure E-3. Click **Next**.

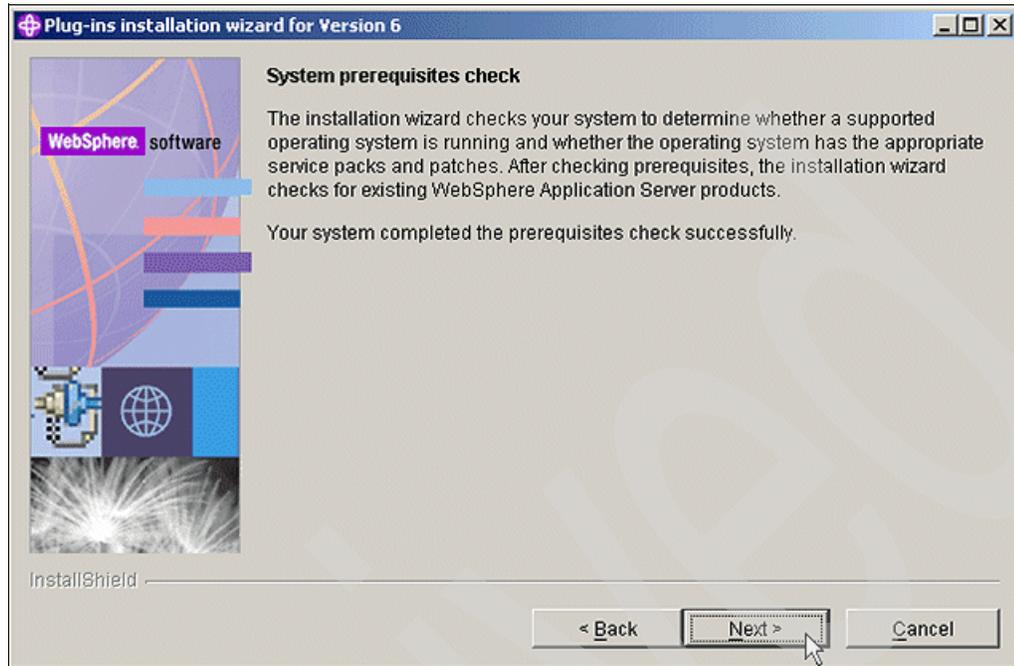


Figure E-3 Successful check of prerequisites

9. In the next panel, select the version of IIS installed on your system. In our example, we select **Microsoft Internet Information Services V6** and click **Next** (see Figure E-4).

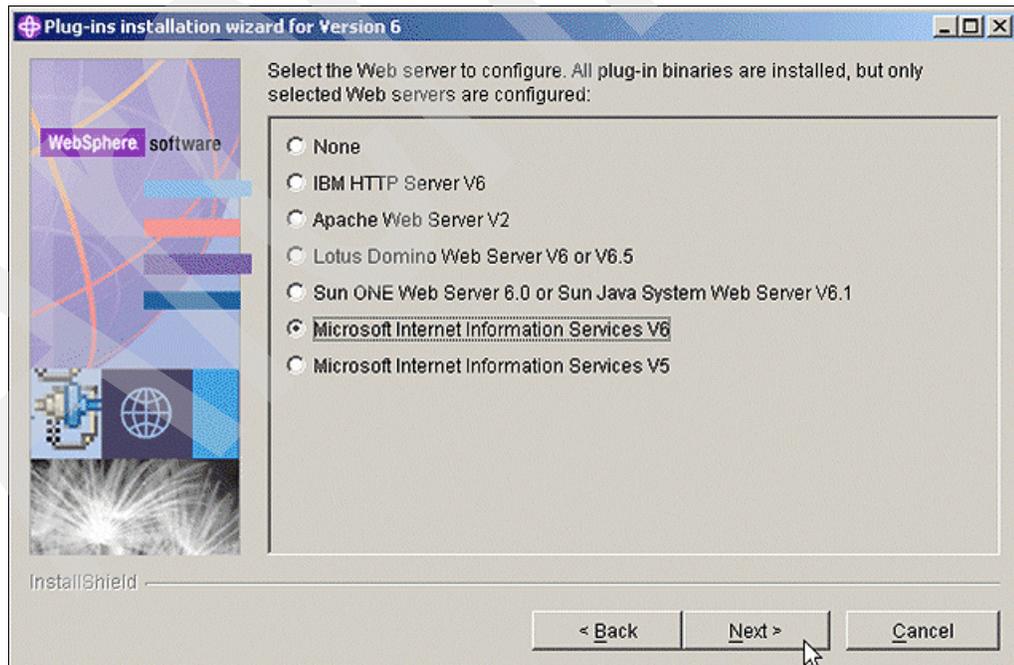


Figure E-4 Selecting the Web server

10. In the next panel (Figure E-5), select the **Web server machine (remote)** scenario and click **Next**.

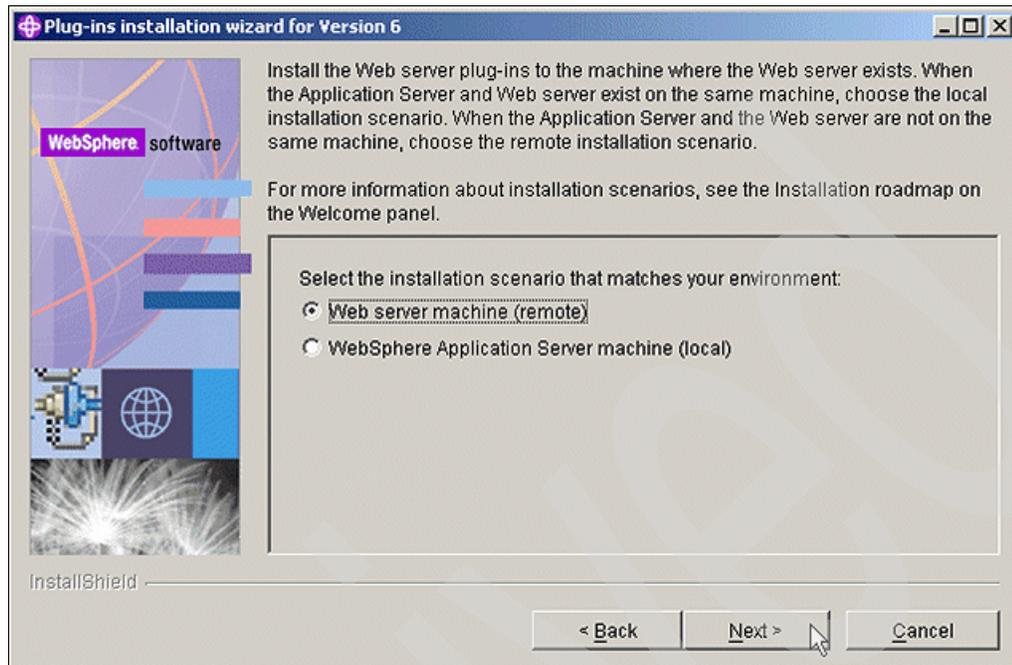


Figure E-5 Selecting the scenario

11. In the next panel, you can change the default location for the installation, but we recommend that you use the default. Click **Next**.

12. In the next panel, type the port number of your IIS instance. In our example, we use the default of 80. Click **Next**.

13. Type the name of your Web server. This name is used as the Web server definition name (see Figure E-6). Click **Next**.

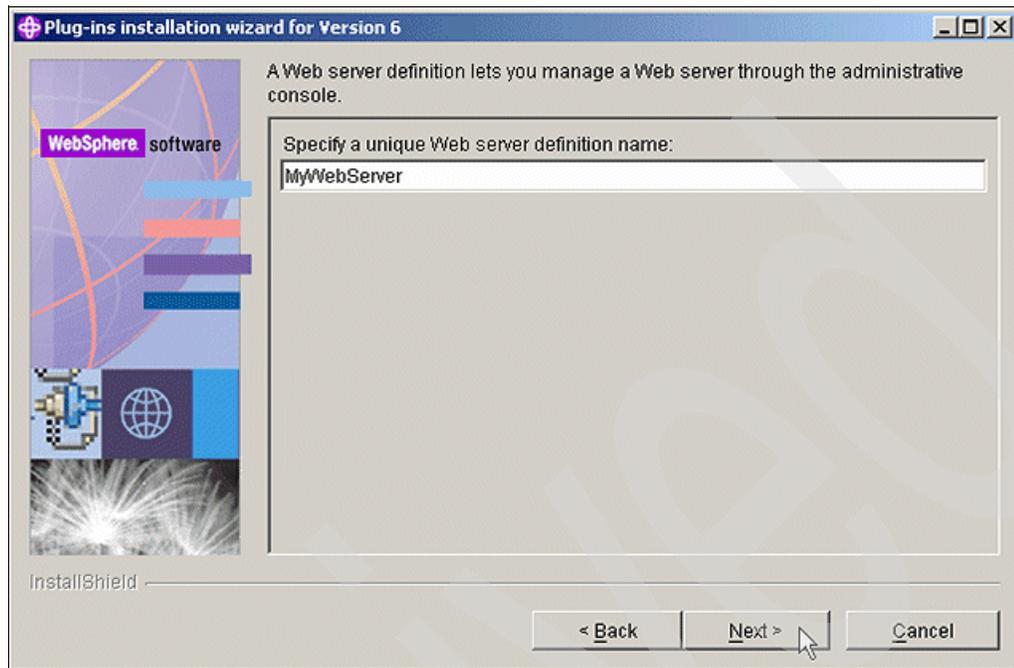


Figure E-6 Type the Web server name

14. In the next panel, you see the location of the plugin-cfg.xml file. Write down the location of the plug-in file because you will need it later. Click **Next**.
15. In the next panel, type the fully qualified host name or IP address of your iSeries system where you run WebSphere Application Server. Click **Next**.
16. The next two panels show the summary for the Web server plug-in configuration. Click **Next** on each panel.
17. The installation starts. You see a panel that shows the progress bar.

18. When installation completes, you should see the panel shown in Figure E-7. Click **Next**.

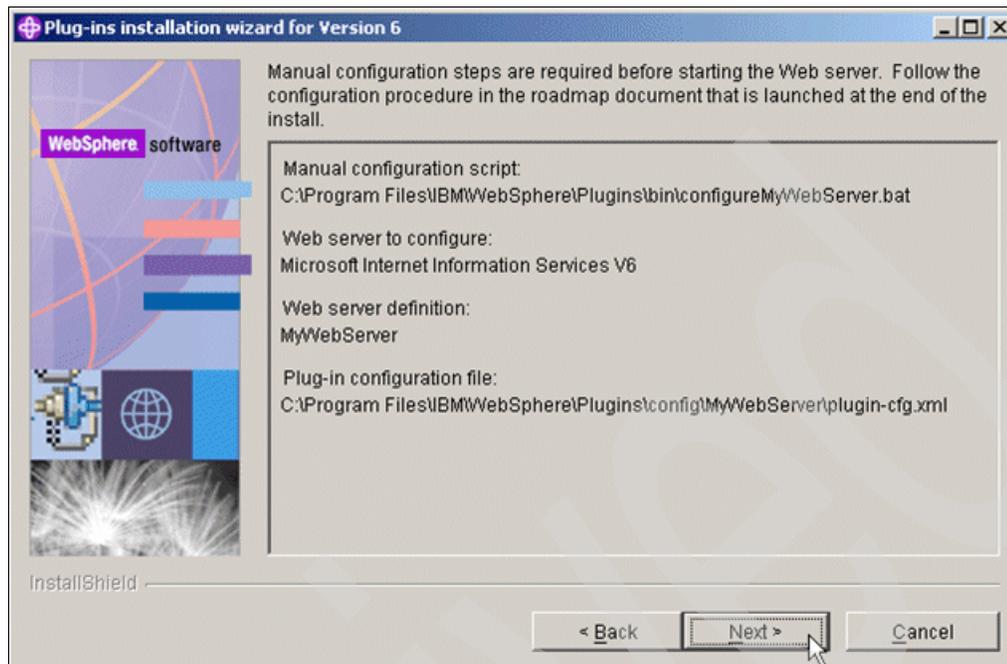


Figure E-7 Summary panel

19. A Web browser window opens. You can read additional information about setting up the Web server. Close the Web browser window.

20. Close the Launchpad window.

Modifying the WebSphere profile configuration

Your next task is to create a Web server definition in your WebSphere profile running on iSeries. To complete this task, you must run the script. Creating this script file is not a simple task. To simplify this step, we provide the following guidance:

1. As part of the Web server plug-in installation, a new file called *configureMyWebServer.sh* has been created. If you have used the default installation location, this file is located in C:\Program Files\IBM\WebSphere\Plugins\bin\crossPlatformScripts.

The name of the file is constructed by concatenating the name of the Web server definition (selected as part of the installation wizard) to “configure”. You will use several pieces of information from this file.

Open this file in WordPad. A sample file shown in Example E-1.

Example: E-1 Sample script file

```
./wsadmin.sh -f configureWebserverDefinition.jacl MyWebServer IIS 'C:\\Program
Files\\IBM\\WebSphere\\Plugins\\properties\\version\\install\\plugin\\6.0.0.0\\config\\full\\install\\NULL'
'C:\\Program
Files\\IBM\\WebSphere\\Plugins\\properties\\version\\install\\plugin\\6.0.0.0\\config\\full\\install\\NULL'
80 MAP_ALL 'C:\\Program Files\\IBM\\WebSphere\\Plugins' unmanaged p23tgr37.itso.ibm.com
p23tgr37.itso.ibm.com windows
```

Notice the highlighted values:

- *MyWebServer* is the name we gave to the Web server definition in the installation wizard.
- *p23tgr37.itso.ibm.com* is the fully qualified host name of the IIS machine.

We use these values in the next steps.

2. Open a NotePad and type or copy and paste the content of the file shown in Example E-2.

Example: E-2 Sample iSeries script file

```
. $(/usr/bin/dirname $0)/setupCmdLine
$(/usr/bin/dirname $0)/wsadmin \  
-f ${WAS_INSTALL_ROOT}/bin/configureWebserverDefinition.jacl \  
MyWebServer \  
IIS \  
/www/MyWebServer/conf/httpd.conf \  
/www/MyWebServer/conf/httpd.conf \  
80 \  
MAP_ALL \  
/QIBM/UserData/WebSphere/AppServer/V6/Base/profiles/test \  
unmanaged \  
p23tgr37.itso.ibm.com \  
p23tgr37.itso.ibm.com \  
windows \  

```

3. Modify the highlighted parameters (from Example E-2) as follows:
 - Replace *MyWebServer* in Example E-2 with the Web server definition name (three occurrences) that you specified in the installation wizard (step 13 on page 234).
 - Replace port 80 with the port number of your IIS server.
 - Replace *test* in the WebSphere profile directory name. This has to be the name of *your* WebSphere profile (from the .sh file generated by the wizard; see step 1 on page 235).
 - Replace *p23tgr37.itso.ibm.com* with your Windows system's host name (from the .sh file generated by the wizard; see step 1 on page 235).
4. Save this file with any name and the .sh extension, for example *MyWebServer.sh*.
5. Move this file to your WebSphere profile folder in the /bin directory, for example /QIBM/UserData/WebSphere/AppServer/V6/Base/profiles/test/bin.

You can use multiple methods for copying this file, such as FTP, mapping a network driver, and so on.

6. Open a 5250 session to your iSeries and sign on.
7. Start Qshell:

```
strqsh
```

8. If your WebSphere profile is stopped, start it:

```
/qibm/proddata/websphere/appserver/v6/base/bin/startServer -profileName  
your_profile_name
```

Here *your_profile_name* is the name of your WebSphere profile.

9. Switch to the /bin directory in the profile's folder:

```
cd /QIBM/UserData/WebSphere/AppServer/V6/Base/profiles/your_profile_name/bin
```

Here *your_profile_name* is the name of your WebSphere profile.

10. Run the script that you copied in step 5 on page 236, for example:

```
MyWebServer.sh
```

11. The script should create the Web server definition in the WebSphere profile. Access the WebSphere Application Server Administrative Console:

```
http://iSeries host name:port/ibm/console
```

Here *iSeries host name* is the host name of your iSeries where you run WebSphere. *port* is the WebSphere Application Server Administrative Console port for your WebSphere profile.

12. Log in.

13. In the left navigation frame, expand **Servers** and click **Web servers**.

14. In the right pane, you should see your new Web server in the list (see Figure E-8).

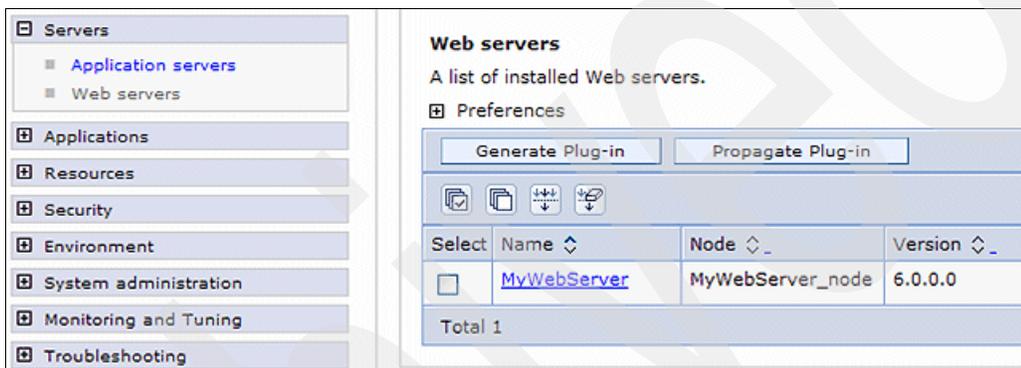


Figure E-8 Web server definition

15. Update the virtual host table with your Web server port number. Expand **Environment** and click **Virtual Hosts**.

16. Click **default_host**. We assume that you have mapped your application to this virtual host. If this is not true, then update the virtual host to which you mapped your application.

17. In the virtual host pane, click **Host Aliases** (see Figure E-9).

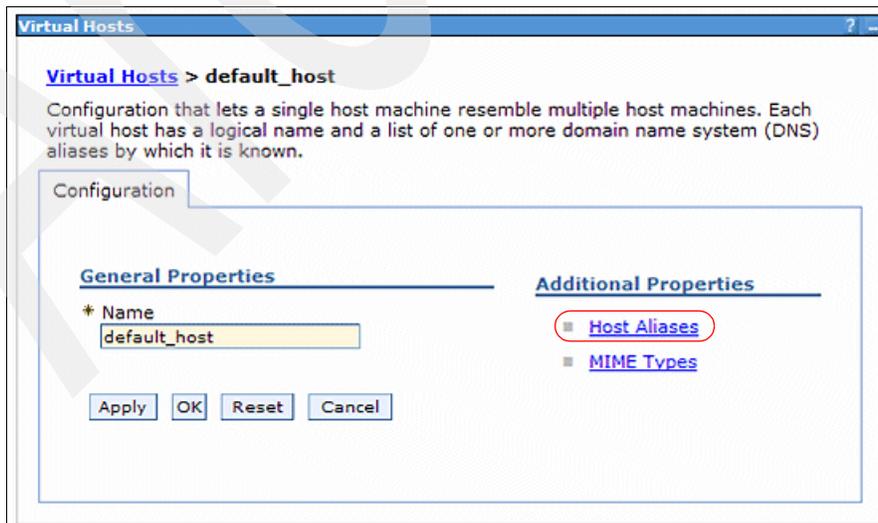


Figure E-9 Modifying the virtual host

18. In the Host Aliases pane, click **New**.

19. In the next pane, in the Host Name field, enter the fully qualified host name of your Windows system. In the Port field, enter port number of your IIS server.

Repeat this step for the short host name and IP address of your IIS server. After you make these changes, your host aliases table should look like the example in Figure E-10.

Virtual Hosts > default_host > Host Aliases

A list of one or more DNS aliases by which the virtual host is known.

Preferences

New Delete

Select	Host Name	Port
<input type="checkbox"/>	*	10016
<input type="checkbox"/>	*	10018
<input type="checkbox"/>	*	10015
<input type="checkbox"/>	10.10.10.1	80
<input type="checkbox"/>	p23tr37	80
<input type="checkbox"/>	p23tr37.itso.ibm.com	80

Total 6

Figure E-10 Updating the host aliases table

20. In the Messages box, click **Save** to save these changes.

21. Expand **Servers** and click **Web servers**.

22. In the right pane, select the Web server and click **Generate Plug-in** (see Figure E-11).

Web servers

A list of installed Web servers.

Preferences

Generate Plug-in Propagate Plug-in

Select	Name	Node	Version	Status
<input checked="" type="checkbox"/>	MyWebServer	MyWebServer_node	6.0.0.0	

Total 1

Figure E-11 Generating the plug-in file

23. Click **Logout**.

24. Switch to your 5250 session and restart the server:

```
stopServer -profileName your_profile_name  
startServer -profileName your_profile_name
```

25. Copy the generated plug-in file (plugin-cfg.xml) to the Windows system where you run IIS:

- a. Use FTP or a network drive to copy the file from the following location:

```
/QIBM/UserData/WebSphere/AppServer/V6/Base/profiles/your_profile_name/config/cells/  
your_cell/nodes/your_Web_Server_Name_node/servers/your_Web_Server_Name/
```

- b. Paste this file to your Windows folder. If you used the default installation, this is the folder where you copy the plug-in file:

```
C:\Program Files\IBM\WebSphere\Plugins\config\  
<you_Web_server_name>
```

26. The final step is to open this file in any text editor and modify one parameter, the location of the log file:

- a. Find the line that starts with:

```
<Log LogLevel="Error"
```

- b. Change the Name parameter. It should point to the log file on the local file system, the Windows file system.

Testing the configuration

Now is the moment of truth, testing. Up to this point, you have changed the WebSphere profile configuration, restarted the server, and moved the plug-in file to the Web server system. The next step is to modify and restart the IIS server and then test this configuration:

1. In Windows, select **Start** → **Administrative Tools** → **Internet Information Services (IIS) Manager**.
2. Configure the Web server to run WebSphere Application Server extensions. In the IIS Manager, expand the local computer and click **Web Service Extensions**. In the right panel, right-click **All Unknown ISAPI Extensions** and click **Allow**. See Figure E-12.

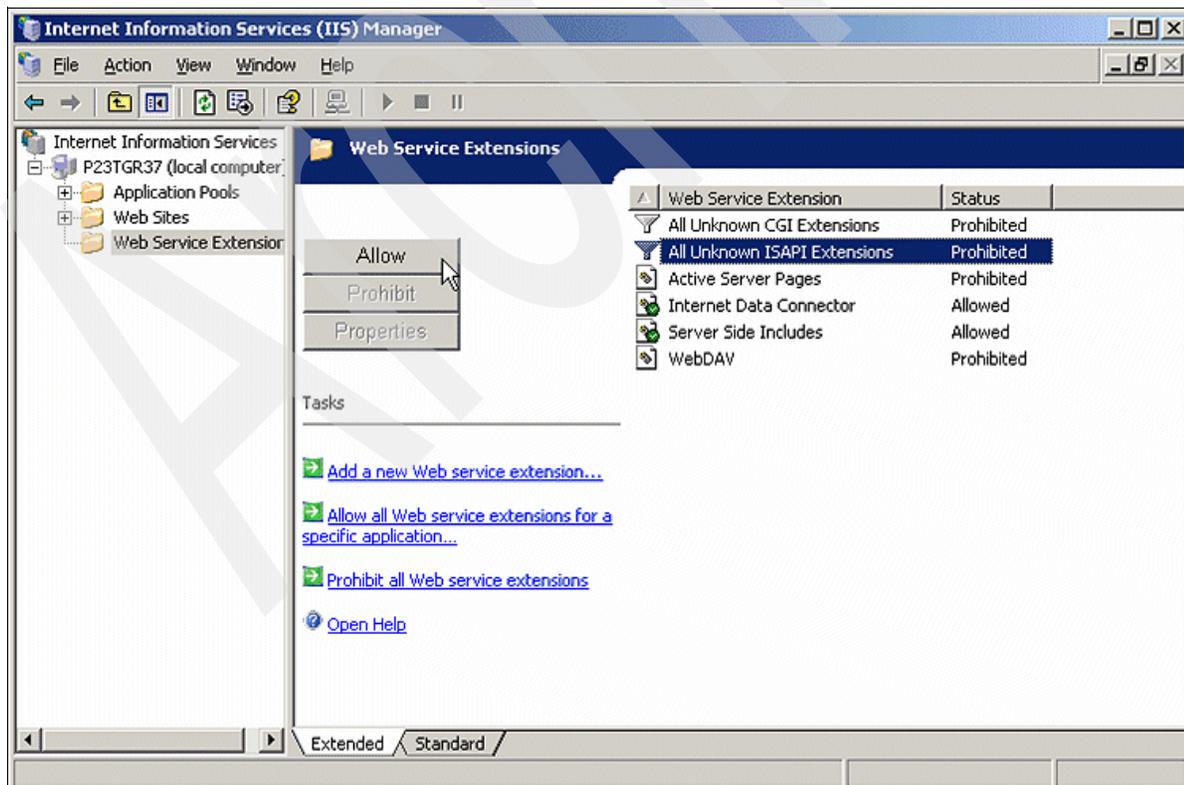


Figure E-12 Web Service Extensions

3. In the IIS Manager window (Figure E-13), click **Yes**.

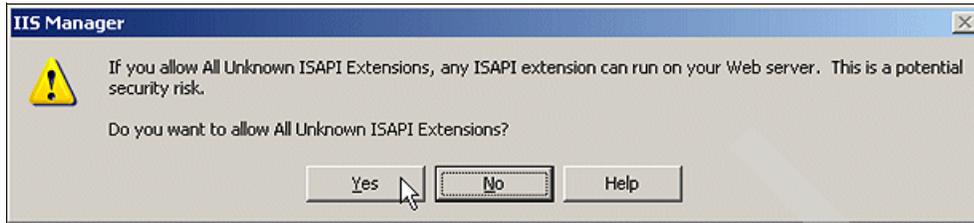


Figure E-13 IIS Manager window

4. Restart the Web server. In the IIS Manager, right-click the local computer and select **All Tasks** → **Restart IIS** (see Figure E-14).

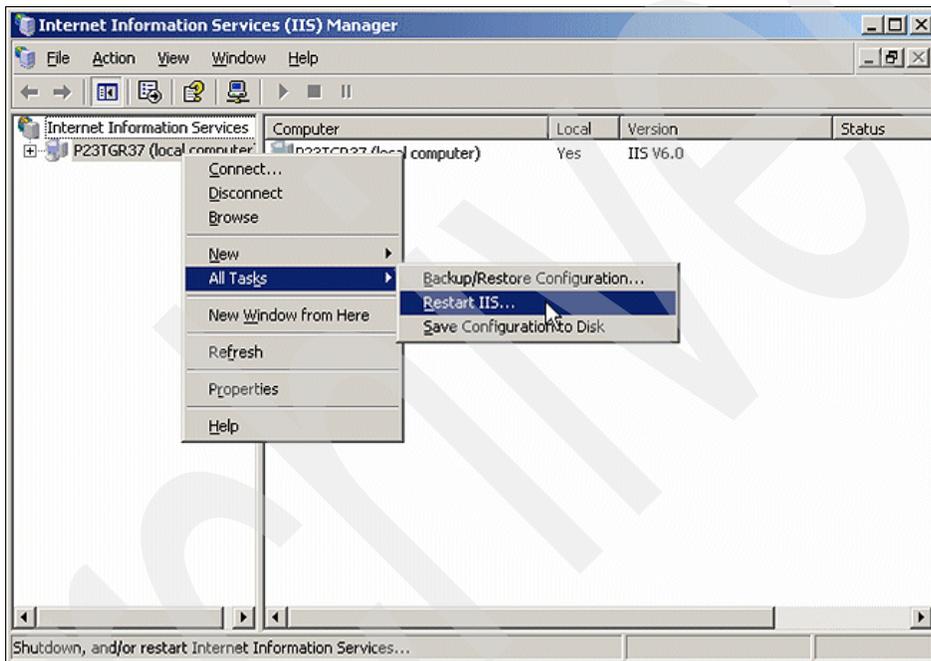


Figure E-14 Restarting IIS

5. In the Stop/Start/Restart window (Figure E-15), select the **Restart Internet Services** option and click **OK**.



Figure E-15 Selecting the restart option

6. After the IIS server restarts, open a Web browser and try to access your application running in WebSphere on iSeries:

`http://your_web_server_hostname:port/your_application_URI`

Important: If the test does not work, read the instructions over again to make sure that you did not skip any steps.

Another common error is incorrect IP configurations on both systems. In general, systems should be able to ping each other. Try it. One of the indicators of the correct IP configuration is the status icon for the Web server (see Figure E-16). If your Web server is running, but the icon is red, then you know that the IP configuration is not correct.

Another useful test is the `iptest` script in the `/bin` directory of the WebSphere product. Try to run it. The output should be similar to what is shown in Example E-3.

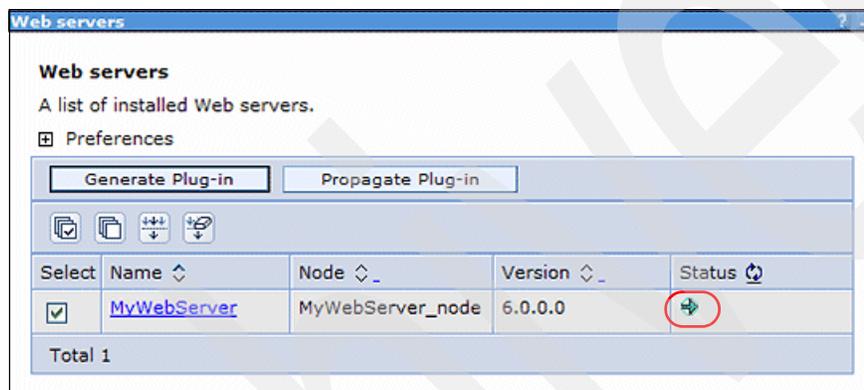


Figure E-16 Status icon

Example: E-3 Output of `iptest`

```
> iptest
Local Address: 10.10.10.1
Local Name: MYSYSTEM.IBM.COM
All addresses for MYSYSTEM.IBM.COM:
    10.10.10.1
$
```

Archived

Related publications

The publications listed in this section are considered particularly suitable for a more detailed discussion of the topics covered in this redbook.

IBM Redbooks

For information about ordering these publications, see “How to get IBM Redbooks” on page 244. Note that some of the documents referenced here might be available in softcopy only.

- ▶ *WebSphere Application Server V6 Security Handbook*, SG24-6316
- ▶ *Maximum Performance with WebSphere Application Server V5.1 on iSeries*, SG24-6383
- ▶ *WebSphere Application Server V6 Planning and Design WebSphere Handbook Series*, SG24-6446
- ▶ *WebSphere Version 6 Web Services Handbook Development and Deployment*, SG24-6461
- ▶ *WebSphere Application Server for iSeries V6: Building Advanced Configurations*, SG24-6637

Other publications

These publications are also relevant as further information sources:

- ▶ *iSeries Performance Capabilities Reference i5/OS Version 5, Release 4*, SC41-0607
<http://publib.boulder.ibm.com/infocenter/series/v5r4/topic/books/sc410607.pdf>
- ▶ *Backup and Recovery*, SC41-5304

Online resources

These Web addresses are also relevant as further information sources:

- ▶ WebSphere Application Server for OS/400 Information Center
<http://publib.boulder.ibm.com/infocenter/wsd400/v6r0/index.jsp>
- ▶ WebSphere Application Server ordering information
<http://www.ibm.com/servers/eserver/series/software/websphere/wsappserver/news/package.html>
- ▶ Functional comparison of the WebSphere Application Server versions
http://www.ibm.com/servers/eserver/series/software/websphere/wsappserver/product/was_60_comparison.pdf
- ▶ iSeries Information Center V5R4
<http://publib.boulder.ibm.com/infocenter/series/v5r4/index.jsp>
- ▶ IBM Systems Workload Estimator
<http://www-912.ibm.com/supporthome.nsf/document/16533356>

- ▶ Performance Management for System i5
<http://www.ibm.com/systems/i/pmsystemi5/>
- ▶ Fix Central
<http://www-912.ibm.com/eserver/support/fixes/fixcentral/main/iserie>
- ▶ WebSphere Application Server PTFs
<http://www.ibm.com/servers/eserver/iserie/software/websphere/wsappserver/services/service.html>
- ▶ WebSphere Application Server product support
<http://www-306.ibm.com/software/webservers/appserv/was/support/>
- ▶ iSeries Native JDBC Driver - FAQs
<http://www.ibm.com/servers/enable/site/java/jdbc/jdbcfaq.html>
- ▶ Toolbox for Java - FAQs
<http://www.ibm.com/servers/eserver/iserie/toolbox/faqjdbc.html>
- ▶ Toolbox for Java
<http://www.ibm.com/servers/eserver/iserie/toolbox/index.html>
- ▶ Performance Management for IBM System i
<http://www.ibm.com/servers/eserver/iserie/perfmgmt/resource.html>
- ▶ Group PTFs sorted by release
http://www-912.ibm.com/s_dir/sline003.nsf/GroupPTFs?OpenView&view=GroupPTFs
- ▶ IBM Systems Hardware Information Center
<http://publib.boulder.ibm.com/infocenter/eserver/v1r3s/index.jsp>

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WebSphere Application Server V6.0 for OS/400: A Guide to Getting Started

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250 <-> 459 pages



WebSphere Application Server V6 for OS/400

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Tips to apply fixes, configure Internet Information Services, and more

Guidance for using WebSphere administrative and maintenance tasks

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By reading this book, you will be able to:

- ▶ Install WebSphere Application Server on iSeries
- ▶ Correctly apply the latest WebSphere fixes
- ▶ Use the most typical WebSphere administrative and maintenance tasks

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