

# WebSphere Application Server

by Cheryl Walton



**T**he old adage that you get what you pay for isn't always true. Sometimes you get more than you pay for. For example, when you pay for NetWare 5.1, you get more than the latest version of Novell's network operating system. You also receive IBM WebSphere Application Server 3.0 for NetWare, Standard Edition, a Java-based web application server—and the final component Novell needed to secure its position in the application server space.

WebSphere Application Server runs on middle-tier servers—such as NetWare 5.1 servers—in n-tier networks. Web application servers enable you to create, manage, deploy, and execute web applications. For example, WebSphere Application Server enables you to manage and deploy web applications through the WebSphere Standard Administrative Console. (For more information about n-tier networks, see “Managing Multiple Databases,” *NetWare Connection*, Oct. 1999, pp. 16–31. You can download this article from <http://www.nwconnection.com/past.>)

NetWare 5.1 also includes IBM WebSphere Studio (Entry Edition). WebSphere Studio provides Java-based tools that

enable programmers and web developers to create web applications and to publish these applications to WebSphere Application Server.

How do WebSphere Application Server and WebSphere Studio compare with other web application servers and Java-based programming tools? According to a recent article in *PC Week*, the WebSphere products lead the competition: “With its updated WebSphere Application Server 3.0 application server and WebSphere Studio 3.0 Web page editor, IBM provides a more complete Web application development package than anyone else, making it easy to get started while still providing lots of room to grow.” (“IBM’s WebSphere 3.0 Pushes Ahead,” *PC Week*, Oct. 18, 1999, p. 14. You can download this article from <http://www.zdnet.com/pc-week/stories/news/0,4153,2374523,00.html>.)

With NetWare 5.1 and WebSphere Application Server, Novell has migrated to the application server space. Bill Oakes, director of NetWare Applications Marketing for Novell, explains: “WebSphere extends the functionality of NetWare 5.1 by enabling the development, deployment, and execution of next-generation applications.”

What are next-generation applications? According to Oakes, next-generation applications are standards-based applications that can be deployed on the Internet, and next-generation web application servers can perform well in this environment. Application server platforms such as NetWare 5.1 can provide security, are reliable, and can scale to accommodate the increased demands of the Internet. (For more information about NetWare 5.1 as an application server, see “NetWare: The Application Platform of the Future,” *NetWare Connection*, Aug. 1999, pp. 20–21. You can download this article from <http://www.nwconnection.com/past.>)

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## WITHIN THE SPHERE

Because NetWare 5.1 includes the Standard Edition of WebSphere Application Server, you may think you receive a

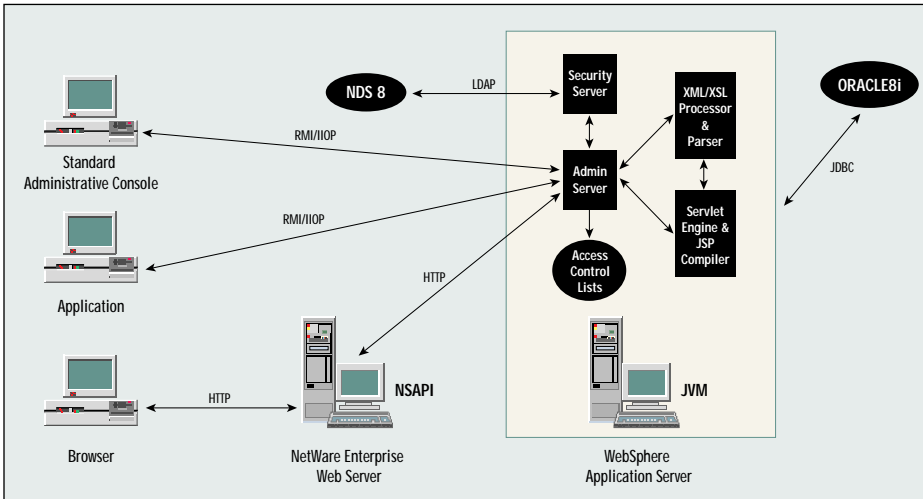


Figure 1. With WebSphere Application Server 3.0 for NetWare, Standard Edition, you can use NDS 8 to authenticate users who want to access WebSphere resources.

scaled-down version of the WebSphere Application Server 3.0, Standard Edition that runs on other operating systems. Instead, you receive a fully functional web application server. Oakes comments, "In a lot of cases, 'Standard Edition' means a reduced-functionality version of the real thing. In this case, WebSphere Application Server 3.0 for NetWare, Standard Edition really is the standard product. It has everything you need to build fully functioning web sites."

In fact, WebSphere Application Server 3.0 for NetWare, Standard Edition includes features that are not available on other operating systems. For example,

WebSphere Application Server 3.0 for NetWare, Standard Edition provides a fully integrated, completely automated installation. In addition, WebSphere Application Server 3.0 for NetWare, Standard Edition has been integrated with Novell Directory Services (NDS) 8. As a result, you can set up security for your company's web application server through NDS 8.

### The Sphere Fits NetWare Like a Glove

If you want to install WebSphere Application Server on another operating system—such as Windows NT or UNIX—

you must install multiple pieces manually, completing the following steps:

1. You must install the operating system.
2. You must install the latest version of the Java Developer Kit (JDK) from Sun Microsystems.
3. You must install a web server and configure WebSphere Application Server to use that web server and the JDK.
4. If you want web applications to access a database for information, you must install that database and configure WebSphere Application Server to access it.
5. You must configure security for WebSphere Application Server.

In contrast, you can install WebSphere Application Server 3.0 for NetWare, Standard Edition when you install NetWare 5.1: You simply click a checkbox in the NetWare 5.1 installation program. The installation program then automatically installs NetWare Enterprise Web Server, JDK 1.17B, and other software, such as the Novell Java Virtual Machine (JVM), that WebSphere Application Server requires for operation.

Because all of the software WebSphere Application Server requires to run is integrated with NetWare 5.1, WebSphere Application Server needs no additional configuration to use this software. In other words, all of the software WebSphere Application Server needs automatically fits together with the click of a mouse. "When you install WebSphere on NetWare 5.1, it will be up and ready [to use] to develop, deploy, and manage web applications that contain servlets, Java-Server Pages, and HTML," Kent Boogert, a technical leader at Novell, explains.

In addition, the NetWare 5.1 installation program integrates WebSphere Application Server with other products that you can select to install with NetWare 5.1. For example, if you click the checkbox to install Oracle8i for NetWare, the installation program automatically installs a Java Database Connectivity (JDBC) driver that enables applications running on WebSphere Application Server to access the Oracle8i database. (For more information about NetWare 5.1, see "Upcoming NetWare Game Highlights," *NetWare Connection*, Nov. 1999, pp. 6–16. You can download this article from <http://www.nwconnection.com/past/>.)

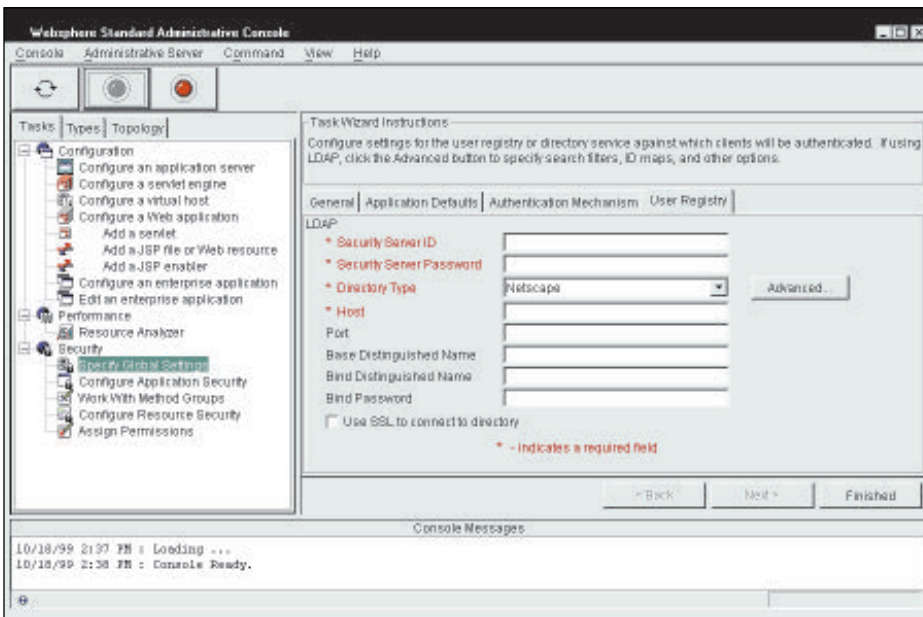


Figure 2. The Standard Administrative Console, which is included with WebSphere Application Server, enables you to customize web services for different users.

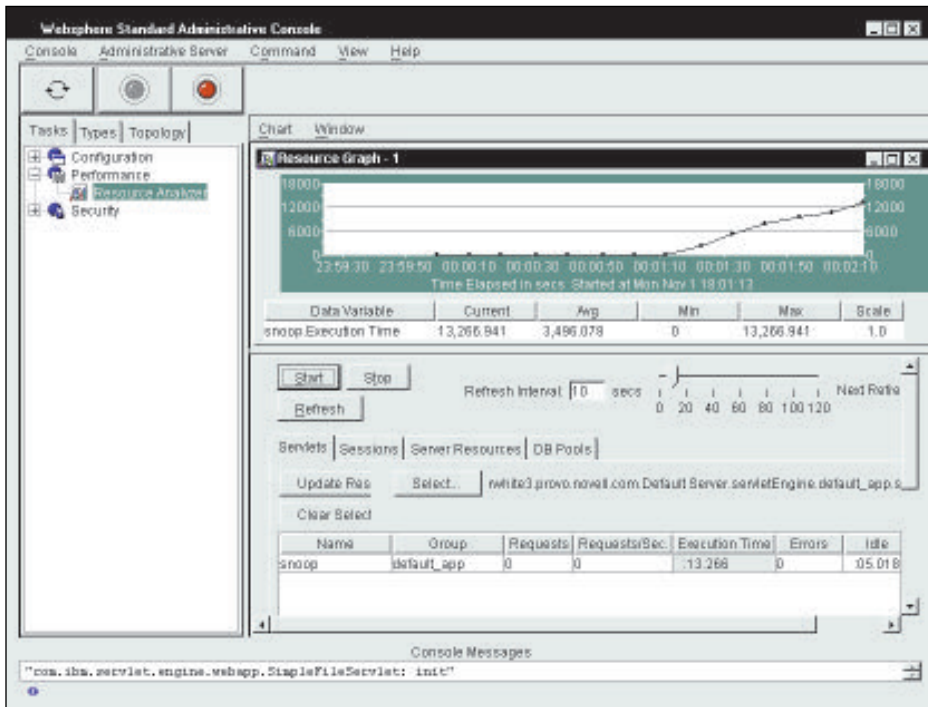


Figure 3. The Resource Analyzer enables you to monitor the performance of web resources.

Full integration with NetWare 5.1 also enables WebSphere Application Server to access NDS 8. In fact, WebSphere Application Server uses NDS 8 to authenticate users who want to access WebSphere Application Server resources. (See Figure 1 on p. 8.)

### STANDARDS IN THE ROUND

Like NetWare 5.1, WebSphere Application Server is based on open standards. As a result, programmers are more likely to write applications that can run on WebSphere Application Server.

Specifically, WebSphere Application Server is based on Sun Microsystems's J2EE, an open standard for Java-based web application servers. Because J2EE is an open standard, you can move web applications that are written to this standard from one J2EE server to another—even when those servers run on different operating systems. For example, if a J2EE-compliant application is written for a BEA WebLogic web application server that runs on Solaris, you can also run this application on WebSphere Application Server 3.0 for NetWare.

More than 30 companies—including Novell, IBM, Oracle, Sun, Netscape, and BEA—are either offering or planning to offer web application servers that comply with the J2EE standard. Software developers will undoubtedly continue to write

web applications for this growing number of J2EE-compliant servers. The greater the number of available web applications that will run on J2EE servers—and therefore on WebSphere Application Server—the greater the likelihood that you can find web applications that meet your company's needs.

The J2EE standard includes several Java technologies, including Java servlets, JavaServer Pages (JSP), JDBC, Extensible Markup Language (XML), Extensible Stylesheet Language (XSL), and Remote Method Invocation (RMI)/Internet Inter-ORB Protocol (IIOP). All of these Java technologies enable programmers and web masters to write applications that access information on your company's network to produce dynamic web pages. (For more information about these Java technologies, see "Java to the Core" on p. 12.)

If you are among the growing number of network administrators who are finding themselves cast in the additional role of webmaster, JSP support may be particularly interesting to you. JSP is a Java component technology that separates the static (HTML) content and page layout in web pages from the dynamic content.

JSP support makes the webmaster's job a lot easier. You can change the look and feel of a JSP page just as you would change any static web page—by using your favorite text editor—without hav-

ing to tamper with the dynamic processes embedded in that page and without having to compile any code. In contrast, to change the appearance of a web page produced by a Java servlet, you would have to alter that servlet's code and re-compile the code yourself.

JSP technology also enables you to take advantage of the expertise of several programmers—such as database or business logic programmers—instead of relying on the expertise of just one programmer. For example, a programmer who specializes in writing database programs could write a program component that accesses your company's financial database for profit and loss information.

Another programmer who specializes in writing human resources programs could write a program component that accesses your company's human resources system for information about employee stock options. You could then use JSP technology to combine the information from these two components in a web page for users who need access to that information. (For more information about programming components for WebSphere Application Server, see "Developing Applications for NetWare" on p. 18.)

WebSphere Application Server supports JSP technology through a JSP engine. JSPs are HTML pages that contain specialized tags to indicate that a dynamic process—such as a scripting process or a JavaBean process—is embedded in that page. (For an explanation of JavaBeans, see the glossary on the *NetWare Connection* web site at <http://www.nwconnection.com>.) A JSP engine is software that runs on a web server or web application server and receives requests for JSPs from first-tier devices, such as browsers. (You can download more information about JSP technology at <http://java.sun.com/products/jsp/download.html>.)

### CONTROLLING YOUR COMPANY'S SPHERE

To make it easier to manage, configure, and deploy resources, WebSphere Application Server includes the Standard Administrative Console, a standalone Java application that provides an easy-to-use GUI and wizards. For example, the Standard Administrative Console allows you to customize web services for different groups of users. (See Figure 2 on p. 8.)

You can also control multiple WebSphere Application Servers running on

## Java to the Core

The J2EE standard includes several Java technologies. IBM WebSphere Application Server 3.0 for NetWare, Standard Edition supports the following J2EE technologies:

- Java servlets
- JavaServer Pages (JSP)
- Java Database Connectivity (JDBC)
- Extensible Markup Language (XML) and Extensible Stylesheet Language (XSL)
- Remote Method Invocation (RMI)/Internet Inter-ORB Protocol (IIOP)

The J2EE standard also includes Enterprise JavaBeans (EJB) and Java Naming and Directory Interface (JNDI). An EJB is a portable, reusable Java component that performs a specific function, such as accessing information from a directory. JNDI is the Application Program Interface (API) through which such an EJB could access that directory information. (For more information about EJBs and JNDI, visit <http://java.sun.com/products/ejb/docs.html> and <http://java.sun.com/products/jndi>.)

WebSphere Application Server 3.0 for NetWare, Standard Edition uses EJBs internally for security and administration. However, WebSphere Application Server 3.0 for NetWare, Advanced Edition will also include EJB support for customer-installed EJBs. (For more information about WebSphere Application Server 3.0 for NetWare, Advanced Edition, see "Bean There" on p. 16.)

### JAVA SERVLETS

As you probably know, a servlet is a small Java program that runs on a Java Virtual Machine (JVM), which in turn runs on a server. Java servlets generate dynamic web pages. WebSphere Application Server supports Java servlets through the Java servlet API, which consists of several Java classes that allow WebSphere Application Server to use and manage servlets.

For example, the Java servlet API includes the `HttpServlet` and `GenericServlet` classes. The `HttpServlet` class enables WebSphere

Application Server to support servlets that respond to HTTP requests. In other words, this class enables a servlet to respond to a request from a user's browser. The `GenericServlet` class enables WebSphere Application Server to support servlets that respond to other processes, such as requests from other servlets. (For more information about the Java servlet API, visit <http://java.sun.com/products/servlet/2.2/javadoc>.)

### JDBC

JDBC is an API that enables WebSphere Application Server resources—such as servlets—to access information from databases. These resources can use the JDBC API to access a specific database, such as an Oracle8i database, or a middleware application that can then access a number of databases simultaneously.

For example, a servlet may use JDBC to request information from SQL Integrator, which in turn may access Oracle8i, Sybase, and DB2 databases for the requested information. SQL Integrator is a middleware application from Novell and B2Systems that can access multiple databases. (For more information about SQL Integrator, see "Managing Multiple Databases," *NetWare Connection*, Oct. 1999, pp. 16–31. You can download this article from <http://www.nwconnection.com/past>.)

The JDBC API also makes WebSphere Application Server resources that access databases portable. "If you're running an Oracle shop today and you get acquired and tomorrow you're running a DB2 shop, your web applications will all work with the new database because they're written to JDBC," John Christensen, the WebSphere development manager for Novell, explains.

### THE NEXT GENERATION OF XS

XML is a platform-independent and application-independent language through which WebSphere Application Server applications and components can share information with and receive information from disparate applications. For example, an accounting servlet running on WebSphere Application Server might use XML to send information from a human resources database to an application running on an Internal Revenue Service (IRS) mainframe.

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multiple NetWare 5.1 servers through a single Standard Administrative Console, and you can control access to the resources running on these WebSphere Application Servers. In addition, the Standard Administrative Console gives you access to information about each WebSphere Application Server's performance and configuration.

You can run Standard Administrative Console on the same NetWare 5.1 server on which WebSphere Application Server 3.0 for NetWare, Standard Edition is running. However, you can also run Standard Administrative Console on servers running Windows NT 4.0, Sun Solaris 2.6, or IBM AIX/6000 3.2. (For more information about WebSphere Standard Administrative Console system require-

ments, visit <http://www.software.ibm.com/webserver/appserv/standard.html>.)

To access WebSphere Application Server 3.0 for NetWare, Standard Edition from one of these platforms, you simply launch the Standard Administrative Console, which prompts you to enter the IP address—or a host name that resolves to that address—of the server on which WebSphere Application Server is running. (The default IP address is the address of the server on which Standard Administrative Console is installed. Thus, if Standard Administrative Console is running on NetWare 5.1 with WebSphere Application Server, you do not need to enter an IP address.)

The Standard Administrative Console includes the following tabs:

- Types
- Tasks
- Topology

### MY TYPE, EXACTLY

The Types tab allows you to create and customize the following features by adding, deleting, and modifying the default properties of those features:

- Application Servers. An application server is a copy of WebSphere Application Server that you can create and configure to provide a specific set of services. That is, the Standard Administrative Console allows you to create multiple copies of WebSphere Application Server on the same NetWare 5.1 server. You can then customize the

## Java to the Core (cont. from p. 12)

XSL is a language that allows you to produce HTML pages in which the presentation of XML data is separate from the data itself. That is, you can change the look and feel of a web page without affecting the source XML that page contains.

XML uses predetermined data-type definitions and XML tags to describe the structure and internal semantics of data contained in documents. These documents can be either static or dynamically generated, such as documents generated by servlets. An XML parser then interprets these XML tags and presents that data in such a way that the data is meaningful to the requesting application. (An XML parser is software that understands XML semantics. WebSphere Application Server uses the IBM XML for Java parser to perform this function.)

XSL is a language that uses tags to describe how parsed XML pages should be presented to the user, just as HTML tags describe how the data in HTML pages should be presented to users. An XSL processor interprets these tags to produce either a finished HTML or a formatted XML page.

For example, suppose your company uses a servlet that runs on WebSphere Application Server and accepts user requests for human resources information. Also suppose this servlet uses XML and XSL to return requested information. Upon receiving a request, this servlet would first access the human resources database to obtain the requested information. The servlet would then pass this data—in the form of a page—to an XML generator. (An XML generator is software that applies XML tags to raw data.)

The XML generator would describe the data on this page using XML tags. For example, this generator might use `<birth date>`

`</birth date>` tags to describe a particular string of numerical data as a birth date. The XML generator would then send this page through the XML parser, which would interpret the tags and return the resulting page to the servlet.

Next, the servlet would pass this page to an XSL processor, which would use XSL tags to format the data according to a predetermined template. The XSL processor would then process these tags and return the resulting HTML page to the servlet. Finally, the servlet would pass this page to the user requesting the information.

### RMI/IIOP

RMI/IIOP allows distributed applications or application components that use different programming languages to communicate with one another. For example, a servlet running on WebSphere Application Server could use RMI/IIOP to request the services of a C++ programming language component running on a different server. This component would then perform the requested service—access a human resources system, for example—and then use RMI/IIOP to return the results of that service to the requesting Java application. In fact, WebSphere Application Server and the WebSphere Standard Administrative Console form a distributed application that uses RMI/IIOP to communicate.

RMI is a Java API through which one Java application or component can communicate with another. IIOP is the transport protocol (based on TCP/IP) specified by the Object Management Group (OMG) to transport Common Object Request Broker (CORBA) communications. (For more information about RMI/IIOP, visit <http://java.sun.com/products/rmi-iiop>.)

services these copies, or application servers, provide. For example, you can configure the number of connections an application server can accommodate.

You can create multiple application servers to provide customized services for a particular subset of users. For example, if your company has several branch offices, each of which needs to access a different set of web applications, you can set up a separate application server to meet the particular needs of each branch office. You can then give each branch office access to its application server through a virtual host.

- **Virtual Hosts.** A virtual host is an alias, or logical representation, of web application servers and programs that share a common management point. A single physical host can support multiple virtual hosts. When you configure a virtual host, you give that virtual host a URL and point that URL to a particular application server. You also name the resources—the JSPs and servlets—that you want to provide through that application server.

This virtual host then appears to users as a separate entity with separate resources. For example, you might configure an application server and virtual host for your company's accounting department. The members of that department could then use WebSphere features, such as the Java servlet and JSP Application Program Interfaces (APIs), to access web-based accounting resources, such as a servlet that cuts company paychecks.

These resources would be logically confined within the space of the application server and virtual host. In other words, the accounting department could manage and control its own virtual application server that ran on a physical host that was shared by other departments within the company. Nonaccounting users would not see the accounting department's resources on your company's intranet site.

- **Nodes.** The node feature enables you to create a logical application server that spans multiple machines. A node also enables you to use one Standard

Administrative Console to manage multiple WebSphere Application Servers on multiple NetWare 5.1 servers. For example, you might use the node type to control the WebSphere Application Server running on your company's e-commerce system as well as the WebSphere Application Server running on your company's intranet.

### TAKE WEBSHERE TO TASK

As you may guess, you use the Standard Administrative Console Task tab to perform administrative tasks, such as adding resources—for example, servlets and JSPs—to WebSphere Application Server. To make the task of adding, configuring, and managing these resources easier than it may otherwise be, the Task tab provides wizards.

Among other things, these wizards help you configure the following features for WebSphere Application Server:

- Security
- Performance

### Bean There

What can you infer from the word Enterprise in the name Enterprise JavaBeans (EJB)? If you infer that EJBs are capable of handling business transactions, you are right. Furthermore, if you infer that EJBs can respond to a high volume of requests and can operate in large, distributed networks, you can say Bingo.

JavaBeans enable you to create Java program components that perform a specific function and that can be combined with other components and Java code to form full-fledged Java applications. EJB technology extends the JavaBean technology to handle business transactions and a high volume of requests in large, distributed networks. If your company's NetWare network is large and complex and requires the extended capabilities EJBs provide, WebSphere Application Server 3.0 for NetWare, Advanced Edition will soon be available to meet those requirements.

WebSphere Application Server 3.0 for NetWare, Advanced Edition will include an EJB container that you can use to manage and deploy EJBs in your company's network. An EJB container is software composed of Java classes that provide both entity and session EJBs with specialized services—such as storage, threading, and distributed transaction services.

#### ENTITY EJBS AND SESSION EJBS

Entity EJBs are components that use persistent data—that is, data that must exist for an indefinite period of time. For example, a particular entity EJB might use data that comprises a customer's purchasing history.

Conversely, session EJBs use nonpersistent data—data that does not exist beyond the particular session during which a session EJB interacts with a client application. For example, a session EJB might keep track of the potential purchases in a customer's shopping cart.

Entity EJBs are always stateful. However, session EJBs can be either stateful or stateless. A stateful EJB keeps track of more than one interaction between that EJB and a client application. For example, the shopping cart EJB in the example above would be a stateful EJB because it would keep track of all the interactions required for a customer to fill his or her shopping cart.

A stateless EJB, on the other hand, handles only one interaction per session. For example, a stateless EJB might calculate the shipping costs on a customer's purchase at checkout.

Because EJBs are persistent and transactional, they are particularly well suited to providing web-based applications with

access to data running on bottom-tier applications, such as databases. John Christensen, the WebSphere development manager for Novell, explains: "If you have legacy payroll systems and inventory systems and human relations systems that are within your company, EJBs can provide access to those from the web."

#### PROGRAMMING TOOLS FOR EJBS

WebSphere Application Server 3.0 for NetWare, Advanced Edition will also include tools to help you deploy these entity and session EJBs on your company's network. For example, you might use these tools to deploy the Novell Licensing Service EJB, an entity EJB that checks a client application's license to use a particular web resource, such as a servlet.

According to Christensen, Novell created the Licensing Service EJB for both software developers and for network administrators like you. The Licensing Service EJB encourages software developers to write applications and components (such as EJBs) for WebSphere Application Server because it provides you with a framework for checking a user's right to use their products.

The resulting availability of these applications and components means that you, the network administrator, are more likely to find the resources you need without having to develop those resources yourself—or pay someone else to develop them. Furthermore, this framework gives you the ability to license these resources at both the application and component levels as you deploy resources on your company's network.

WebSphere Application Server 3.0 for NetWare, Advanced Edition will also include Thunderbolt, Novell's code name for its implementation of Java Message Service (JMS). JMS is an Application Program Interface (API) from Sun Microsystems through which web resources, such as EJBs, can publish or receive event messages.

For example, if an online customer were to purchase the last of an item in stock, this event might trigger a JMS call to an EJB. This EJB might then publish this event to a subscribing servlet in your company's e-commerce system. If another customer were to then place this item in his or her shopping cart, this servlet would immediately notify that customer that the item was out of stock. That is, JMS can enable customers to "know in real-time" that an item is out of stock, Christensen explains.

When will you be able to put EJBs and Thunderbolt to work on your company's network? Probably sooner than you think. WebSphere Application Server 3.0 for NetWare, Advanced Edition is scheduled for beta release next year. ●

### Shields Up

The security feature allows you to configure Secure Sockets Layer (SSL) security for web applications, such as e-commerce applications. (See Figure 2 on p. 8. For an explanation of SSL, see the glossary on the *NetWare Connection* web site at <http://www.nwconnection.com>.) WebSphere Application Server uses the NetWare infrastructure to supply SSL services through Novell International Cryptographic Infrastructure (NICI).

NICI is a group of NetWare Loadable Modules (NLMs) that work together to provide network applications with a secure way to send and receive communications. In addition, NICI controls the level of encryption that a resource—such as a servlet—can receive based on the laws of the country in which the NetWare 5.1 server and NICI are running. (For more information about NICI, see "With NICI It's All Holes Barred," *NetWare Connection*, Dec. 1998, pp.

8–20. You can download this article from <http://www.nwconnection.com/past>.)

The security feature also allows you to select the authentication mechanism that allows WebSphere Application Server to authenticate users through NDS 8. You can choose no authentication, basic authentication, or X.509 certificate authentication. If you choose basic authentication, the user must supply a valid username and password to access resources on WebSphere

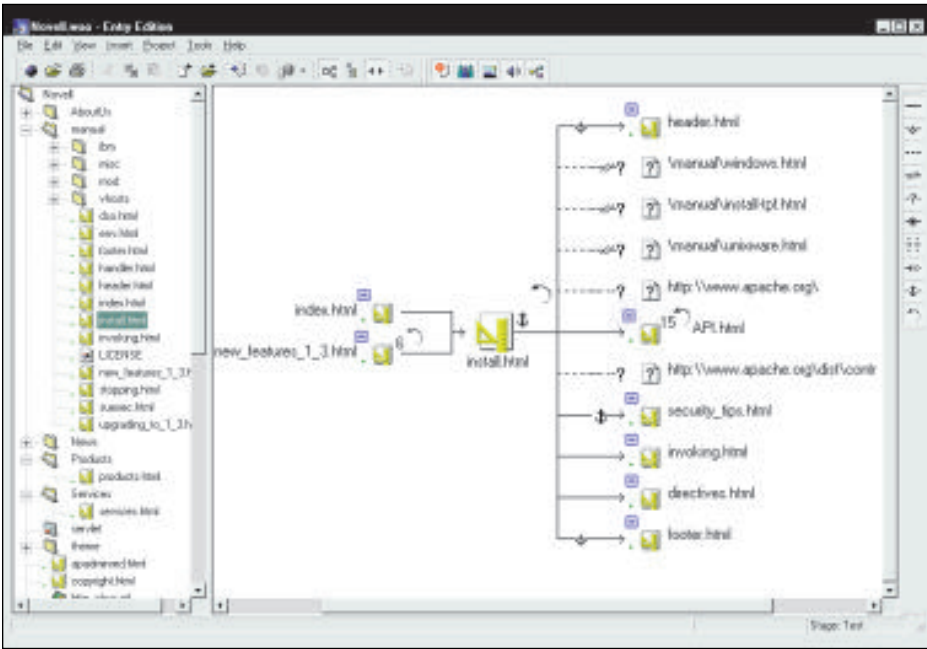


Figure 4. WebSphere Studio (Entry Edition) offers an easy-to-use GUI.

Application Server. If you choose X.509 certificate authentication, WebSphere Application Server requires the Internet browser to return a digital certificate that identifies the user. WebSphere Application Server then uses this certificate to both authenticate and authorize the user's access.

After specifying the authentication mechanism, you can configure access control lists—which use this mechanism—for particular resources running on your company's network. For example, you can limit access to the servlets and JSPs you deploy through WebSphere Application Server. (When you create

an access control list for a particular resource, you name the users who can access that resource.)

This granular control allows you to offer different services to different people through your company's intranet or web site. For example, suppose your company's intranet resources include a servlet that cuts employee bonus checks. You could limit access to this servlet by configuring an access control list that lists specific users, such as the company president or the head of the accounting department. Only these individuals could then access this servlet.

#### Performance Does Matter

The performance feature allows you to access information about how WebSphere Application Server is performing. For example, you can access the Resource Analyzer, which includes statistical information, such as the number of servlets WebSphere Application Server is serving per second.

The Resource Analyzer also allows you to monitor the performance of web resources by building custom graphs and reports about WebSphere Application Server's throughput. (See Figure 3 on p. 10.) In other words, the performance feature allows you to see firsthand how

## Developing Applications for NetWare

In addition to integrating WebSphere Application Server 3.0 for NetWare, Standard Edition with NetWare 5.1, Novell is providing several programming components that can help you or someone on your company's programming staff develop web applications that interact with browser-based first-tier devices. These components are part of a component model Novell is creating for WebSphere Application Server.

Based on the Model/View/Controller (MVC) architecture, Novell's component model includes the following components:

- Model components
- View components
- Controller components

The model components, called command beans, are JavaBeans or Enterprise JavaBeans (EJB) that encompass a discrete piece of business logic. Novell provides several command beans for WebSphere Application Server 3.0 for NetWare, Standard Edition, including JavaBeans that access Novell Directory Services (NDS), the NetWare file system, and NetWare Storage Services (NSS). (See "WebSphere Components," Novell DeveloperNotes, Dec. 1999 for a complete list of the command beans Novell provides. You can download this article from [\[developer.novell.com/research/devnotes.htm\]\(http://developer.novell.com/research/devnotes.htm\).\)](http://</a></p>
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The view components—usually JavaServer Pages (JSP)—are responsible for generating the HTML pages through which web applications respond to browser-based user requests. View components include format beans, which are JavaBeans that format web pages, including JSP. Novell provides format beans that support the NDS syntax types and the NetWare file system syntax types.

The controller components—usually Java servlets—pass information between the model and view components. Controller components are included in Java servlets and ServletBeans. (A ServletBean is a Java servlet that complies with the Sun Microsystems JavaBeans specification.) Novell provides servlets and ServletBeans to control model and view components.

The MVC architecture enables you, the network administrator, to define the components you want a web application to include and then to assign the development of those components to the programmer most qualified to write them. For example, you might assign a component that accesses your company's PeopleSoft database to a developer who specializes in writing PeopleSoft components.

You or your company's programmer can also use WebSphere Studio (Entry Edition) to assemble existing components, such as Novell command beans, to create a web application that meets your company's needs. ●

WebSphere Application Server is performing so that you can then make system configuration decisions that enhance that performance.

### LAY OF THE LAND

The Standard Administrative Console Topology tab provides a hierarchical view of how WebSphere Application Server is currently configured. The top entry in this view is the WebSphere Application Server domain. This entry is followed by a list of the nodes you have configured for that domain. Each node is followed by a list of the web application servers and virtual hosts configured on that node. Finally, each of these web application servers is followed by a list of the servlet engines configured for that server.

### AROUND THE STUDIO

As mentioned earlier, WebSphere Studio (Entry Edition) includes application development tools that are designed to make it easy for both experienced programmers and novice programmers to create web applications and to publish those applications to WebSphere Application Server. (See Figure 4 on p. 18.) WebSphere Studio offers an easy-to-use GUI and runs on Windows NT 4.0 (with Service Pack 3 installed), 98, or 95. Specifically, WebSphere Studio provides the following tools:

- **Wizards.** WebSphere Studio wizards include the Java servlet API to help you write or edit Java servlets and the JDBC API to help you create server-side applications that access bottom-tier databases (such as Oracle8i). These wizards also help you write JavaBeans and Java code that links Java components—such as servlets and JavaBeans—to form full-fledged web applications.
  - **Workbench.** WebSphere Studio workbench enables you to organize and manage the files that comprise WebSphere Application Server applications and application components. Through the workbench, you can organize these files according to projects and store the files anywhere on your company's network.
- The workbench also includes search capabilities that help you locate stored files. These search capa-

bilities facilitate collaborative work on projects: You can distribute component files to various individuals without losing control of those files.

In addition, the workbench includes a Relationship view that enables you to see the links between the component files that comprise a particular project—a feature that makes it easy to locate broken links. You can also configure the workbench to automatically update the links between

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component files whenever you move these files to a new location.

Finally, the workbench enables you to import existing applications and application components into a project file and to publish this file to WebSphere Application Server. You can then test the logic contained in those files.

- **Page Designer.** WebSphere Studio page designer helps you design and edit web pages. Using the page designer, you can create and edit JSPs and can drag and drop JavaBeans into JSPs. The page designer also enables you to create and edit JavaScript, XSL style sheets, and XML and HTML pages.

- **Applet Designer.** WebSphere Studio applet designer is an applet creation tool that is based on NetObjects BeanBuilder technology. (You can find more information about NetObjects BeanBuilder by visiting <http://www.netobjects.com/store/index.html>. Click NetObjects Products, find BeanBuilder, and click Full.)

You can also access and use other web application development tools, such as IBM VisualAge for Java, through WebSphere Studio (Entry Edition). In fact, WebSphere Studio (Entry Edition) ships with 30-day trial versions of VisualAge for Java 3.0 (Entry Edition) and NetObjects ScriptBuilder 2.0.

VisualAge for Java 3.0 is an application development tool that enables you to create, test, and deploy Java web applications without writing Java code. VisualAge for Java is tightly integrated with both WebSphere Application Server and WebSphere Studio. (You can download more information about VisualAge for Java at <http://www-4.ibm.com/software/ad/vajava/vaj3.html>.)

NetObjects ScriptBuilder 2.0 is a web-based scripting tool that supports more than a dozen scripting languages, including VisualBasic script, Perl script, and JavaScript. (For more information about ScriptBuilder 2.0, visit <http://www.netobjects.com/products/html/nsb3.html>.)

Novell is also providing some programming components that will help you build applications. These components will be released in the near future through Novell's developer web site. (For more information, see "Developing Applications for NetWare" on p. 18.)

### CONCLUSION

NetWare 5.1 represents the first release of NetWare that includes WebSphere Application Server and WebSphere Studio. However, Novell and IBM intend to include WebSphere Application Server with every version of NetWare from NetWare 5.1 forward. Novell also intends to further integrate WebSphere Application Server with Novell products in these future releases. (See "Rolling Along" on p. 22.)

Why are Novell and IBM partnering to offer you a web application server with each new version of the NetWare operating system you purchase? According to John Christensen, the WebSphere development manager for Novell, this

## Rolling Along

WebSphere Application Server 3.0 for NetWare, Standard Edition is the first version of WebSphere Application Server to ship with the NetWare operating system. From the year 2000 forward, however, Novell and IBM intend to include WebSphere Application Server with every new release of NetWare that ships.

As a rule, new releases of existing software contain new or enhanced features, and future releases of WebSphere Application Server will not be an exception to this rule. As you may expect, Novell is already thinking of what it might add to these future releases. Following is a sneak peek at some of the products Novell is considering integrating with WebSphere Application Server:

- BorderManager Enterprise Edition
- Novell Storage Services (NSS)
- NetWare Cluster Services for NetWare 5
- ManageWise

### BORDERMANAGER ENTERPRISE EDITION

Current plans for future releases of WebSphere Application Server include integration with BorderManager Enterprise Edition. Novell's BorderManager is firewall, caching, and Virtual Private Network (VPN) software that functions at borders—the points at which one network meets another. For example, you could place BorderManager between your company's internal network and the Internet.

Integration with BorderManager would enable companies to protect the resources running on WebSphere Application Server using the same BorderManager firewall technology that keeps other network resources beyond the view of users who do not have rights to access those resources. Companies could also use the BorderManager VPN to create a virtual intranet between far-flung corporate branch offices without incurring the cost of purchasing dedicated lines. Integrating BorderManager with WebSphere Application Server would enable companies to cache the resources that users request most frequently. In this way, companies could speed up users' access to those resources.

### NOVELL STORAGE SERVICES

Novell also plans to integrate WebSphere Application Server with NSS. NSS is a storage and access system that would enable WebSphere Application Server to store almost any kind of

data—including data in oversized files, such as audio and video files—and to quickly retrieve that stored data.

### NETWARE CLUSTER SERVICES FOR NETWARE 5

In addition, Novell plans to integrate WebSphere Application Server with its NetWare Cluster Services for NetWare 5—software that allows you to cluster several network servers that supply crucial network services. Clustering servers ensures that if a server fails, another server can take over and provide critical network services.

Clustering also supplies fault tolerance at the application level. For example, if the web application that provides your company's network with its e-commerce system fails, another application running on one of the clustered servers will immediately take over for that failed application.

### MANAGEWISE

Novell's plans for future versions of WebSphere Application Server also include integration with ManageWise. ManageWise enables you to manage all of your company's network resources—such as Novell Directory Services (NDS), NetWare file and print services, and workstations—from a single GUI. Integration with ManageWise would allow you to add WebSphere Application Server to the network resources you already manage through ManageWise.

### MORE INTEGRATION WITH NDS

In addition, Novell plans to further enhance WebSphere Application Server integration with NDS. Currently, WebSphere Application Server uses NDS to authenticate users. However, in the future, WebSphere Application Server may use NDS to control access to the resources WebSphere now controls through internal access control lists.

Furthermore, enhanced integration with NDS will allow WebSphere Application Server to take advantage of NDS products, such as Novell's digitalme. digitalme uses NDS to allow users to control information about themselves—such as address, telephone numbers, and credit card numbers—on the Internet. An application running on your company's WebSphere Application Server might then be able to use digitalme to supply information that a user would normally have to type in each time he or she accessed that application.

For example, a checkout application might access digitalme for a customer's mailing address, telephone number, and credit card number. That customer would then be spared the necessity of typing in this information each time he or she purchased an item through your company's e-commerce system. ●

partnership will enable IBM to achieve nearly immediate market penetration of its WebSphere products. "Novell ships a million servers a year," Christensen explains. "We anticipate that within the first year, there will be more WebSphere Application Servers deployed on NetWare than there will be on any other platform."

For Novell, this partnership represents the first step in establishing NetWare as a server that ideally suits the Open Appli-

cation Server (OAS) model, a model that Novell believes will define the application server platform of the future.

"WebSphere is basically our entrance into the Open Application Server space," Oakes explains. (For more information about the OAS model, see "NetWare: The Application Platform of the Future," *NetWare Connection*, Aug. 1999, pp. 20–21. You can download this article at <http://www.nwconnection.com/past.>)

In other words, all interested parties benefit from the Novell-IBM alliance: IBM increases its customer base, Novell establishes NetWare as the next generation of application servers, and you get a web application server that can help your company's network take advantage of the latest web-based technologies.

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