BEA WebLogic Server®

Programming WebLogic Security

Version 10.0
Revised: March 30, 2007

Contents

3. Securing Web Applications

6. Securing Enterprise JavaBeans (EJBs)

7. Using Network Connection Filters

8. Using Java Security to Protect WebLogic Resources

CHAPTER 1

Introduction and Roadmap

The following sections describe the contents and organization of this guide—*Programming WebLogic Security*:

Document Scope

This document explains how to use the WebLogic Server security programming features.

See "Related Information" on page 1-4 for a description of other WebLogic Server security documentation.

Audience for This Guide

This document is intended for the following audiences:

- Application Developers

Java programmers who focus on developing client applications, adding security to Web applications and Enterprise JavaBeans (EJBs). They work with other engineering, Quality Assurance (QA), and database teams to implement security features. Application developers have in-depth/working knowledge of Java (including Java Platform, Enterprise Edition (Java EE) Version 5 components such as servlets/JSPs and JSEE) and Java security.

Application developers use the WebLogic security and Java 2 security application programming interfaces (APIs) to secure their applications. Therefore, this document provides instructions for using those APIs for securing Web applications, Java applications, and Enterprise JavaBeans (EJBs).

- Security Developers

  Developers who focus on defining the system architecture and infrastructure for security products that integrate into WebLogic Server and on developing custom security providers for use with WebLogic Server. They work with application architects to ensure that the security architecture is implemented according to design and that no security holes are introduced. They also work with WebLogic Server administrators to ensure that security is properly configured. Security developers have a solid understanding of security concepts, including authentication, authorization, auditing (AAA), in-depth knowledge of Java (including Java Management eXtensions (JMX), and working knowledge of WebLogic Server and security provider functionality.

  Security developers use the Security Service Provider Interfaces (SSPIs) to develop custom security providers for use with WebLogic Server. This document does not address this task; for information on how to use the SSPIs to develop custom security providers, see *Developing Security Providers for WebLogic Server*.

- Server Administrators

  Administrators who work closely with application architects to design a security scheme for the server and the applications running on the server, to identify potential security risks, and to propose configurations that prevent security problems. Related responsibilities may include maintaining critical production systems, configuring and managing security realms, implementing authentication and authorization schemes for server and application resources, upgrading security features, and maintaining security provider databases. WebLogic Server administrators have in-depth knowledge of the Java security architecture, including Web application and EJB security, Public Key security, and SSL.

- Application Administrators

  Administrators who work with WebLogic Server administrators to implement and maintain security configurations and authentication and authorization schemes, and to set up and

maintain access to deployed application resources in defined security realms. Application administrators have general knowledge of security concepts and the Java Security architecture. They understand Java, XML, deployment descriptors, and can identify security events in server and audit logs.

While administrators typically use the Administration Console to deploy, configure, and manage applications when they put the applications into production, application developers may also use the Administration Console to test their applications before they are put into production. At a minimum, testing requires that applications be deployed and configured. This document does not cover some aspects of administration as it relates to security, rather, it references *Securing WebLogic Server*, *Securing WebLogic Resources Using Roles and Policies*, and *Administration Console Online Help* for descriptions of how to use the Administration Console to perform security tasks.

Guide to this Document

This document is organized as follows:

- Chapter 2, "WebLogic Security Programming Overview," discusses the need for security, and the WebLogic Security application programming Interfaces (APIs).
- Chapter 3, "Securing Web Applications," describes how to implement security in Web applications.
- Chapter 4, "Using JAAS Authentication in Java Clients," describes how to implement JAAS authentication in Java clients.
- Chapter 5, "Using SSL Authentication in Java Clients," describes how to implement SSL and digital certificate authentication in Java clients.
- Chapter 6, "Securing Enterprise JavaBeans (EJBs)," describes how to implement security in Enterprise JavaBeans.
- Chapter 7, "Using Network Connection Filters," describes how to implement network connection filters.
- Chapter 8, "Using Java Security to Protect WebLogic Resources," discusses using Java security to protect WebLogic resources.
- Chapter 9, "SAML APIs," describes the WebLogic SAML APIs.
- Chapter 10, "Using CertPath Building and Validation," describes how to build and validate certification paths.

- Appendix A, "Deprecated Security APIs," provides a list of `weblogic.security` packages in which APIs have been deprecated.

Note: This document does not supply detailed information for developers who want to write custom security providers for use with WebLogic Server. For information on developing custom security providers, see *Developing Security Providers for WebLogic Server*.

Related Information

In addition to this document, *Programming WebLogic Security*, the following documents provide information on the WebLogic Security Service:

- *Understanding WebLogic Security*—This document summarizes the features of the WebLogic Security Service and presents an overview of the architecture and capabilities of the WebLogic Security Service. It is the starting point for understanding the WebLogic Security Service.
- *Securing a Production Environment*— This document highlights essential security measures for you to consider before you deploy WebLogic Server into a production environment.
- *Developing Security Providers for WebLogic Server*—This document provides security vendors and application developers with the information needed to develop custom security providers that can be used with WebLogic Server.
- *Securing WebLogic Server*—This document explains how to configure security for WebLogic Server and how to use Compatibility security.
- *Securing WebLogic Resources Using Roles and Policies*—This document introduces the various types of WebLogic resources, and provides information that allows you to secure these resources using WebLogic Server.
- *Administration Console Online Help*—This document describes how to use the Administration Console to perform security tasks.
- Javadocs for WebLogic Classes—This document includes reference documentation for the WebLogic security packages that are provided with and supported by the WebLogic Server software.

Security Samples and Tutorials

In addition to the documents listed in Related Information, BEA Systems provides a variety of code samples for developers.

Security Examples in the WebLogic Server Distribution

WebLogic Server optionally installs API code examples in *WL_HOME*\samples\server\examples\src\examples\security, where *WL_HOME* is the top-level directory of your WebLogic Server installation. You can start the examples server, and obtain information about the samples and how to run them from the WebLogic Server Start menu.

The following examples illustrate WebLogic security features:

- Java Authentication and Authorization Service
- Outbound and Two-way SSL

The security tasks and code examples provided in this document assume that you are using the WebLogic security providers that are included in the WebLogic Server distribution, not custom security providers. The usage of the WebLogic security APIs does not change if you elect to use custom security providers, however, the management procedures of your custom security providers may be different.

Note: This document does not provide comprehensive instructions on how to configure WebLogic Security providers or custom security providers. For information on configuring WebLogic security providers and custom security providers, see *Securing WebLogic Server*.

Additional Examples Available for Download

Additional API examples are available for download at http://dev2dev.bea.com. These examples are distributed as `.zip` files that you can unzip into an existing WebLogic Server samples directory structure.

You build and run the downloadable examples in the same manner as you would an installed WebLogic Server example. See the download pages of individual examples for more information.

New and Changed Security Features in This Release

For this manual, there are no significant new or changed features for version 10.0 of WebLogic Server.

CHAPTER 2

WebLogic Security Programming Overview

The following topics are covered in this section:

What Is Security?

Security refers to techniques for ensuring that data stored in a computer or passed between computers is not compromised. Most security measures involve proof material and data encryption. Proof material is typically a secret word or phrase that gives a user access to a particular application or system. Data encryption is the translation of data into a form that cannot be interpreted without holding or supplying the same secret.

Distributed applications, such as those used for electronic commerce (e-commerce), offer many access points at which malicious people can intercept data, disrupt operations, or generate fraudulent input. As a business becomes more distributed the probability of security breaches increases. Accordingly, as a business distributes its applications, it becomes increasingly important for the distributed computing software upon which such applications are built to provide security.

An application server resides in the sensitive layer between end users and your valuable data and resources. WebLogic Server provides authentication, authorization, and encryption services with

which you can guard these resources. These services cannot provide protection, however, from an intruder who gains access by discovering and exploiting a weakness in your deployment environment.

Therefore, whether you deploy WebLogic Server on the Internet or on an intranet, it is a good idea to hire an independent security expert to go over your security plan and procedures, audit your installed systems, and recommend improvements.

Another good strategy is to read as much as possible about security issues and appropriate security measures. The document *Securing a Production Environment* highlights essential security measures for you to consider before you deploy WebLogic Server into a production environment. The document *Securing WebLogic Resources Using Roles and Policies* introduces the various types of WebLogic resources, and provides information that allows you to secure these resources using WebLogic Server. For the latest information about securing Web servers, BEA also recommends reading the Security Improvement Modules, Security Practices, and Technical Implementations information available from the CERT™ Coordination Center operated by Carnegie Mellon University.

BEA suggests that you apply the remedies recommended in our security advisories. In the event of a problem with a BEA product, BEA distributes an advisory and instructions with the appropriate course of action. If you are responsible for security related issues at your site, please register to receive future notifications. BEA has established an e-mail address (`security-report@bea.com`) to which you can send reports of any possible security issues in BEA products. In addition, you are advised to apply every Service Pack as they are released. Service Packs include a roll up of all bug fixes for each version of the product, as well as each of the previously released Service Packs.

Product provided by BEA partners can also help you in your effort to secure the WebLogic Server production environment. For more information, see the BEA Partner's Page.

Administration Console and Security

With regard to security, you can use the Administration Console to define and edit deployment descriptors for Web Applications, EJBs, Java EE Connectors, and Enterprise Applications. This document, *Programming WebLogic Security*, does not describe how to use the Administration Console to configure security. For information on how to use the Administration Console to define and edit deployment descriptors, see *Securing WebLogic Resources Using Roles and Policies* and *Securing WebLogic Server*.

Types of Security Supported by WebLogic Server

WebLogic Server supports the following security mechanisms:

Authentication

Authentication is the mechanism by which callers and service providers prove that they are acting on behalf of specific users or systems. Authentication answers the question, "Who are you?" using credentials. When the proof is bidirectional, it is referred to as mutual authentication.

WebLogic Server supports username and password authentication and certificate authentication. For certificate authentication, WebLogic Server supports both one-way and two-way SSL (Secure Sockets Layer) authentication. Two-way SSL authentication is a form of mutual authentication.

In WebLogic Server, Authentication providers are used to prove the identity of users or system processes. Authentication providers also remember, transport, and make identity information available to various components of a system (via subjects) when needed. You can configure the Authentication providers using the Web application and EJB deployment descriptor files, or the Administration Console, or a combination of both.

Authorization

Authorization is the process whereby the interactions between users and WebLogic resources are controlled, based on user identity or other information. In other words, authorization answers the question, "What can you access?"

In WebLogic Server, a WebLogic Authorization provider is used to limit the interactions between users and WebLogic resources to ensure integrity, confidentiality, and availability. You can configure the Authorization provider using the Web application and EJB deployment descriptor files, or the Administration Console, or a combination of both.

WebLogic Server also supports the use of programmatic authorization (also referred to in this document as programmatic security) to limit the interactions between users and WebLogic resources.

Java EE Security

For implementation and use of user authentication and authorization, BEA WebLogic Server utilizes the security services of the J2SE Development Kit 5.0 (JDK 5.0). Like the other Java EE components, the security services are based on standardized, modular components. BEA WebLogic Server implements these Java security service methods according to the standard, and adds extensions that handle many details of application behavior automatically, without requiring additional programming.

Security APIs

This section lists the Security packages and classes that are implemented and supported by WebLogic Server. You use these packages to secure interactions between WebLogic Server and client applications, Enterprise JavaBeans (EJBs), and Web applications.

Note: Several of the WebLogic security packages, classes, and methods are deprecated in this release of WebLogic Server. For more detailed information on deprecated packages and classes, see Appendix A, "Deprecated Security APIs."

The following topics are covered in this section:

JAAS Client Application APIs

You use Java APIs and WebLogic APIs to write client applications that use JAAS authentication.

The following topics are covered in this section:

Java JAAS Client Application APIs

You use the following Java APIs to write JAAS client applications.

- javax.naming
- javax.security.auth

- javax.security.auth.callback
- javax.security.auth.login
- javax.security.auth.spi

For information on how to use these APIs, see "JAAS Authentication APIs" on page 4-4.

WebLogic JAAS Client Application APIs

You use the following WebLogic APIs to write JAAS client applications:

- weblogic.security
- weblogic.security.auth
- weblogic.security.auth.callback

For information on how to use these APIs, see "JAAS Authentication APIs" on page 4-4.

SSL Client Application APIs

You use Java and WebLogic APIs to write client applications that use SSL authentication:

The following topics are covered in this section:

- "Java SSL Client Application APIs" on page 2-5
- "WebLogic SSL Client Application APIs" on page 2-6

Java SSL Client Application APIs

You use the following Java APIs to write SSL client applications:

- java.security
- java.security.cert
- javax.crypto
- javax.naming
- javax.net
- javax.security
- javax.servlet

- javax.servlet.http

WebLogic Server also supports the javax.net.SSL API, but BEA recommends that you use the `weblogic.security.SSL` package when you use SSL with WebLogic Server.

For information on how to use these APIs, see "SSL Authentication APIs" on page 5-4.

WebLogic SSL Client Application APIs

You use the following WebLogic APIs to write SSL client applications.

- weblogic.net.http
- weblogic.security.SSL

For information on how to use these APIs, see "SSL Authentication APIs" on page 5-4.

Other APIs

Additionally, you use the following APIs to develop WebLogic Server applications:

- `weblogic.security.jacc`

  This API provides the `RoleMapper` interface. If you implement the Java Authorization Contract for Containers (JACC), you can use this package with the `javax.security.jacc` package. See "Using the Java Authorization Contract for Containers" on page 8-6 for information about the WebLogic JACC provider. See http://java.sun.com/j2ee/javaacc/ for information on developing a JACC provider.

- `weblogic.security.net`

  This API provides interfaces and classes that are used to implement network connection filters. Network connection filters allow or deny connections to WebLogic Server based on attributes such as the IP address, domain, or protocol of the initiator of the network connection. For more information about how to use this API, see "Using Network Connection Filters" on page 7-1.

- `weblogic.security.pk`

  This API provides interfaces and classes to build and validate certification paths. See Chapter 10, "Using CertPath Building and Validation," for information on using this API to build and validate certificate chains.

  See the `java.security.cert` package for additional information on certificates and certificate paths.

- `weblogic.security.providers.saml`

This API provides interfaces and classes that are used to perform mapping of user and group information to Security Assertion Markup Language (SAML) assertions, and to cache and retrieve SAML assertions.

SAML is an XML-based framework for exchanging security information. WebLogic Server supports SAML V1.1, including the Browser/Post and Browser/Artifact profiles. SAML authorization is not supported.

For more information about SAML, see http://www.oasis-open.org.

- `weblogic.security.service`

  This API includes interfaces, classes, and exceptions that support security providers. The WebLogic Security Framework consists of interfaces, classes, and exceptions provided by this API. The interfaces, classes, and exceptions in this API should be used in conjunction with those in the `weblogic.security.spi` package. For more information about how to use this API, see *Developing Security Providers for WebLogic Server*.

- `weblogic.security.services`

  This API provides the server-side authentication class. This class is used to perform a local login to the server. It provides login methods that are used with CallbackHandlers to authenticate the user and return credentials using the default security realm.

- `weblogic.security.spi`

  This package provides the Security Service Provider Interfaces (SSPIs). It provides interfaces, classes, and exceptions that are used for developing custom security providers. In many cases, these interfaces, classes, and exceptions should be used in conjunction with those in the `weblogic.security.service` API. You implement interfaces, classes, and exceptions from this package to create runtime classes for security providers. For more information about how to use the SSPIs, see *Developing Security Providers for WebLogic Server*.

- `weblogic.servlet.security`

  This API provides a server-side API that supports programmatic authentication from within a servlet application. For more about how to use this API, see, "Using the Programmatic Authentication API" on page 3-43.

CHAPTER 3

Securing Web Applications

WebLogic Server supports the Java EE architecture security model for securing Web applications, which includes support for declarative authorization (also referred to in this document as declarative security) and programmatic authorization (also referred to in this document as programmatic security).

This section covers the following topics:

Note: You can use deployment descriptor files and the Administration Console to secure Web applications. This document describes how to use deployment descriptor files. For information on using the Administration Console to secure Web applications, see *Securing WebLogic Resources Using Roles and Policies*.

WebLogic Server supports the use of the `HttpServletRequest.isUserInRole` and `HttpServletRequest.getUserPrincipal` methods and the use of the `security-role-ref`

element in deployment descriptors to implement programmatic authorization in Web applications.

Authentication With Web Browsers

Web browsers can connect to WebLogic Server over either a HyperText Transfer Protocol (HTTP) port or an HTTP with SSL (HTTPS) port. The benefits of using an HTTPS port versus an HTTP port are two-fold. With HTTPS connections:

- All communication on the network between the Web browser and the server is encrypted. None of the communication, including the user name and password, is in clear text.
- As a minimum authentication requirement, the server is required to present a digital certificate to the Web browser client to prove its identity.

If the server is configured for two-way SSL authentication, both the server and client are required to present a digital certificate to each other to prove their identity.

User Name and Password Authentication

WebLogic Server performs user name and password authentication when users use a Web browser to connect to the server via the HTTP port. In this scenario, the browser and an instance of WebLogic Server interact in the following manner to authenticate a user (see Figure 3-1):

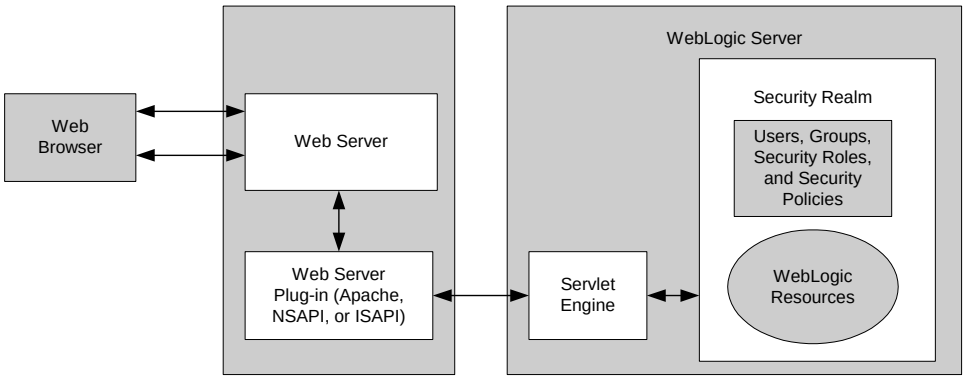
1. A user invokes a WebLogic resource in WebLogic Server by entering the URL for that resource in a Web browser. The `http` URL contains the HTTP listen port, for example, `http://myserver:7001`.
2. The Web server in WebLogic Server receives the request.

   Note: WebLogic Server provides its own Web server but also supports the use of Apache Server, Microsoft Internet Information Server, and Netscape Enterprise Server as Web servers.
3. The Web server determines whether the WebLogic resource is protected by a security policy. If the WebLogic resource is protected, the Web server uses the established HTTP connection to request a user name and password from the user.
4. When the user's Web browser receives the request from the Web server, it prompts the user for a user name and password.
5. The Web browser sends the request to the Web server again, along with the user name and password.

6. The Web server forwards the request to the Web server plug-in. WebLogic Server provides the following plug-ins for Web servers:
   - Apache-WebLogic Server plug-in
   - Netscape Server Application Programming Interface (NSAPI)
   - Internet Information Server Application Programming Interface (ISAPI)

   The Web server plug-in performs authentication by sending the request, via the HTTP protocol, to WebLogic Server, along with the authentication data (user name and password) received from the user.
7. Upon successful authentication, WebLogic Server proceeds to determine whether the user is authorized to access the WebLogic resource.
8. Before invoking a method on the WebLogic resource, the WebLogic Server instance performs a security authorization check. During this check, the server security extracts the user's credentials from the security context, determines the user's security role, compares the user's security role to the security policy for the requested WebLogic resource, and verifies that the user is authorized to invoke the method on the WebLogic resource.
9. If authorization succeeds, the server fulfills the request.

Figure 3-1 Secure Login for Web Browsers



Note: Username/Password authentication can be required for HTTP and one-way SSL authentication. HTTPS connections can be configured for one-way or two-way SSL authentication.

Digital Certificate Authentication

WebLogic Server uses encryption and digital certificate authentication when Web browser users connect to the server via the HTTPS port. In this scenario, the browser and WebLogic Server instance interact in the following manner to authenticate and authorize a user (see Figure 3-1):

1. A user invokes a WebLogic resource in WebLogic Server by entering the URL for that resource in a Web browser. The `https` URL contains the SSL listen port, for example, `https://myserver:7002`.
2. The Web server in WebLogic Server receives the request.

   Note: WebLogic Server provides its own Web server but also supports the use of Apache Server, Microsoft Internet Information Server, and Netscape Enterprise Server as Web servers.
3. The Web server checks whether the WebLogic resource is protected by a security policy. If the WebLogic resource is protected, the Web server uses the established HTTPS connection to request a user name and password from the user.
4. When the user's Web browser receives the request from WebLogic Server, it prompts the user for a user name and password. (This step is optional.)
5. The Web browser sends the request again, along with the user name and password. (Only supplied if requested by the server.)
6. WebLogic Server presents its digital certificate to the Web browser.
7. The Web browser checks that the server's name used in the URL (for example, `myserver`) matches the name in the digital certificate and that the digital certificate was issued by a trusted third party, that is, a trusted CA
8. If two-way SSL authentication is in force on the server, the server requests a digital certificate from the client.

   Note: Even though WebLogic Server cannot be configured to enforce the full two-way SSL handshake with Web Server proxy plug-ins, proxy plug-ins can be configured to provide the client certificate to the server if it is needed. To do this, configure the proxy plug-in to export the client certificate in the HTTP Header for WebLogic Server. For instructions on how to configure proxy plug-ins to export the client certificate to WebLogic Server, see the configuration information for the specific plug-in in *Using Web Server Plug-Ins With WebLogic Server*.
9. The Web server forwards the request to the Web server plug-in. If secure proxy is set (this is the case if the HTTPS protocol is being used), the Web server plug-in also performs

authentication by sending the request, via the HTTPS protocol, to the WebLogic resource in WebLogic Server, along with the authentication data (user name and password) received from the user.

Note: When using two-way SSL authentication, you can also configure the server to do identity assertion based on the client's certificate, where, instead of supplying a user name and password, the server extracts the user name and password from the client's certificate.

10. Upon successful authentication, WebLogic Server proceeds to determine whether the user is authorized to access the WebLogic resource.
11. Before invoking a method on the WebLogic resource, the server performs a security authorization check. During this check, the server extracts the user's credentials from the security context, determines the user's security role, compares the user's security role to the security policy for the requested WebLogic resource, and verifies that the user is authorized to invoke the method on the WebLogic resource.
12. If authorization succeeds, the server fulfills the request.

For more information, see the following documents:

- Securing WebLogic Server
- Installing and Configuring the Apache HTTP Server Plug-In
- Installing and Configuring the Microsoft Internet Information Server (IIS) Plug-In
- Installing and Configuring the Netscape Enterprise Server (NES) Plug-In

Multiple Web Applications, Cookies, and Authentication

By default, WebLogic Server assigns the same cookie name (`JSESSIONID`) to all Web applications. When you use any type of authentication, all Web applications that use the same cookie name use a single sign-on for authentication. Once a user is authenticated, that authentication is valid for requests to any Web Application that uses the same cookie name. The user is not prompted again for authentication.

If you want to require separate authentication for a Web application, you can specify a unique cookie name or cookie path for the Web application. Specify the cookie name using the `CookieName` parameter and the cookie path with the `CookiePath` parameter, defined in the WebLogic-specific deployment descriptor `weblogic.xml` `<session-descriptor>` element. For more information, see session-descriptor in *Developing Web Applications, Servlets, and JSPs for WebLogic Server*.

If you want to retain the cookie name and still require independent authentication for each Web application, you can set the cookie path parameter (`CookiePath`) differently for each Web application.

WebLogic Server allows a user to securely access HTTPS resources in a session that was initiated using HTTP, without loss of session data. This feature enables Web site designers to prevent session stealing. For more information on this feature, see "Using Secure Cookies to Prevent Session Stealing" on page 3-6.

Using Secure Cookies to Prevent Session Stealing

A common Web security problem is session stealing. This happens when an attacker manages to get a copy of your session cookie, generally while the cookie is being transmitted over the network. This can only happen when the data is being sent in clear-text; that is, the cookie is not encrypted.

WebLogic Server allows a user to securely access HTTPS resources in a session that was initiated using HTTP, without loss of session data. To enable this feature, add `AuthCookieEnabled="true"` to the `WebServer` element in `config.xml`:

```
<WebServer Name="myserver" AuthCookieEnabled="true"/>
```

Setting `AuthCookieEnabled` to `true`, which is the default setting, causes the WebLogic Server instance to send a new secure cookie, `_WL_AUTHCOOKIE_JSESSIONID`, to the browser when authenticating via an HTTPS connection. Once the secure cookie is set, the session is allowed to access other security-constrained HTTPS resources only if the cookie is sent from the browser.

Thus, WebLogic Server uses two cookies: the `JSESSIONID` cookie and the `_WL_AUTHCOOKIE_JSESSIONID` cookie. By default, the `JSESSIONID` cookie is never secure, but the `_WL_AUTHCOOKIE_JSESSIONID` cookie is always secure. A secure cookie is only sent when an encrypted communication channel is in use. Assuming a standard HTTPS login (HTTPS is an encrypted HTTP connection), your browser gets both cookies.

For subsequent HTTP access, you are considered authenticated if you have a valid `JSESSIONID` cookie, but for HTTPS access, you must have both cookies to be considered authenticated. If you only have the `JSESSIONID` cookie, you must re-authenticate.

With this feature enabled, once you have logged in over HTTPS, the secure cookie is only sent encrypted over the network and therefore can never be stolen in transit. The `JSESSIONID` cookie is still subject to in-transit hijacking. Therefore, a Web site designer can ensure that session stealing is not a problem by making all sensitive data require HTTPS. While the HTTP session

cookie is still vulnerable to being stolen and used, all sensitive operations require the `_WL_AUTHCOOKIE_JSESSIONID`, which cannot be stolen, so those operations are protected.

You can also specify a cookie name for `JSESSIONID` or `_WL_AUTHCOOKIE_JSESSIONID` using the `CookieName` parameter defined in the `weblogic.xml` deployment descriptor's `<session-descriptor>` element, as follows:

```
<session-descriptor>
    <cookie-name>FOOAPPID</cookie-name>
</session-descriptor>
```

In this case, Weblogic Server will not use `JSESSIONID` and `_WL_AUTHCOOKIE_JSESSIONID`, but `FOOAPPID` and `_WL_AUTHCOOKIE_FOOAPPID` to serve the same purpose, as shown in Table 3-1.

Table 3-1 WebLogic Server Cookies

User-Specified in Deployment Descriptor	HTTP Session	HTTPS Session
No - uses the `JSESSIONID` default	`JSESSIONID`	`_WL_AUTHCOOKIE_JSESSIONID`
Yes - specified as `FOOAPPID`	`FOOAPPID`	`_WL_AUTHCOOKIE_FOOAPPID`

Developing Secure Web Applications

WebLogic Server supports three types of authentication for Web browsers:

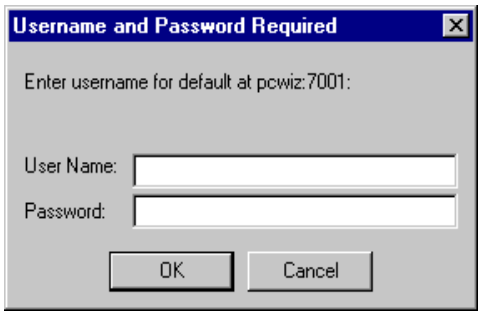
- BASIC
- FORM
- CLIENT-CERT

The following sections cover the different ways to use these types of authentication:

Developing BASIC Authentication Web Applications

With basic authentication, the Web browser pops up a login screen in response to a WebLogic resource request. The login screen prompts the user for a user name and password. Figure 3-2 shows a typical login screen.

Figure 3-2 Authentication Login Screen



Note: See "Understanding BASIC Authentication with Unsecured Resources" on page 3-14 for important information about how unsecured resources are handled.

To develop a Web application that provides basic authentication, perform these steps:

1. Create the `web.xml` deployment descriptor. In this file you include the following information (see Listing 3-1):
   a. Define the welcome file. The welcome file name is `welcome.jsp`.
   b. Define a security constraint for each set of Web application resources, that is, URL resources, that you plan to protect. Each set of resources share a common URL. URL resources such as HTML pages, JSPs, and servlets are the most commonly protected, but other types of URL resources are supported. In Listing 3-1, the URL pattern points to the `welcome.jsp` file located in the Web application's top-level directory; the HTTP methods that are allowed to access the URL resource, POST and GET; and the security role name, `webuser`.

Note: When specifying security role names, observe the following conventions and restrictions:

- The proper syntax for a security role name is as defined for an `Nmtoken` in the Extensible Markup Language (XML) recommendation available on the Web at: `http://www.w3.org/TR/REC-xml#NT-Nmtoken`.
- Do not use blank spaces, commas, hyphens, or any characters in this comma-separated list: \t, < >, #, |, &, ~, ?, ( ), { }.
- Security role names are case sensitive.
- The BEA suggested convention for security role names is that they be singular.

c. Use the `<login-config>` tag to define the type of authentication you want to use and the security realm to which the security constraints will be applied. In Listing 3-1, the BASIC type is specified and the realm is the default realm, which means that the security constraints will apply to the active security realm when the WebLogic Server instance boots.

d. Define one or more security roles and map them to your security constraints. In our sample, only one security role, `webuser`, is defined in the security constraint so only one security role name is defined here (see the `<security-role>` tag in Listing 3-1). However, any number of security roles can be defined.

Listing 3-1 Basic Authentication web.xml File

```
<?xml version='1.0' encoding='UTF-8'?>
<web-app xmlns="http://java.sun.com/xml/ns/j2ee"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">

   <web-app>
          <welcome-file-list>
               <welcome-file>welcome.jsp</welcome-file>
          </welcome-file-list>

          <security-constraint>
                <web-resource-collection>
                      <web-resource-name>Success</web-resource-name>
                      <url-pattern>/welcome.jsp</url-pattern>
                     <http-method>GET</http-method>
                     <http-method>POST</http-method>
                </web-resource-collection>
```

```
            <auth-constraint>
                <role-name>webuser</role-name>
            </auth-constraint>
        </security-constraint>

        <login-config>
            <auth-method>BASIC</auth-method>
            <realm-name>default</realm-name>
        </login-config>

         <security-role>
             <role-name>webuser</role-name>
         </security-role>
    </web-app>
```

2. Create the `weblogic.xml` deployment descriptor. In this file you map security role names to users and groups. Listing 3-2 shows a sample `weblogic.xml` file that maps the `webuser` security role defined in the `<security-role>` tag in the `web.xml` file to a group named `myGroup`. Note that principals can be users or groups, so the `<principal-tag>` can be used for either. With this configuration, WebLogic Server will only allow users in `myGroup` to access the protected URL resource—`welcome.jsp`.

   Note: Starting in version 9.0, the default role mapping behavior is to create empty role mappings when none are specified in `weblogic.xml`. In version 8.x, if you did not include a `weblogic.xml` file, or included the file but did not include mappings for all security roles, security roles without mappings defaulted to any user or group whose name matched the role name. For information on role mapping behavior and backward compatibility settings, see the section Understanding the Combined Role Mapping Enabled Setting in the *Securing WebLogic Resources Using Roles and Policies* manual.

Listing 3-2 BASIC Authentication weblogic.xml File

```
<?xml version='1.0' encoding='UTF-8'?>
<weblogic-web-app xmlns="http://www.bea.com/ns/weblogic/90"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">

<weblogic-web-app>
```

```
    <security-role-assignment>
        <role-name>webuser</role-name>
        <principal-name>myGroup</principal-name>
    </security-role-assignment>
</weblogic-web-app>
```

3. Create a file that produces the Welcome screen that displays when the user enters a user name and password and is granted access. Listing 3-3 shows a sample `welcome.jsp` file. Figure 3-3 shows the Welcome screen.

Listing 3-3 BASIC Authentication welcome.jsp File

```
<html>
  <head>
    <title>Browser Based Authentication Example Welcome Page</title>
  </head>
  <h1> Browser Based Authentication Example Welcome Page </h1>
  <p> Welcome <%= request.getRemoteUser() %>!
  </blockquote>
  </body>
</html>
```

Note: In Listing 3-3, notice that the JSP is calling an API (`request.getRemoteUser()`) to get the name of the user that logged in. A different API, `weblogic.security.Security.getCurrentSubject()`, could be used instead. To use this API to get the name of the user, use it with the `SubjectUtils` API as follows:

```
String username = weblogic.security.SubjectUtils.getUsername(
                    weblogic.security.Security.getCurrentSubject());
```

Figure 3-3 Welcome Screen

4. Start WebLogic Server and define the users and groups that will have access to the URL resource. In the `weblogic.xml` file (see Listing 3-2), the `<principal-name>` tag defines `myGroup` as the group that has access to the `welcome.jsp`. Therefore, use the Administration Console to define the `myGroup` group, define a user, and add that user to the `myGroup` group. For information on adding users and groups, see Users, Groups, and Security Roles in *Securing WebLogic Resources Using Roles and Policies*.

5. Deploy the Web application and use the user defined in the previous step to access the protected URL resource.

   a. For deployment instructions, see "Deploying Web Applications" on page 3-26.

   b. Open a Web browser and enter this URL:

      ```
      http://localhost:7001/basicauth/welcome.jsp
      ```

   c. Enter the user name and password. The Welcome screen displays.

Using HttpSessionListener to Account for Browser Caching of Credentials

The browser caches user credentials and frequently re-sends them to the server automatically. This can give the appearance that WebLogic Server sessions are not being destroyed after logout or timeout. Depending on the browser, the credentials can be cached just for the current browser session, or across browser sessions.

You can validate that a WebLogic Server's session was destroyed by creating a class that implements the `javax.servlet.http.HttpSessionListener` interface. Implementations of this interface are notified of changes to the list of active sessions in a web application. To receive notification events, the implementation class must be configured in the deployment descriptor for the web application in `web.xml`.

To configure a session listener class:

1. Open the `web.xml` deployment descriptor of the Web application for which you are creating a session listener class in a text editor. The `web.xml` file is located in the WEB-INF directory of your Web application.
2. Add an event declaration using the listener element of the web.xml deployment descriptor. The event declaration defines the event listener class that is invoked when the event occurs. For example:

   ```
   <listener>
     <listener-class>myApp.MySessionListener</listener-class>
   </listener>
   ```

   See Configuring an Event Listener Class for additional information and guidelines.

Write and deploy the session listener class. The example shown in Listing 3-4 uses a simple counter to track the session count.

Listing 3-4 Tracking the Session Count

```
package myApp;

import javax.servlet.http.HttpSessionListener;
import javax.servlet.http.HttpSessionEvent;

public class MySessionListener implements HttpSessionListener {

       private static int sessionCount = 0;

       public void sessionCreated(HttpSessionEvent se) {
               sessionCount++;
                // Write to a log or do some other processing.
       }

       public void sessionDestroyed(HttpSessionEvent se) {
                if(sessionCount > 0)
```

```
                    sessionCount--;
                //Write to a log or do some other processing.
            }
    }
```

Understanding BASIC Authentication with Unsecured Resources

For WebLogic Server versions 9.2 and later, client requests that use HTTP BASIC authentication must pass WebLogic Server authentication, even if access control is not enabled on the target resource.

The setting of the Security Configuration MBean flag `enforce-valid-basic-auth-credentials` determines this behavior. (The DomainMBean can return the new Security Configuration MBean for the domain.) It specifies whether or not the system should allow requests with invalid HTTP BASIC authentication credentials to access unsecured resources.

Note: The Security Configuration MBean provides domain-wide security configuration information. The enforce-valid-basic-auth-credentials flag effects the entire domain.

The `enforce-valid-basic-auth-credentials` flag is true by default, and WebLogic Server authentication is performed. If authentication fails, the request is rejected. WebLogic Server must therefore have knowledge of the user and password.

You may want to change the default behavior if you rely on an alternate authentication mechanism. For example, you might use a backend web service to authenticate the client, and WebLogic Server does not need to know about the user. With the default authentication enforcement enabled, the web service can do its own authentication, but only if WebLogic Server authentication first succeeds.

If you explicitly set the `enforce-valid-basic-auth-credentials` flag to false, WebLogic Server does not perform authentication for HTTP BASIC authentication client requests for which access control was not enabled for the target resource.

In the previous example of a backend web service that authenticates the client, the web service can then perform its own authentication without WebLogic Server having knowledge of the user.

Setting the enforce-valid-basic-auth-credentials Flag

To set the e`enforce-valid-basic-auth-credentials` flag, perform the following steps:

1. Add the `<enforce-valid-basic-auth-credentials>` element to `config.xml` within the `<security-configuration>` element.

:

```
<enforce-valid-basic-auth-credentials>false</enforce-valid-basic-auth-credentials>
  </security-configuration>
```

2. Start or restart all of the servers in the domain.

Using WLST to Check the Value of enforce-valid-basic-auth-credentials

The Administration Console does not display or log the `enforce-valid-basic-auth-credentials` setting. However, you can use WLST to check the value in a running server. Remember that `enforce-valid-basic-auth-credentials` is a domain-wide setting.

The WLST session shown in Listing 3-5 demonstrates how to check the value of the `enforce-valid-basic-auth-credentials` flag in a sample running server.

Listing 3-5 Checking the Value of enforce-valid-basic-auth-credentials

```
wls:/offline> connect('weblogic','weblogic','t3://localhost:7001')
Connecting to t3://localhost:7001 with userid weblogic ...
Successfully connected to Admin Server 'examplesServer' that belongs to
domain '
wl_server'.

wls:/wl_server/serverConfig> cd('SecurityConfiguration')


wls:/wl_server/serverConfig/SecurityConfiguration> ls()

dr--   wl_server

wls:/wl_server/serverConfig/SecurityConfiguration> cd('wl_server')

wls:/wl_server/serverConfig/SecurityConfiguration/wl_server> ls()

dr--   DefaultRealm
```

```
dr--   Realms
-r--   AnonymousAdminLookupEnabled                 false
-r--   CompatibilityConnectionFiltersEnabled       false
-r--   ConnectionFilter                            null
-r--   ConnectionFilterRules                       null
-r--   ConnectionLoggerEnabled                     false
-r--   ConsoleFullDelegationEnabled                false
-r--   Credential                                  ******
-r--   CredentialEncrypted                         ******
-r--   CrossDomainSecurityEnabled                  false
-r--   DowngradeUntrustedPrincipals                false
-r--   EnforceStrictURLPattern                     true
-r--   EnforceValidBasicAuthCredentials            false
:
:
```

Developing FORM Authentication Web Applications

When using FORM authentication with Web applications, you provide a custom login screen that the Web browser displays in response to a Web application resource request and an error screen that displays if the login fails. The login screen can be generated using an HTML page, JSP, or servlet. The benefit of form-based login is that you have complete control over these screens so that you can design them to meet the requirements of your application or enterprise policy/guideline.

The login screen prompts the user for a user name and password. Figure 3-4 shows a typical login screen generated using a JSP and Listing 3-6 shows the source code.

Figure 3-4 Form-Based Login Screen (login.jsp)

Listing 3-6 Form-Based Login Screen Source Code (login.jsp)

```
<html>
  <head>)
    <title>Security WebApp login page</title>
  </head>
  <body bgcolor="#cccccc">
  <blockquote>
  <img src=BEA_Button_Final_web.gif align=right>
  <h2>Please enter your user name and password:</h2>
  <p>
  <form method="POST" action="j_security_check">
  <table border=1>
    <tr>
      <td>Username:</td>
      <td><input type="text" name="j_username"></td>
    </tr>
    <tr>
      <td>Password:</td>
```

```
      <td><input type="password" name="j_password"></td>
    </tr>
    <tr>
      <td colspan=2 align=right><input type=submit
                                    value="Submit"></td>
    </tr>
  </table>
  </form>
  </blockquote>
  </body>
</html>
```

Figure 3-5 shows a typical login error screen generated using HTML and Listing 3-7 shows the source code.

Figure 3-5 Login Error Screen

Listing 3-7 Login Error Screen Source Code

```
<html>
  <head>
```

```
    <title>Login failed</title>
  </head>
  <body bgcolor=#ffffff>
  <blockquote>
  <img src=/security/BEA_Button_Final_web.gif align=right>
  <h2>Sorry, your user name and password were not recognized.</h2>
  <p><b>
  <a href="/security/welcome.jsp">Return to welcome page</a> or
           <a href="/security/logout.jsp">logout</a>
  </b>
  </blockquote>
  </body>
</html>
```

To develop a Web application that provides FORM authentication, perform these steps:

1. Create the `web.xml` deployment descriptor. In this file you include the following information (see Listing 3-8):

   a. Define the welcome file. The welcome file name is `welcome.jsp`.

   b. Define a security constraint for each set of URL resources that you plan to protect. Each set of URL resources share a common URL. URL resources such as HTML pages, JSPs, and servlets are the most commonly protected, but other types of URL resources are supported. In Listing 3-8, the URL pattern points to `/admin/edit.jsp`, thus protecting the `edit.jsp` file located in the Web application's `admin` sub-directory, defines the HTTP method that is allowed to access the URL resource, `GET`, and defines the security role name, `admin`.

   Note: Do not use hyphens in security role names. Security role names with hyphens cannot be modified in the Administration Console. Also, the BEA suggested convention for security role names is that they be singular.

   c. Define the type of authentication you want to use and the security realm to which the security constraints will be applied. In this case, the `FORM` type is specified and no realm is specified, so the realm is the default realm, which means that the security constraints will apply to the security realm that is activated when a WebLogic Server instance boots.

d. Define one or more security roles and map them to your security constraints. In our sample, only one security role, `admin`, is defined in the security constraint so only one security role name is defined here. However, any number of security roles can be defined.

Listing 3-8 FORM Authentication web.xml File

```
<?xml version='1.0' encoding='UTF-8'?>
<web-app xmlns="http://java.sun.com/xml/ns/j2ee"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">

<web-app>

    <welcome-file-list>
        <welcome-file>welcome.jsp</welcome-file>
    </welcome-file-list>

    <security-constraint>
        <web-resource-collection>
            <web-resource-name>AdminPages</web-resource-name>
            <description>
                These pages are only accessible by authorized
                 administrators.
            </description>
            <url-pattern>/admin/edit.jsp</url-pattern>
            <http-method>GET</http-method>
        </web-resource-collection>
        <auth-constraint>
            <description>
                These are the roles who have access.
            </description>
            <role-name>
                admin
            </role-name>
        </auth-constraint>
        <user-data-constraint>
            <description>
                This is how the user data must be transmitted.
            </description>
            <transport-guarantee>NONE</transport-guarantee>
```

```
        </user-data-constraint>
    </security-constraint>

    <login-config>
        <auth-method>FORM</auth-method>
        <form-login-config>
            <form-login-page>/login.jsp</form-login-page>
            <form-error-page>/fail_login.html</form-error-page>
        </form-login-config>
    </login-config>

    <security-role>
        <description>
            An administrator
        </description>
        <role-name>
            admin
        </role-name>
    </security-role>
</web-app>
```

2. Create the `weblogic.xml` deployment descriptor. In this file you map security role names to users and groups. Listing 3-9 shows a sample `weblogic.xml` file that maps the `admin` security role defined in the `<security-role>` tag in the `web.xml` file to the group `supportGroup`. With this configuration, WebLogic Server will only allow users in the `supportGroup` group to access the protected WebLogic resource. However, you can use the Administration Console to modify the Web application's security role so that other groups can be allowed to access the protected WebLogic resource.

Listing 3-9 FORM Authentication weblogic.xml File

```
<?xml version='1.0' encoding='UTF-8'?>
<weblogic-web-app xmlns="http://www.bea.com/ns/weblogic/90"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">

<weblogic-web-app>

     <security-role-assignment>
         <role-name>admin</role-name>
```

```
        <principal-name>supportGroup</principal-name>
    </security-role-assignment>
</weblogic-web-app>
```

3. Create a Web application file that produces the welcome screen when the user requests the protected Web application resource by entering the URL. Listing 3-10 shows a sample `welcome.jsp` file. Figure 3-3 shows the Welcome screen.

Listing 3-10 Form Authentication welcome.jsp File

```
<html>
  <head>
    <title>Security login example</title>
  </head>

  <%
    String bgcolor;
    if ((bgcolor=(String)application.getAttribute("Background")) ==
        null)
    {
        bgcolor="#cccccc";
    }
  %>

  <body bgcolor=<%="\""+bgcolor+"\""%>>

  <blockquote>
  <img src=BEA_Button_Final_web.gif align=right>
  <h1> Security Login Example </h1>

  <p> Welcome <%= request.getRemoteUser() %>!

  <p> If you are an administrator, you can configure the background
  color of the Web Application.
  <br> <b><a href="admin/edit.jsp">Configure background</a></b>.

  <% if (request.getRemoteUser() != null) { %>
    <p> Click here to <a href="logout.jsp">logout</a>.
  <% } %>
```

```
  </blockquote>
  </body>
</html>
```

Note: In Listing 3-3, notice that the JSP is calling an API (`request.getRemoteUser()`) to get the name of the user that logged in. A different API, `weblogic.security.Security.getCurrentSubject()`, could be used instead. To use this API to get the name of the user, use it with the `SubjectUtils` API as follows:

```
String username = weblogic.security.SubjectUtils.getUsername(
                      weblogic.security.Security.getCurrentSubject());
```

4. Start WebLogic Server and define the users and groups that will have access to the URL resource. In the `weblogic.xml` file (see Listing 3-9), the `<role-name>` tag defines `admin` as the group that has access to the `edit.jsp`, file and defines the user `joe` as a member of that group. Therefore, use the Administration Console to define the `admin` group, and define user `joe` and add `joe` to the `admin` group. You can also define other users and add them to the group and they will also have access to the protected WebLogic resource. For information on adding users and groups, see Users, Groups, and Security Roles in *Securing WebLogic Resources Using Roles and Policies*.

5. Deploy the Web application and use the user(s) defined in the previous step to access the protected Web application resource.

   a. For deployment instructions, see "Deploying Web Applications" on page 3-26.

   b. Open a Web browser and enter this URL:

      `http://hostname:7001/security/welcome.jsp`

   c. Enter the user name and password. The Welcome screen displays.

Using Identity Assertion for Web Application Authentication

You use identity assertion in Web applications to verify client identities for authentication purposes. When using identity assertion, the following requirements must be met:

1. The authentication type must be set to CLIENT-CERT.

2. An Identity Assertion provider must be configured in the server. If the Web browser or Java client requests a WebLogic Server resource protected by a security policy, WebLogic Server requires that the Web browser or Java client have an identity. The WebLogic Identity

Assertion provider maps the token from a Web browser or Java client to a user in a WebLogic Server security realm. For information on how to configure an Identity Assertion provider, see Configuring Identity Assertion Providers in *Securing WebLogic Server.*

3. The user corresponding to the token's value must be defined in the server's security realm; otherwise the client will not be allowed to access a protected WebLogic resource. For information on configuring users on the server, see Users, Groups, and Security Roles in *Securing WebLogic Resources Using Roles and Policies*.

Using Two-Way SSL for Web Application Authentication

You use two-way SSL in Web applications to verify that clients are whom they claim to be. When using two-way SSL, the following requirements must be met:

1. The authentication type must be set to CLIENT-CERT.
2. The server must be configured for two-way SSL. For information on using SSL and digital certificates, see Chapter 5, "Using SSL Authentication in Java Clients.". For information on configuring SSL on the server, see Configuring SSL in *Securing WebLogic Server*.
3. The client must use HTTPS to access the Web application on the server.
4. An Identity Assertion provider must be configured in the server. If the Web browser or Java client requests a WebLogic Server resource protected by a security policy, WebLogic Server requires that the Web browser or Java client have an identity. The WebLogic Identity Assertion provider allows you to enable a user name mapper in the server that maps the digital certificate of a Web browser or Java client to a user in a WebLogic Server security realm. For information on how to configure security providers, see Configuring Security Providers in *Managing WebLogic Security.*
5. The user corresponding to the Subject's Distinguished Name (SubjectDN) attribute in the client's digital certificate must be defined in the server's security realm; otherwise the client will not be allowed to access a protected WebLogic resource. For information on configuring users on the server, see Users, Groups, and Security Roles in *Securing WebLogic Resources Using Roles and Policies*.

Note: When you use SSL authentication, it is not necessary to use `web.xml` and `weblogic.xml` files to specify server configuration because you use the Administration Console to specify the server's SSL configuration.

Providing a Fallback Mechanism for Authentication Methods

The Servlet 2.4 specification allows you to define the authentication method (BASIC, FORM, etc.) to be used in a Web application. WebLogic Server provides an `auth-method` security module that allows you to define multiple authentication methods (as a comma separated list), so the container can provide a fall-back mechanism. Authentication will be attempted in the order the values are defined in the `auth-method` list.

For example, you can define the following `auth-method` list in the `login-config` element of your `web.xml` file:

```
<login-config>
  <auth-method>CLIENT-CERT,BASIC</auth-method>
</login-config>
```

Then the container will first try to authenticate by looking at the CLIENT-CERT value. If that should fail, the container will challenge the user-agent for BASIC authentication.

If either FORM or BASIC are configured, then they must exist at the end of the list since they require a round-trip communication with the user. However, both FORM and BASIC cannot exist together in the list of `auth-method` values.

Configuration

The `auth-method` authentication security can be configured in two ways:

- Define a comma separated list of `auth-method` values in the `login-config` element of your `web.xml` file.
- Define the `auth-method` values as a comma separated list on the `RealmMBean` and in the `login-config` element of your `web.xml` use the REALM value, then the Web application will pick up the authentication methods from the security realm.

WebLogic Java Management Extensions (JMX) enables you to access the `RealmMBean` to create and manage the securtity resources. For more information, see "Overview of WebLogic Server Subsystem MBeans" in *Programming WebLogic JMX Management Interfaces Guide*.

Developing Swing-Based Authentication Web Applications

Web browsers can also be used to run graphical user interfaces (GUIs) that were developed using Java Foundation Classes (JFC) Swing components; the Swing component kit is integrated into the Java 2 platform, Standard Edition (J2SE).

For information on how to create a graphical user interface (GUI) for applications and applets using the Swing components, see the *Creating a GUI with JFC/Swing* tutorial (also known as The Swing Tutorial) produced by Sun Microsystems, Inc. You can access this tutorial on the Web at `http://java.sun.com/docs/books/tutorial/uiswing/`.

After you have developed your Swing-based GUI, refer to "Developing FORM Authentication Web Applications" on page 3-16 and use the Swing-based screens to perform the steps required to develop a Web application that provides FORM authentication.

Note: When developing a Swing-based GUI, do not rely on the Java Virtual Machine-wide user for child threads of the swing event thread. This is not Java EE compliant and does not work in thin clients, or in IIOP in general. Instead, take either of the following approaches:

- Make sure an `InitialContext` is created before any Swing artifacts.
- Or, use the Java Authentication and Authorization Service (JAAS) to log in and then use the `Security.runAs()` method inside the Swing event thread and its children.

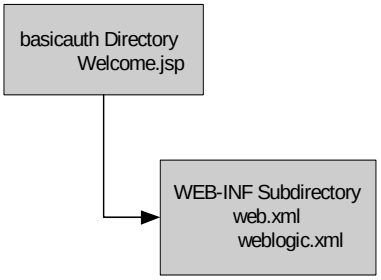
Deploying Web Applications

To deploy a Web application on a server running in *development* mode, perform the following steps:

Note: For more information about deploying Web applications in either development of production mode, see Deploying Applications and Modules in *Deploying Applications to WebLogic Server*.

1. Set up a directory structure for the Web application's files. Figure 3-6 shows the directory structure for the Web application named `basicauth`. The top-level directory must be assigned the name of the Web application and the sub-directory must be named `WEB-INF`.

Figure 3-6 Basicauth Web Application Directory Structure



2. To deploy the Web application in exploded directory format, that is, not in the Java archive (jar) format, simply move your directory to the `applications` directory on your server. For example, you would deploy the `basicauth` Web application in the following location:

   `WL_HOME``\user_projects\domains\mydomain\applications\basicauth`

   If the WebLogic Server instance is running, the application should auto-deploy. Use the Administration Console to verify that the application deployed.

   If the WebLogic Server instance is not running, the Web application should auto-deploy when you start the server.

3. If you have not done so already, use the Administration Console to configure the users and groups that will have access to the Web application. To determine the users and groups that are allowed access to the protected WebLogic resource, examine the `weblogic.xml` file. For example, the `weblogic.xml` file for the `basicauth` sample (see Listing 3-2) defines `myGroup` as the only group to have access to the `welcome.jsp` file.

For more information on deploying secure Web applications, see Deploying Applications and Modules in *Deploying Applications to WebLogic Server*.

Using Declarative Security With Web Applications

There are three ways to implement declarative security:

1. Security providers via the Administration Console, as described in *Securing WebLogic Resources Using Roles and Policies*.
2. Java Authorization Contract for Containers (JACC), as described in "Using the Java Authorization Contract for Containers" on page 8-6.
3. Deployment descriptors, which are discussed in this section.

Which of these three methods is used is defined by the JACC flags and the security model. (Security models are described in Options for Securing EJB and Web Application Resources in *Securing WebLogic Resources Using Roles and Policies*.)

To implement declarative security in Web applications, you can use deployment descriptors (`web.xml` and `weblogic.xml`) to define security requirements. The deployment descriptors map the application's logical security requirements to its runtime definitions. And at runtime, the servlet container uses the security definitions to enforce the requirements. For a discussion of using deployment descriptors, see "Developing Secure Web Applications" on page 3-7.

For information about how to use deployment descriptors and the `externally-defined` element to configure security in Web applications declaratively, see "externally-defined" on page 3-35.

For information about how to use the Administration Console to configure security in Web applications, see *Securing WebLogic Resources Using Roles and Policies*.

Web Application Security-Related Deployment Descriptors

The following topics describe the deployment descriptor elements that are used in the `web.xml` and `weblogic.xml` files to define security requirements in Web applications:

web.xml Deployment Descriptors

The following `web.xml` security-related deployment descriptor elements are supported by WebLogic Server:

auth-constraint

The optional `auth-constraint` element defines which groups or principals have access to the collection of Web resources defined in this security constraint.

The following table describes the elements you can define within an `auth-constraint` element.

Table 3-2 `auth-constraint` Element

Element	Required/ Optional	Description
`<description>`	Optional	A text description of this security constraint.
`<role-name>`	Optional	Defines which security roles can access resources defined in this `<security-constraint>`. Security role names are mapped to principals using the `<security-role-ref>` element. See "security-role-ref" on page 3-31.

Used Within

The `auth-constraint` element is used within the `security-constraint` element.

Example

See Listing 3-11 for an example of how to use the `auth-constraint` element in a `web.xml` file.

security-constraint

The `security-constraint` element is used in the `web.xml` file to define the access privileges to a collection of resources defined by the `web-resource-collection` element.

The following table describes the elements you can define within a `security-constraint` element.

Table 3-3 `security-constraint` Element

Element	Required/ Optional	Description
`<web-resource-collection>`	Required	Defines the components of the Web Application to which this security constraint is applied. For more information, see "web-resource-collection" on page 3-33.

Table 3-3 `security-constraint` **Element**

Element	Required/ Optional	Description
`<auth-constraint>`	Optional	Defines which groups or principals have access to the collection of web resources defined in this security constraint.For more information, see "auth-constraint" on page 3-29.
`<user-data-constraint>`	Optional	Defines defines how data communicated between the client and the server should be protected. For more information, see "user-data-constraint" on page 3-32.

Example

Listing 3-11 shows how to use the `security-constraint` element to defined security for the `SecureOrdersEast` resource in a `web.xml` file.

Listing 3-11 Security Constraint Example

```
web.xml entries:
<security-constraint>
     <web-resource-collection>
          <web-resource-name>SecureOrdersEast</web-resource-name>
          <description>
             Security constraint for
             resources in the orders/east directory
          </description>
          <url-pattern>/orders/east/*</url-pattern>
          <http-method>POST</http-method>
          <http-method>GET</http-method>
     </web-resource-collection>
     <auth-constraint>
          <description>
           constraint for east coast sales
          </description>
          <role-name>east</role-name>
          <role-name>manager</role-name>
     </auth-constraint>
```

```
 <user-data-constraint>
          <description>SSL not required</description>
          <transport-guarantee>NONE</transport-guarantee>
     </user-data-constraint>
</security-constraint>
...
```

security-role

The `security-role` element contains the definition of a security role. The definition consists of an optional description of the security role, and the security role name.

The following table describes the elements you can define within a `security-role` element.

Table 3-4 `security-role` Element

Element	Required/ Optional	Description
`<description>`	Optional	A text description of this security role.
`<role-name>`	Required	The role name. The name you use here must have a corresponding entry in the WebLogic-specific deployment descriptor, `weblogic.xml`, which maps roles to principals in the security realm. For more information, see "security-role-assignment" on page 3-40.

Example

See Listing 3-14 for an example of how to use the `security-role` element in a `web.xml` file.

security-role-ref

The `security-role-ref` element links a security role name defined by `<security-role>` to an alternative role name that is hard-coded in the servlet logic. This extra layer of abstraction allows the servlet to be configured at deployment without changing servlet code.

The following table describes the elements you can define within a `security-role-ref` element.

Table 3-5 `security-role-ref` Element

Element	Required/ Optional	Description
`<description>`	Optional	Text description of the role.
`<role-name>`	Required	Defines the name of the security role or principal that is used in the servlet code.
`<role-link>`	Required	Defines the name of the security role that is defined in a `<security-role>` element later in the deployment descriptor.

Example

See Listing 3-17 for an example of how to use the `security-role-ref` element in a `web.xml` file.

user-data-constraint

The `user-data-constraint` element defines how data communicated between the client and the server should be protected.

The following table describes the elements you can define within a `user-data-constraint` element.

Table 3-6 `user-data-constraint` Element

Element	Required/ Optional	Description
`<description>`	Optional	A text description.

Table 3-6 `user-data-constraint` **Element**

Element	Required/ Optional	Description
`<transport-guarantee>`	Required	Specifies data security requirements for communications between the client and the server. Range of values: `NONE`—The application does not require any transport guarantees. `INTEGRAL`—The application requires that the data be sent between the client and server in such a way that it cannot be changed in transit. `CONFIDENTIAL`—The application requires that data be transmitted so as to prevent other entities from observing the contents of the transmission. WebLogic Server establishes a Secure Sockets Layer (SSL) connection when the user is authenticated using the `INTEGRAL` or `CONFIDENTIAL` transport guarantee.

Used Within

The `user-data-constraint` element is used within the `security-constraint` element.

Example

See Listing 3-11 for an example of how to use the `user-data-constraint` element in a `web.xml` file.

web-resource-collection

The `web-resource-collection` element identifies a subset of the resources and `HTTP` methods on those resources within a Web application to which a security constraint applies. If no `HTTP` methods are specified, the security constraint applies to all `HTTP` methods.

The following table describes the elements you can define within a `web-resource-collection` element.

Table 3-7 `web-resource-collection` **Element**

Element	Required/ Optional	Description
`<web-resource-name>`	Required	The name of this web resource collection.

Table 3-7 `web-resource-collection` **Element**

Element	Required/ Optional	Description
`<description>`	Optional	Text description of the Web resource.
`<url-pattern>`	Required	The mapping, or location, of the Web resource collection. URL patterns must use the syntax defined in section 11.2 of JSR-000154, Java Servlet Specification Version 2.4. The pattern `<url-pattern>/</url-pattern>` applies the security constraint to the entire Web application.
`<http-method>`	Optional	The `HTTP` methods to which the security constraint applies when clients attempt to access the Web resource collection. If no `HTTP` methods are specified, then the security constraint applies to all `HTTP` methods.

Used Within

The `web-resource-collection` element is used within the `security-constraint` element.

Example

See Listing 3-11 for an example of how to use the `web-resource-collection` element in a `web.xml` file.

weblogic.xml Deployment Descriptors

The following `weblogic.xml` security-related deployment descriptor elements are supported by WebLogic Server:

- "externally-defined" on page 3-35
- "run-as-principal-name" on page 3-37
- "run-as-role-assignment" on page 3-37
- "security-permission" on page 3-39
- "security-permission-spec" on page 3-39
- "security-role-assignment" on page 3-40

For additional information on `weblogic.xml` deployment descriptors, see the section *XML Deployment Descriptors* in *Developing Applications with WebLogic Server*.

For additional information on the `weblogic.xml` elements, see weblogic.xml Deployment Descriptor Elements in *Developing Web Applications, Servlets, and JSPs for WebLogic Server*.

externally-defined

The `externally-defined` element lets you explicitly indicate that you want the security roles defined by the `role-name` element in the `web.xml` deployment descriptors to use the mappings specified in the Administration Console. The element gives you the flexibility of not having to specify a specific security role mapping for each security role defined in the deployment descriptors for a particular Web application. Therefore, within the same security realm, deployment descriptors can be used to specify and modify security for some applications while the Administration Console can be used to specify and modify security for others.

The role mapping behavior for a server depends on which security deployment model is selected on the Administration Console. For information on security deployment models, see Options for Securing Web Application and EJB Resources in *Securing WebLogic Resources Using Roles and Policies*.

Note: When specifying security role names, observe the following conventions and restrictions:

- The proper syntax for a security role name is as defined for an `Nmtoken` in the Extensible Markup Language (XML) recommendation available on the Web at: `http://www.w3.org/TR/REC-xml#NT-Nmtoken`.
- Do not use blank spaces, commas, hyphens, or any characters in this comma-separated list: \t, < >, #, |, &, ~, ?, ( ), { }.
- Security role names are case sensitive.
- The BEA suggested convention for security role names is that they be singular.

Used Within

The `externally-defined` element is used within the `security-role-assignment` element.

Example

Listing 3-12 and Listing 3-13 show by comparison how to use the `externally-defined element` in the `weblogic.xml` file. In Listing 3-13, the specification of the "webuser" `externally-defined` element in the `weblogic.xml` means that for security to be correctly

configured on the `getReceipts` method, the principals for `webuser` will have to be created in the Administration Console.

Note: If you need to list a significant number of principals, consider specifying groups instead of users. There are performance issues if you specify too many users.

Listing 3-12 Using the web.xml and weblogic.xml Files to Map Security Roles and Principals to a Security Realm

```
web.xml entries:

<web-app>
           ...
           <security-role>
               <role-name>webuser</role-name>
           </security-role>
           ...
</web-app>

<weblogic.xml entries:

<weblogic-web-app>

     <security-role-assignment>
         <role-name>webuser</role-name>
         <principal-name>myGroup</principal-name>
         <principal-name>Bill</principal-name>
         <principal-name>Mary</principal-name>
     </security-role-assignment>

</weblogic-web-app>
```

Listing 3-13 Using the externally-defined tag in Web Application Deployment Descriptors

```
web.xml entries:

<web-app>
           ...
           <security-role>
               <role-name>webuser</role-name>
```

```
            </security-role>
            ...
</web-app>
<weblogic.xml entries:
<weblogic-web-app>
     <security-role-assignment>
         <role-name>webuser</role-name>
         <externally-defined/>
     </security-role-assignment>
```

For information about how to use the Administration Console to configure security for Web applications, see *Securing WebLogic Resources Using Roles and Policies*.

run-as-principal-name

The `run-as-principal-name` element specifies the name of a principal to use for a security role defined by a `run-as` element in the companion `web.xml` file.

Used Within

The `run-as-principal-name` element is used within a `run-as-role-assignment` element.

Example

For an example of how to use the `run-as-principal-name` element, see Listing 3-14.

run-as-role-assignment

The `run-as-role-assignment` element maps a given role name, defined by a `role-name` element in the companion `web.xml` file, to a valid user name in the system. The value can be overridden for a given servlet by the `run-as-principal-name` element in the servlet-descriptor. If the `run-as-role-assignment` element is absent for a given role name, the Web application container chooses the first principal-name defined in the `security-role-assignment` element.

The following table describes the elements you can define within a `run-as-role-assignment` element.

Table 3-8 `run-as-role-assignment` **Element**

Element	Required Optional	Description
`<role-name>`	Required	Specifies the name of a security role name specified in a `run-as` element in the companion `web.xml` file.
`<run-as-principal-name>`	Required	Specifies a principal for the security role name defined in a `run-as` element in the companion `web.xml` file.

Example:

Listing 3-14 shows how to use the `run-as-role-assignment` element to have the `SnoopServlet` always execute as a user `joe`.

Listing 3-14 run-as-role-assignment Element Example

`web.xml:`

```
  <servlet>
    <servlet-name>SnoopServlet</servlet-name>
    <servlet-class>extra.SnoopServlet</servlet-class>
    <run-as>
      <role-name>runasrole</role-name>
    </run-as>
  </servlet>
  <security-role>
    <role-name>runasrole</role-name>
  </security-role>
```

`weblogic.xml:`

```
  <weblogic-web-app>
     <run-as-role-assignment>
       <role-name>runasrole</role-name>
       <run-as-principal-name>joe</run-as-principal-name>
```

```
    </run-as-role-assignment>
  </weblogic-web-app>
```

security-permission

The `security-permission` element specifies a security permission that is associated with a Java EE Sandbox.

Example

For an example of how to used the `security-permission` element, see Listing 3-15.

security-permission-spec

The `security-permission-spec` element specifies a single security permission based on the Security policy file syntax. Refer to the following URL for Sun's implementation of the security permission specification:

http://java.sun.com/j2se/1.5.0/docs/guide/security/PolicyFiles.html#FileSyntax

Note: Disregard the optional `codebase` and `signedBy` clauses.

Used Within

The security-permission-`spec` element is used within the `security-permission` element.

Example

Listing 3-15 shows how to use the security-permission-spec element to grant permission to the `java.net.SocketPermission` class.

Listing 3-15 security-permission-spec Element Example

```
<weblogic-web-app>
   <security-permission>
     <description>Optional explanation goes here</description>
     <security-permission-spec>
<!—
A single grant statement following the syntax of
http://java.sun.com/j2se/1.5.0/docs/guide/security/PolicyFiles.html#FileSy
```

```
ntax, without the “codebase” and “signedBy” clauses, goes here. For example:
-->
      grant {
      permission java.net.SocketPermission “*”, “resolve”;
      };
     </security-permission-spec>
   </security-permission>
</weblogic-web-app>
```

In Listing 3-15, `permission java.net.SocketPermission` is the permission class name, `"*"` represents the target name, and `resolve` indicates the action (resolve host/IP name service lookups).

security-role-assignment

The `security-role-assignment` element declares a mapping between a security role and one or more principals in the WebLogic Server security realm.

Note: For information on using the `security-role-assignment` element in a `weblogic-application.xml` deployment descriptor for an enterprise application, see Enterprise Application Deployment Descriptor Elements in *Developing Applications with WebLogic Server*.

Example

Listing 3-16 shows how to use the `security-role-assignment` element to assign principals to the `PayrollAdmin` role.

Note: If you need to list a significant number of principals, consider specifying groups instead of users. There are performance issues if you specify too many users.

Listing 3-16 security-role-assignment Element Example

```
<weblogic-web-app>
  <security-role-assignment>
    <role-name>PayrollAdmin</role-name>
    <principal-name>Tanya</principal-name>
    <principal-name>Fred</principal-name>
```

```
    <principal-name>system</principal-name>
  </security-role-assignment>
</weblogic-web-app>
```

Using Programmatic Security With Web Applications

You can write your servlets to access users and security roles programmatically in your servlet code. To do this, use the following methods in your servlet code: `javax.servlet.http.HttpServletRequest.getUserPrincipal` and `javax.servlet.http.HttpServletRequest.isUserInRole(String role)` methods.

getUserPrincipal

You use the `getUserPrincipal()` method to determine the current user of the Web application. This method returns a `WLSUser Principal` if one exists in the current user. In the case of multiple `WLSUser Principals`, the method returns the first in the ordering defined by the `Subject.getPrincipals().iterator()` method. If there are no `WLSUser Principals`, then the `getUserPrincipal()` method returns the first non-`WLSGroup Principal`. If there are no `Principals` or all `Principals` are of type `WLSGroup`, this method returns `null`. This behavior is identical to the semantics of the `weblogic.security.SubjectUtils.getUserPrincipal()` method.

For more information about how to use the `getUserPrincipal()` method, see http://java.sun.com/javaee/5/docs/tutorial/doc/Security-WebTier4.html.

isUserInRole

`The javax.servlet.http.HttpServletRequest.isUserInRole(String role)` method returns a boolean indicating whether the authenticated user is granted the specified logical security "role." If the user has not been authenticated, this method returns false.

The `isUserInRole()` method maps security roles to the group names in the security realm. Listing 3-17 shows the elements that are used with the `<servlet>` element to define the security role in the `web.xml` file.

Listing 3-17 IsUserInRole web.xml and weblogic.xml Elements

```
Begin web.xml entries:
```

```
...
<servlet>
        <security-role-ref>
             <role-name>user-rolename</role-name>
             <role-link>rolename-link</role-link>
         </security-role-ref>
</servlet>

<security-role>
         <role-name>rolename-link</role-name>
</security-role>
...

Begin weblogic.xml entries:

...
<security-role-assignment>
         <role-name>rolename-link</role-name>
         <principal-name>groupname</principal>
         <principal-name>username</principal>
</security-role-assignment>
...
```

The string `role` is mapped to the name supplied in the `<role-name>` element, which is nested inside the `<security-role-ref>` element of a `<servlet>` declaration in the `web.xml` deployment descriptor. The `<role-name>` element defines the name of the security role or `principal` (the user or group) that is used in the servlet code. The `<role-link>` element maps to a `<role-name>` defined in the `<security-role-assignment>` element in the `weblogic.xml` deployment descriptor.

Note: When specifying security role names, observe the following conventions and restrictions:

- The proper syntax for a security role name is as defined for an `Nmtoken` in the Extensible Markup Language (XML) recommendation available on the Web at: http://www.w3.org/TR/REC-xml#NT-Nmtoken.
- Do not use blank spaces, commas, hyphens, or any characters in this comma-separated list: \t, < >, #, |, &, ~, ?, ( ), { }.
- Security role names are case sensitive.

- The BEA suggested convention for security role names is that they be singular.

For example, if the client has successfully logged in as user `Bill` with the security role of `manager`, the following method would return true:

```
request.isUserInRole(“manager”)
```

Listing 3-18 provides an example.

Listing 3-18 Example of Security Role Mapping

```
Servlet code:
out.println("Is the user a Manager? " +
              request.isUserInRole("manager"));

web.xml entries:

<servlet>
. . .
   <role-name>manager</role-name>
   <role-link>mgr</role-link>
. . .
</servlet>

<security-role>
   <role-name>mgr</role-name>
</security-role>

weblogic.xml entries:

<security-role-assignment>
   <role-name>mgr</role-name>
   <principal-name>bostonManagers</principal-name>
   <principal-name>Bill</principal-name>
   <principal-name>Ralph</principal-name>
</security-role-ref>
```

Using the Programmatic Authentication API

There are some applications where programmatic authentication is appropriate.

WebLogic Server provides a server-side API that supports programmatic authentication from within a servlet application:

```
weblogic.servlet.security.ServletAuthentication
```

Using this API, you can write servlet code that authenticates the user, logs in the user, and associates the user with the current session so that the user is registered in the default (active) security realm. Once the login is completed, it appears as if the user logged in using the standard mechanism.

You have the option of using either of two WebLogic-supplied classes with the `ServletAuthentication` API, the `weblogic.security.SimpleCallbackHandler` class or the `weblogic.security.URLCallbackHandler` class. For more information on these classes, see Javadocs for WebLogic Classes.

Listing 3-19 shows an example that uses `SimpleCallbackHandler`. Listing 3-20 shows an example that uses `URLCallbackHandler`.

Listing 3-19 Programmatic Authentication Code Fragment Using the SimpleCallbackHandler Class

```
CallbackHandler handler = new SimpleCallbackHandler(username,
                                                    password);
Subject mySubject =
        weblogic.security.services.Authentication.login(handler);
weblogic.servlet.security.ServletAuthentication.runAs(mySubject, request);
// Where request is the httpservletrequest object.
```

Listing 3-20 Programmatic Authentication Code Fragment Using the URLCallbackHandler Class

```
CallbackHandler handler = new URLCallbackHandler(username,
                                                 password);
Subject mySubject =
        weblogic.security.services.Authentication.login(handler);
weblogic.servlet.security.ServletAuthentication.runAs(mySubject, request);
// Where request is the httpservletrequest object.
```

CHAPTER 4

Using JAAS Authentication in Java Clients

The following topics are covered in this section:

The sections refer to sample code which is available online at BEA's dev2dev web site, and is also included in the WebLogic Server distribution at:

SAMPLES_HOME`\server\examples\src\examples\security\jaas`

The `jaas` directory contains an `instructions.html` file, `ant` build files, a `sample_jaas.config` file, and the following Java files:

- `BaseClient.java`
- `BaseClientConstants.java`
- `SampleAction.java`
- `SampleCallbackHandler.java`
- `SampleClient.java`
- `TradeResult.java`
- `TraderBean.java`

You will need to look at the examples when reading the information in the following sections.

JAAS and WebLogic Server

The Java Authentication and Authorization Service (JAAS) is a standard extension to the security in the J2SE Development Kit 5.0. JAAS provides the ability to enforce access controls based on user identity. JAAS is provided in WebLogic Server as an alternative to the JNDI authentication mechanism.

WebLogic Server clients use the authentication portion of the standard JAAS only. The JAAS LoginContext provides support for the ordered execution of all configured authentication provider LoginModule instances and is responsible for the management of the completion status of each configured provider.

Note the following considerations when using JAAS authentication for Java clients:

- WebLogic Server clients can either use the JNDI login or JAAS login for authentication, however JAAS login is the preferred method.
- While JAAS is the preferred method of authentication, the WebLogic-supplied LoginModule (`weblogic.security.auth.login.UsernamePasswordLoginModule`) only supports username and password authentication. Thus, for client certificate authentication (also referred to as two-way SSL authentication), you should use JNDI. To use JAAS for client certificate authentication, you must write a custom LoginModule that does certificate authentication.

  Note: If you write your own LoginModule for use with WebLogic Server clients, have it call `weblogic.security.auth.Authenticate.authenticate()` to perform the login.
- To perform a JAAS login from a remote Java client (that is, the Java client is not a WebLogic Server client), you may use the WebLogic-supplied LoginModule to perform the login. However, if you elect not to use the WebLogic-supplied LoginModule but decide to write your own instead, you must have it call the `weblogic.security.auth.Authenticate.authenticate()` method to perform the login.
- If you are using a remote, or perimeter, login system such as Security Assertion Markup Language (SAML), you do not need to call `weblogic.security.auth.Authenticate.authenticate()`. You only need to call the `authenticate()` method if you are using WebLogic Server to perform the logon.

Note: WebLogic Server provides full container support for JAAS authentication and supports full use of JAAS authentication and authorization in application code.

- Within WebLogic Server, JAAS is called to perform the login. Each Authentication provider includes a LoginModule. This is true for servlet logins as well as Java client logins via JNDI or JAAS. The method WebLogic Server calls internally to perform the JAAS logon is `weblogic.security.auth.Authentication.authenticate()`. When using the Authenticate class, `weblogic.security.SimpleCallbackHandler` may be a useful helper class.
- While WebLogic Server does not protect any resources using JAAS authorization (it uses WebLogic security), you can use JAAS authorization in application code to protect the application's own resources.

For more information about JAAS, see the JAAS documentation at http://java.sun.com/products/jaas/reference/docs/index.html.

JAAS Authentication Development Environment

Whether the client is an application, applet, Enterprise JavaBean (EJB), or servlet that requires authentication, WebLogic Server uses the JAAS classes to reliably and securely authenticate to the server. JAAS implements a Java version of the Pluggable Authentication Module (PAM) framework, which permits applications to remain independent from underlying authentication technologies. Therefore, the PAM framework allows the use of new or updated authentication technologies without requiring modifications to a Java application.

WebLogic Server uses JAAS for remote Java client authentication, and internally for authentication. Therefore, only developers of custom Authentication providers and developers of remote Java client applications need to be involved with JAAS directly. Users of Web browser clients or developers of within-container Java client applications (for example, those calling an EJB from a servlet) do not require direct use or knowledge of JAAS.

Note: In order to implement security in a WebLogic client you must install the WebLogic Server software distribution kit on the Java client.

The following topics are covered in this section:

JAAS Authentication APIs

To implement Java clients that use JAAS authentication on WebLogic Server, you use a combination of Java J2SE 5.0 application programming interfaces (APIs) and WebLogic APIs.

Table 4-1 lists and describes the Java API packages used to implement JAAS authentication. The information in Table 4-1 is taken from the Java API documentation and annotated to add WebLogic Server specific information. For more information on the Java APIs, see the Javadocs at `http://java.sun.com/j2se/1.5.0/docs/api/index.html` and http://java.sun.com/javaee/5/docs/api/.

Table 4-2 lists and describes the WebLogic APIs used to implement JAAS authentication. For more information, see Javadocs for WebLogic Classes.

Table 4-1 Java JAAS APIs

Java JAAS API	Description
`javax.security.auth.Subject`	The `Subject` class represents the source of the request, and can be an individual user or a group. The `Subject` object is created only after the subject is successfully logged in.
`javax.security.auth.login.LoginContext`	The `LoginContext` class describes the basic methods used to authenticate `Subjects` and provides a way to develop an application independent of the underlying authentication technology. A `Configuration` specifies the authentication technology, or LoginModule, to be used with a particular application. Therefore, different LoginModules can be plugged in under an application without requiring any modifications to the application itself. After the caller instantiates a `LoginContext`, it invokes the `login` method to authenticate a `Subject`. This `login` method invokes the `login` method from each of the LoginModules configured for the name specified by the caller. If the `login` method returns without throwing an exception, then the overall authentication succeeded. The caller can then retrieve the newly authenticated `Subject` by invoking the `getSubject` method. Principals and credentials associated with the `Subject` may be retrieved by invoking the `Subject`'s respective `getPrincipals`, `getPublicCredentials`, and `getPrivateCredentials` methods. To log the `Subject` out, the caller invokes the `logout` method. As with the `login` method, this `logout` method invokes the `logout` method for each LoginModule configured for this `LoginContext`. For a sample implementation of this class, see Listing 4-3.
`javax.security.auth.login.Configuration`	This is an abstract class for representing the configuration of LoginModules under an application. The `Configuration` specifies which LoginModules should be used for a particular application, and in what order the LoginModules should be invoked. This abstract class needs to be subclassed to provide an implementation which reads and loads the actual configuration. In WebLogic Server, use a login configuration file instead of this class. For a sample configuration file, see Listing 4-2. By default, WebLogic Server uses the Sun Microsystems, Inc. configuration class, which reads from a configuration file.

Table 4-1 Java JAAS APIs

Java JAAS API	Description
`javax.security.auth.spi.LoginModule`	`LoginModule` describes the interface implemented by authentication technology providers. `LoginModules` are plugged in under applications to provide a particular type of authentication. While application developers write to the `LoginContext` API, authentication technology providers implement the LoginModule interface. A configuration specifies the LoginModule(s) to be used with a particular login application. Therefore, different LoginModules can be plugged in under the application without requiring any modifications to the application itself. **Note:** WebLogic Server provides an implementation of the LoginModule (`weblogic.security.auth.login.UsernamePasswordLoginModule`). BEA recommends that you use this implementation for JAAS authentication in WebLogic Server Java clients; however, you can develop your own LoginModule.

Table 4-1 Java JAAS APIs

Java JAAS API	Description
`javax.security.auth.callback.Callback`	Implementations of this interface are passed to a `CallbackHandler`, allowing underlying security services to interact with a calling application to retrieve specific authentication data, such as usernames and passwords, or to display information such as error and warning messages. `Callback` implementations do not retrieve or display the information requested by underlying security services. `Callback` implementations simply provide the means to pass such requests to applications, and for applications to return requested information to the underlying security services.
`javax.security.auth.callback.CallbackHandler`	An application implements a `CallbackHandler` and passes it to underlying security services so that they can interact with the application to retrieve specific authentication data, such as usernames and passwords, or to display information such as error and warning messages. `CallbackHandlers` are implemented in an application-dependent fashion. Underlying security services make requests for different types of information by passing individual `Callbacks` to the `CallbackHandler`. The `CallbackHandler` implementation decides how to retrieve and display information depending on the `Callbacks` passed to it. For example, if the underlying service needs a username and password to authenticate a user, it uses a `NameCallback` and `PasswordCallback`. The `CallbackHandler` can then choose to prompt for a username and password serially, or to prompt for both in a single window.

Table 4-2 WebLogic JAAS APIs

WebLogic JAAS API	Description
`weblogic.security.auth.Authenticate`	An authentication class used to authenticate user credentials. The WebLogic implementation of the LoginModule, (`weblogic.security.auth.login.UsernamePasswordLoginModule`, uses this class to authenticate a user and add `Principals` to the `Subject`. Developers who write LoginModules must also use this class for the same purpose.
`weblogic.security.auth.Callback.ContextHandlerCallback`	Underlying security services use this class to instantiate and pass a `ContextHandlerCallback` to the `invokeCallback` method of a `CallbackHandler` to retrieve the ContextHandler related to this security operation. If no ContextHandler is associated with this operation, the `javax.security.auth.callback.UnsupportedCallback exception` is thrown. This callback passes the ContextHandler to LoginModule.login() methods.
`weblogic.security.auth.Callback.GroupCallback`	Underlying security services use this class to instantiate and pass a `GroupCallback` to the `invokeCallback` method of a `CallbackHandler` to retrieve group information.
`weblogic.security.auth.Callback.URLCallback`	Underlying security services use this class to instantiate and pass a `URLCallback` to the `invokeCallback` method of a `CallbackHandler` to retrieve URL information. The WebLogic implementation of the `LoginModule`, (`weblogic.security.auth.login.UsernamePasswordLoginModule`, uses this class. **Note:** Application developers should not use this class to retrieve URL information. Instead, they should use the `weblogic.security.URLCallbackHandler`.

Table 4-2 WebLogic JAAS APIs

WebLogic JAAS API	Description
`weblogic.security.Security`	This class implements the WebLogic Server client `runAs` methods. Client applications use the `runAs` methods to associate their `Subject` identity with the `PrivilegedAction` or `PrivilegedExceptionAction` that they execute. For a sample implementation, see Listing 4-5.
`weblogic.security.URLCallbackHandler`	The class used by application developers for returning a `username`, `password` and `URL`. Application developers should use this class to handle the `URLCallback` to retrieve URL information.

JAAS Client Application Components

At a minimum, a JAAS authentication client application includes the following components:

- Java client

  The Java client instantiates a `LoginContext` object and invokes the login by calling the object's `login()` method. The `login()` method calls methods in each LoginModule to perform the login and authentication.

  The LoginContext also instantiates a new empty `javax.security.auth.Subject` object (which represents the user or service being authenticated), constructs the configured LoginModule, and initializes it with this new `Subject` and `CallbackHandler`.

  The LoginContext subsequently retrieves the authenticated Subject by calling the LoginContext's `getSubject` method. The LoginContext uses the `weblogic.security.Security.runAs()` method to associate the `Subject` identity with the `PrivilegedAction` or `PrivilegedExceptionAction` to be executed on behalf of the user identity.

- LoginModule

  The LoginModule uses the `CallbackHandler` to obtain the user name and password and determines whether that name and password are the ones required.

  If authentication is successful, the LoginModule populates the Subject with a Principal representing the user. The Principal the LoginModule places in the Subject is an instance of `Principal`, which is a class implementing the `java.security.Principal` interface.

You can write LoginModule files that perform different types of authentication, including username/password authentication and certificate authentication. A client application can include one LoginModule (the minimum requirement) or several LoginModules.

Note: Use of the JAAS `javax.security.auth.Subject.doAs` methods in WebLogic Server applications do not associate the Subject with the client actions. You can use the `doAs` methods to implement J2SE security in WebLogic Server applications, but such usage is independent of the need to use the `Security.runAs()` method.

- Callbackhandler

  The `CallbackHandler` implements the `javax.security.auth.callback.CallbackHandler` interface. The LoginModule uses the `CallbackHandler` to communicate with the user and obtain the requested information, such as the username and password.

- Configuration file

  This file configures the LoginModule(s) used in the application. It specifies the location of the LoginModule(s) and, if there are multiple LoginModules, the order in which they are executed. This file enables Java applications to remain independent from the authentication technologies, which are defined and implemented using the LoginModule.

- Action file

  This file defines the operations that the client application will perform.

- `ant` build script (`build.xml`)

  This script compiles all the files required for the application and deploys them to the WebLogic Server applications directories.

For a complete working JAAS authentication client that implements the components described here, see the JAAS sample application in the *SAMPLES_HOME*`\server\examples\src\examples\security\jaas` directory provided with WebLogic Server. This example is also available online at BEA's dev2dev site.

For more information on the basics of JAAS authentication, see Sun's *JAAS Authentication Tutorial* available at `http://java.sun.com/j2se/1.5.0/docs/guide/security/jaas/tutorials/GeneralAcnOnly.html`.

WebLogic LoginModule Implementation

The WebLogic implementation of the `LoginModule` class is provided in the WebLogic Server distribution in the `weblogic.jar` file, located in the `WL_HOME\server\lib` directory.

Note: WebLogic Server supports all callback types defined by JAAS as well as all callback types that extend the JAAS specification.

The WebLogic Server `UsernamePasswordLoginModule` checks for existing system user authentication definitions prior to execution, and does nothing if they are already defined.

For more information about implementing JAAS LoginModules, see the LoginModule Developer's Guide at
http://java.sun.com/j2se/1.5.0/docs/guide/security/jaas/JAASLMDevGuide.html

JVM-Wide Default User and the runAs() Method

The first time you use the WebLogic Server implementation of the LoginModule (`weblogic.security.auth.login.UsernamePasswordLoginModule`) to log on, the specified user becomes the machine-wide default user for the JVM (Java virtual machine). When you execute the `weblogic.security.Security.runAs()` method, it associates the specified `Subject` with the current thread's access permissions and then executes the action. If a specified `Subject` represents a non-privileged user (users who are not assigned to any groups are considered non-privileged), the JVM-wide default user is used. Therefore, it is important make sure that the `runAs()` method specifies the desired `Subject`. You can do this using one of the following options:

- ***Option 1*:** If the client has control of `main()`, implement the wrapper code shown in Listing 4-1 in the client code.
- ***Option 2:*** If the client does not have control of `main()`, implement the wrapper code shown in Listing 4-1 on each thread's `run()` method.

Listing 4-1 runAs() Method Wrapper Code

```
import java.security.PrivilegedAction;
import javax.security.auth.Subject;
import weblogic.security.Security;

public class client
{
```

```
  public static void main(String[] args)
  {
  Security.runAs(new Subject(),
    new PrivilegedAction() {
      public Object run() {
       //
       //If implementing in client code, main() goes here.
       //
      return null;
      }
    });
  }
}
```

Writing a Client Application Using JAAS Authentication

To use JAAS in a WebLogic Server Java client to authenticate a subject, perform the following procedure:

1. Implement `LoginModule` classes for the authentication mechanisms you want to use with WebLogic Server. You will need a LoginModule class for each type of authentication mechanism. You can have multiple LoginModule classes for a single WebLogic Server deployment.

   Note: BEA recommends that you use the implementation of the LoginModule provided by WebLogic Server (`weblogic.security.auth.login.UsernamePasswordLoginModule`) for username/password authentication. You can write your own `LoginModule` for username/password authentication, however, *do not* attempt to modify the WebLogic Server `LoginModule` and reuse it. If you write your own LoginModule, you must have it call the `weblogic.security.auth.Authenticate.authenticate()` method to perform the login. If you use a remote login mechanism such as SAML, you do not need to call the `authenticate()` method. You only need to call `authenticate()` if you are using WebLogic Server to perform the logon.

   The `weblogic.security.auth.Authenticate` class uses a JNDI Environment object for initial context as described in Table 4-3.

2. Implement the `CallbackHandler` class that the LoginModule will use to communicate with the user and obtain the requested information, such as the username, password, and URL. The URL can be the URL of a WebLogic cluster, providing the client with the benefits of server failover. The WebLogic Server distribution provides a `SampleCallbackHandler` which is used in the JAAS client sample. The `SampleCallbackHandler.java` code is available online and as part of the distribution:
   - Online: Follow the links for BEA-Certified Code from http://dev.bea.com/code.
   - WebLogic Server Distribution: In the directory *`SAMPLES_HOME`*`\server\examples\src\examples\security\jaas`

   Note: Instead of implementing your own `CallbackHandler` class, you can use either of two WebLogic-supplied `CallbackHandler` classes, `weblogic.security.SimpleCallbackHandler` or `weblogic.security.URLCallbackHandler`. For more information on these classes, see Javadocs for WebLogic Classes.

3. Write a configuration file that specifies which LoginModule classes to use for your WebLogic Server and in which order the LoginModule classes should be invoked. See Listing 4-2 for the sample configuration file used in the JAAS client sample provided in the WebLogic Server distribution.

Listing 4-2 sample_jaas.config Code Example

```
/** Login Configuration for the JAAS Sample Application **/

Sample {
   weblogic.security.auth.login.UsernamePasswordLoginModule
          required debug=false;
};
```

4. In the Java client, write code to instantiate a `LoginContext`. The `LoginContext` consults the configuration file, `sample_jaas.config`, to load the default LoginModule configured for WebLogic Server. See Listing 4-3 for an example `LoginContext` instantiation.

   Note: If you use another means to authenticate the user, such as an Identity Assertion provider or a remote instance of WebLogic Server, the default LoginModule is determined by the remote source.

Listing 4-3 LoginContext Code Fragment

```
...
import javax.security.auth.login.LoginContext;
...
    LoginContext loginContext = null;

    try
    {
      // Create LoginContext; specify username/password login module
      loginContext = new LoginContext("Sample",
             new SampleCallbackHandler(username, password, url));
    }
```

5. Invoke the `login()` method of the `LoginContext` instance. The `login()` method invokes all the loaded LoginModules. Each LoginModule attempts to authenticate the subject. If the configured login conditions are not met, the `LoginContext` throws a `LoginException`. See Listing 4-4 for an example of the `login()` method.

Listing 4-4 Login() Method Code Fragment

```
...
import javax.security.auth.login.LoginContext;
import javax.security.auth.login.LoginException;
import javax.security.auth.login.FailedLoginException;
import javax.security.auth.login.AccountExpiredException;
import javax.security.auth.login.CredentialExpiredException;
...
 /**
     * Attempt authentication
     */
    try
    {
      // If we return without an exception, authentication succeeded
      loginContext.login();

    }
```

```
catch(FailedLoginException fle)
{
  System.out.println("Authentication Failed, " +
                     fle.getMessage());
  System.exit(-1);
}
catch(AccountExpiredException aee)
{
  System.out.println("Authentication Failed: Account Expired");
  System.exit(-1);
}
catch(CredentialExpiredException cee)
{
  System.out.println("Authentication Failed: Credentials
                     Expired");
  System.exit(-1);
}
catch(Exception e)
{
  System.out.println("Authentication Failed: Unexpected
                     Exception, " + e.getMessage());
  e.printStackTrace();
  System.exit(-1);
}
```

6. Write code in the Java client to retrieve the authenticated Subject from the `LoginContext` instance using the `javax.security.auth.Subject.getSubject()` method and call the action as the Subject. Upon successful authentication of a Subject, access controls can be placed upon that Subject by invoking the `weblogic.security.Security.runAs()` method. The `runAs()` method associates the specified Subject with the current thread's access permissions and then executes the action. See Listing 4-5 for an example implementation of the `getSubject()` and `runAs()` methods.

   Note: Use of the JAAS `javax.security.auth.Subject.doAs` methods in WebLogic Server applications do not associate the Subject with the client actions. You can use the `doAs` methods to implement J2SE security in WebLogic Server applications, but such usage is independent of the need to use the `Security.runAs()` method.

Listing 4-5 getSubject() and runAs() Methods Code Fragment

```
...
/**
 * Retrieve authenticated subject, perform SampleAction as Subject
 */
   Subject subject = loginContext.getSubject();
   SampleAction sampleAction = new SampleAction(url);
   Security.runAs(subject, sampleAction);
   System.exit(0);
...
```

7. Write code to execute an action if the Subject has the required privileges. BEA provides a a sample implementation, `SampleAction`, of the `javax.security.PrivilegedAction` class that executes an EJB to trade stocks. The `SampleAction.java` code is available online and as part of the distribution:
   - Online: Follow the links for BEA-Certified Code from http://dev.bea.com/code.
   - WebLogic Server Distribution: In the directory *SAMPLES_HOME*`\server\examples\src\examples\security\jaas`
8. Invoke the `logout()` method of the `LoginContext` instance. The `logout()` method closes the user's session and clear the `Subject`. See Listing 4-6 for an example of the `login()` method.

Listing 4-6 logout() Method Code Example

```
...
import javax.security.auth.login.LoginContext;
...
try
    {
      System.out.println("logging out...");
      loginContext.logout();
    }
```

Note: The `LoginModule.logout()` method is never called for a WebLogic Authentication provider or a custom Authentication provider, because once the `Principals` are created and placed into a `Subject`, the WebLogic Security Framework no longer controls the lifecycle of the `Subject`. Therefore, code that creates the JAAS `LoginContext` to log in and obtain the `Subject` should also call the `LoginContext` to log out. Calling `LoginContext.logout()` results in the clearing of the `Principals` from the `Subject`.

Using JNDI Authentication

Java clients use the Java Naming and Directory Interface (JNDI) to pass credentials to WebLogic Server. A Java client establishes a connection with WebLogic Server by getting a JNDI `InitialContext`. The Java client then uses the `InitialContext` to look up the resources it needs in the WebLogic Server JNDI tree.

Note: JAAS is the preferred method of authentication, however, the WebLogic Authentication provider's LoginModule supports only user name and password authentication. Thus, for client certificate authentication (also referred to as two-way SSL authentication), you should use JNDI. To use JAAS for client certificate authentication, you must write a custom Authentication provider whose LoginModule does certificate authentication. For information on how to write LoginModules, see `http://java.sun.com/j2se/1.5.0/docs/guide/security/jaas/JAASLMDevGuide.html`.

To specify a user and the user's credentials, set the JNDI properties listed in Table 4-3.

Table 4-3 JNDI Properties Used for Authentication

Property	Meaning
`INITIAL_CONTEXT_FACTORY`	Provides an entry point into the WebLogic Server environment. The class `weblogic.jndi.WLInitialContextFactory` is the JNDI SPI for WebLogic Server.
`PROVIDER_URL`	Specifies the host and port of the WebLogic Server that provides the name service. For example: `t3://weblogic:7001`.

Table 4-3 JNDI Properties Used for Authentication (Continued)

Property	Meaning
SECURITY_PRINCIPAL	Specifies the identity of the user when that user authenticates to the default (active) security realm.
SECURITY_CREDENTIALS	Specifies the credentials of the user when that user authenticates to the default (active) security realm.

These properties are stored in a hash table that is passed to the `InitialContext` constructor. Listing 4-7 illustrates how to use JNDI authentication in a Java client running on WebLogic Server.

Listing 4-7 Example of Authentication

```
...
Hashtable env = new Hashtable();
     env.put(Context.INITIAL_CONTEXT_FACTORY,
              "weblogic.jndi.WLInitialContextFactory");
     env.put(Context.PROVIDER_URL, “t3://weblogic:7001”);
     env.put(Context.SECURITY_PRINCIPAL, “javaclient”);
     env.put(Context.SECURITY_CREDENTIALS, “javaclientpassword”);
     ctx = new InitialContext(env);
```

Note: For information on JNDI contexts and threads and how to avoid potential JNDI context problems, see “JNDI Contexts and Threads” and “How to Avoid Potential JNDI Context Problems” in *Programming WebLogic JNDI*.

Note: In versions of WebLogic Server prior to 9.0, when using protocols other than IIOP with JNDI, the first user is "sticky" in the sense that it becomes the default user when no other user is present. This is not a good practice, as any subsequent logins that do not have a username and credential are granted the identify of the default user.

In version 9.0, this is no longer true and there is no default user.

To return to the previous behavior, the `weblogic.jndi.WLContext.ENABLE_DEFAULT_USER` field must be set, either via the command line or through the `InitialContext` interface.

Java Client JAAS Authentication Code Examples

A complete working JAAS authentication sample is provided with the WebLogic Server product. The sample is located in the *SAMPLES_HOME*\server\examples\src\examples\security\jaas directory. For a description of the sample and instructions on how to build, configure, and run this sample, see the package.html file in the sample directory. You can modify this code example and reuse it.

CHAPTER 5

Using SSL Authentication in Java Clients

The following topics are covered in this section:

The sections refer to sample code which is available online at BEA's dev2dev web site, and is also included in the WebLogic Server distribution at:

SAMPLES_HOME`\server\examples\src\examples\security\sslclient`

The `sslclient` directory contains an `instructions.html` file, `ant` build files, and the following Java and JavaServer Pages (`.jsp`) files:

- `MyListener.java`
- `NulledHostnameVerifier.java`
- `NulledTrustManager.java`
- `SSLClient.java`
- `SSLClientServlet.java`
- `SSLSocketClient.java`
- `SnoopServlet.jsp`

You will need to look at the examples when reading the information in the following sections.

JSSE and WebLogic Server

The Java Secure Socket Extension (JSSE) is a set of packages that support and implement the SSL and TLS v1 protocols, making those capabilities programmatically available. BEA WebLogic Server provides Secure Sockets Layer (SSL) support for encrypting data transmitted between WebLogic Server clients and servers, Java clients, Web browsers, and other servers.

WebLogic Server's JSSE implementation can be used by WebLogic clients, but is not required. Other JSSE implementations can be used for their client-side code outside the server as well.

The following restrictions apply when using SSL in WebLogic server-side applications:

- The use of other (third-party) JSSE implementations to develop WebLogic Server applications is not supported. The SSL implementation that WebLogic Server uses is static to the server configuration and is not replaceable by customer applications.
- The WebLogic implementation of JSSE does support JCE Cryptographic Service Providers (CSPs); however, due to the inconsistent provider support for JCE, BEA cannot guarantee that untested providers will work out of the box. BEA has tested WebLogic Server with the following providers:
  - The default JCE provider (SunJCE provider) included with JDK 5.0. See http://java.sun.com/j2se/1.5.0/docs/guide/security/jce/HowToImplAJCEProvider.html for information about the SunJCE provider.
  - The nCipher JCE provider.

  Other providers may work with WebLogic Server, but an untested provider is not likely to work out of the box. For more information on using the JCE providers supported by WebLogic Server, see Configuring SSL in *Securing WebLogic Server.*

WebLogic Server uses the HTTPS port for Secure Sockets Layer (SSL) encrypted communication; only SSL can be used on that port.

Note: In order to implement security in a WebLogic client, you must install the WebLogic Server software distribution kit on the Java client.

Using JNDI Authentication

Java clients use the Java Naming and Directory Interface (JNDI) to pass credentials to WebLogic Server. A Java client establishes a connection with WebLogic Server by getting a JNDI

`InitialContext`. The Java client then uses the `InitialContext` to look up the resources it needs in the WebLogic Server JNDI tree.

Note: JAAS is the preferred method of authentication; however, the Authentication provider's LoginModule supports only username and password authentication. Thus, for client certificate authentication (also referred to as two-way SSL authentication), you should use JNDI. To use JAAS for client certificate authentication, you must write a custom Authentication provider whose LoginModule does certificate authentication.

To specify a user and the user's credentials, set the JNDI properties listed in Table 5-1.

Table 5-1 JNDI Properties Used for Authentication

Property	Meaning
`INITIAL_CONTEXT_FACTORY`	Provides an entry point into the WebLogic Server environment. The class `weblogic.jndi.WLInitialContextFactory` is the JNDI SPI for WebLogic Server.
`PROVIDER_URL`	Specifies the host and port of the WebLogic Server that provides the name service. For example: `t3s://weblogic:7002`. (t3s is a WebLogic Server proprietary version of SSL.)
`SECURITY_PRINCIPAL`	Specifies the identity of the user when that user authenticates to the default (active) security realm.
`SECURITY_CREDENTIALS`	Specifies the credentials of the user when that user authenticates to the default (active) security realm.

These properties are stored in a hash table which is passed to the `InitialContext` constructor.

Listing 5-1 demonstrates how to use one-way SSL certificate authentication in a Java client. For a two-SSL authentication code example, see Listing 5-4, "Example of a Two-Way SSL Authentication Client That Uses JNDI," on page 5-16.

Listing 5-1 Example of One-Way SSL Authentication Using JNDI

```
...
Hashtable env = new Hashtable();
      env.put(Context.INITIAL_CONTEXT_FACTORY,
```

```
        "weblogic.jndi.WLInitialContextFactory");
env.put(Context.PROVIDER_URL, “t3s://weblogic:7002”);
env.put(Context.SECURITY_PRINCIPAL, “javaclient”);
env.put(Context.SECURITY_CREDENTIALS, “javaclientpassword”);
ctx = new InitialContext(env);
```

Note: For information on JNDI contexts and threads and how to avoid potential JNDI context problems, see “JNDI Contexts and Threads” and “How to Avoid Potential JNDI Context Problems” in *Programming WebLogic JNDI*.

SSL Certificate Authentication Development Environment

The following topics are covered in this section:

SSL Authentication APIs

To implement Java clients that use SSL authentication on WebLogic Server, use a combination of Java JDK 5.0 application programming interfaces (APIs) and WebLogic APIs.

Table 5-2 lists and describes the Java APIs packages used to implement certificate authentication. The information in Table 5-2 is taken from the Java API documentation and annotated to add WebLogic Server specific information. For more information on the Java APIs, see the Javadocs at `http://java.sun.com/j2se/1.5.0/docs/api/index.html` and http://java.sun.com/javaee/5/docs/api/.

Table 5-3 lists and describes the WebLogic APIs used to implement certificate authentication. For more information, see Javadocs for WebLogic Classes.

Table 5-2 Java Certificate APIs

Java Certificate APIs	Description
`javax.crypto`	This package provides the classes and interfaces for cryptographic operations. The cryptographic operations defined in this package include encryption, key generation and key agreement, and Message Authentication Code (MAC) generation. Support for encryption includes symmetric, asymmetric, block, and stream ciphers. This package also supports secure streams and sealed objects. Many classes provided in this package are provider-based (see the `java.security.Provider` class). The class itself defines a programming interface to which applications may be written. The implementations themselves may then be written by independent third-party vendors and plugged in seamlessly as needed. Therefore, application developers can take advantage of any number of provider-based implementations without having to add or rewrite code.
`javax.net`	This package provides classes for networking applications. These classes include factories for creating sockets. Using socket factories you can encapsulate socket creation and configuration behavior.
`javax.net.SSL`	While the classes and interfaces in this package are supported by WebLogic Server, BEA recommends that you use the `weblogic.security.SSL` package when you use SSL with WebLogic Server.
`java.security.cert`	This package provides classes and interfaces for parsing and managing certificates, certificate revocation lists (CRLs), and certification paths. It contains support for X.509 v3 certificates and X.509 v2 CRLs.

Table 5-2 Java Certificate APIs (Continued)

Java Certificate APIs	Description
`java.security.KeyStore`	This class represents an in-memory collection of keys and certificates. It is used to manage two types of keystore entries: • Key Entry This type of keystore entry holds cryptographic key information, which is stored in a protected format to prevent unauthorized access. Typically, a key stored in this type of entry is a secret key, or a private key accompanied by the certificate chain for the corresponding public key. Private keys and certificate chains are used by a given entity for self-authentication. Applications for this authentication include software distribution organizations that sign JAR files as part of releasing and/or licensing software. • Trusted Certificate Entry This type of entry contains a single public key certificate belonging to another party. It is called a trusted certificate because the keystore owner trusts that the public key in the certificate indeed belongs to the identity identified by the subject (owner) of the certificate. This type of entry can be used to authenticate other parties.
`java.security.PrivateKey`	A private key. This interface contains no methods or constants. It merely serves to group (and provide type safety for) all private key interfaces. **Note:** The specialized private key interfaces extend this interface. For example, see the `DSAPrivateKey` interface in `java.security.interfaces`.

Table 5-2 Java Certificate APIs (Continued)

Java Certificate APIs	Description
`java.security.Provider`	This class represents a "Cryptographic Service Provider" for the Java Security API, where a provider implements some or all parts of Java Security, including: • Algorithms (such as DSA, RSA, MD5 or SHA-1). • Key generation, conversion, and management facilities (such as for algorithm-specific keys). Each provider has a name and a version number, and is configured in each runtime it is installed in. To supply implementations of cryptographic services, a team of developers or a third-party vendor writes the implementation code and creates a subclass of the `Provider` class.
`javax.servlet.http.HttpServletRequest`	This interface extends the `ServletRequest` interface to provide request information for HTTP servlets. The servlet container creates an `HttpServletRequest` object and passes it as an argument to the servlet's service methods (`doGet`, `doPost`, and so on.).
`javax.servlet.http.HttpServletResponse`	This interface extends the `ServletResponse` interface to provide HTTP-specific functionality in sending a response. For example, it has methods to access HTTP headers and cookies. The servlet container creates an `HttpServletRequest` object and passes it as an argument to the servlet's service methods (`doGet`, `doPost`, and so on.).
`javax.servlet.ServletOutputStream`	This class provides an output stream for sending binary data to the client. A `ServletOutputStream` object is normally retrieved via the `ServletResponse.getOutputStream()` method. This is an abstract class that the servlet container implements. Subclasses of this class must implement the `java.io.OutputStream.write(int)` method.
`javax.servlet.ServletResponse`	This class defines an object to assist a servlet in sending a response to the client. The servlet container creates a `ServletResponse` object and passes it as an argument to the servlet's service methods (`doGet`, `doPost`, and so on.).

Table 5-3 WebLogic Certificate APIs

WebLogic Certificate APIs	Description
`weblogic.net.http.HttpsURLConnection`	This class is used to represent a HTTP with SSL (HTTPS) connection to a remote object. Use this class to make an outbound SSL connection from a WebLogic Server acting as a client to another WebLogic Server.
`weblogic.security.SSL.HostnameVerifier`	During an SSL handshake, hostname verification establishes that the hostname in the URL matches the hostname in the server's identification; this verification is necessary to prevent man-in-the-middle attacks. WebLogic Server provides a certificate-based implementation of HostnameVerifier which is used by default, and which verifies that the URL hostname matches the CN field value of the server certificate. You can replace this default hostname verifier with a custom hostname verifier by using the Advanced Options pane under the Administration Console SSL tab; this will affect the default for SSL clients running on the server using the WebLogic SSL APIs. In addition, WebLogic SSL APIs such as `HttpsURLConnection`, and `SSLContext` allow the explicit setting of a custom HostnameVerifier.
`weblogic.security.SSL.TrustManager`	This interface permits the user to override certain validation errors in the peer's certificate chain and allow the handshake to continue. This interface also permits the user to perform additional validation on the peer certificate chain and interrupt the handshake if need be.
`weblogic.security.SSL.CertPathTrustManager`	This class makes use of the configured CertPathValidation providers to perform extra validation; for example, revocation checking. By default, CertPathTrustManager is installed but configured not to call the CertPathValidators (controlled by the SSLMBean attributes InboundCertificateValidation and OutboundCertificateValidation). Applications that install a custom TrustManager will replace CertPathTrustManager. An application that wants to use a custom TrustManager, and call the CertPathProviders at the same time, can delegate to a CertPathTrustManager from its custom TrustManager.
`weblogic.security.SSL.SSLContext`	This class holds all of the state information shared across all sockets created under that context.

Table 5-3 WebLogic Certificate APIs (Continued)

WebLogic Certificate APIs	Description
`weblogic.security.SSL.SSLSocketFactory`	This class provides the API for creating SSL sockets.
`weblogic.security.SSL.SSLValidationConstants`	This class defines context element names. SSL performs some built-in validation before it calls one or more CertPathValidator objects to perform additional validation. A validator can reduce the amount of validation it must do by discovering what validation has already been done.

SSL Client Application Components

At a minimum, an SSL client application includes the following components:

- Java client

  Typically, a Java client performs these functions:

  – Initializes an `SSLContext` with client identity, trust, a `HostnameVerifier`, and a `TrustManager`.

  – Loads a keystore and retrieves the private key and certificate chain

  – Uses an SSLSocketFactory

  – Uses HTTPS to connect to a JSP served by an instance of WebLogic Server

- HostnameVerifier

  The HostnameVerifier implements the `weblogic.security.SSL.HostnameVerifier` interface.

- HandshakeCompletedListener

  The HandshakeCompletedListener implements the `javax.net.ssl.HandshakeCompletedListener` interface. It is used by the SSL client to receive notifications about the completion of an SSL handshake on a given SSL connection.

- TrustManager

  The TrustManager implements the `weblogic.security.SSL.TrustManager` interface.

For a complete working SSL authentication client that implements the components described here, see the SSLClient sample application in the

SAMPLES_HOME\server\examples\src\examples\security\sslclient directory provided with WebLogic Server. This example is also available online at BEA's dev2dev site

For more information on JSSE authentication, see Sun's *Java Secure Socket Extension (JSSE) Reference Guide* available at http://java.sun.com/j2se/1.5.0/docs/guide/security/jsse/JSSERefGuide.html.

Writing Applications that Use SSL

This section covers the following topics:

Communicating Securely From WebLogic Server to Other WebLogic Servers

You can use a URL object to make an outbound SSL connection from a WebLogic Server instance acting as a client to another WebLogic Server instance. The `weblogic.net.http.HttpsURLConnection` class provides a way to specify the security context information for a client, including the digital certificate and private key of the client.

The `weblogic.net.http.HttpsURLConnection` class provides methods for determining the negotiated cipher suite, getting/setting a hostname verifier, getting the server's certificate chain, and getting/setting an `SSLSocketFactory` in order to create new SSL sockets.

The SSLClient code example uses the `weblogic.net.http.HttpsURLConnection` class to make an outbound SSL connection. The SSLClient code example is available in the

examples.security.sslclient package in the *SAMPLES_HOME*\server\examples\src\examples\security\sslclient directory.

Writing SSL Clients

This section uses examples to show how to write various types of SSL clients. Examples of the following types of SSL clients are provided:

- "SSLClient Sample" on page 5-11
- "SSLSocketClient Sample" on page 5-13
- "Using Two-Way SSL Authentication" on page 5-15

Any stand-alone Java client that uses WebLogic SSL classes (weblogic.security.SSL) to invoke an Enterprise JavaBean (EJB) must use the BEA license file. When you run your client application, set the following system properties:

- If you keep your license in a location other than bea.home, add that directory to the WebLogic CLASSPATH.
- On the command line, set java.protocol.handler.pkgs=com.certicom.net.ssl

Here is an example of a run command that uses the default location of the license file (c:\bea):

```
java -Dbea.home=c:\bea \
  -Djava.protocol.handler.pkgs=weblogic.net  my_app
```

SSLClient Sample

The SSLClient sample demonstrates how to use the WebLogic SSL library to make outgoing SSL connections using URL and URLConnection objects. It shows both how to do this from a stand-alone application as well as from a servlet in WebLogic Server.

Note: WebLogic Server acting as an SSL client uses the server's identity certificate for outgoing SSL connections. Applications running on WebLogic Server and using the previously described SSL APIs do not share the server's identity certificates by default, only the trust.

Listing 5-2 shows code fragments from the SSLClient example; the complete example is located at *SAMPLES_HOME*\server\examples\src\examples\security\sslclient directory in the SSLClient.java file.

Listing 5-2 SSLClient Sample Code Fragments

```
package examples.security.sslclient;

import java.io.*;
import java.net.URL;
import java.security.Provider;
import javax.servlet.ServletOutputStream;
...
  /*
   * This method contains an example of how to use the URL and
   *  URLConnection objects to create a new SSL connection, using
   *  WebLogic SSL client classes.
   */
  public void wlsURLConnect(String host, String port,
                            String sport, String query,
                            OutputStream out)
      throws Exception {
...
      URL wlsUrl = null;
      try {
        wlsUrl = new URL("http", host, Integer.valueOf(port).intValue(),
                         query);
        weblogic.net.http.HttpURLConnection connection =
            new weblogic.net.http.HttpURLConnection(wlsUrl);
        tryConnection(connection, out);
      }
...
      wlsUrl = new URL("https", host, Integer.valueOf(sport).intValue(),
                       query);
      weblogic.net.http.HttpsURLConnection sconnection =
          new weblogic.net.http.HttpsURLConnection(wlsUrl);
...
```

SSLSocketClient Sample

The SSLSocketClient sample demonstrates how to use SSL sockets to go directly to the secure port to connect to a JSP served by an instance of WebLogic Server and display the results of that connection. It shows how to implement the following functions:

- Initializing an `SSLContext` with client identity, a `HostnameVerifier`, and a `TrustManager`
- Loading a keystore and retrieving the private key and certificate chain
- Using an `SSLSocketFactory`
- Using HTTPS to connect to a JSP served by WebLogic Server
- Implementing the `javax.net.ssl.HandshakeCompletedListener` interface
- Creating a dummy implementation of the `weblogic.security.SSL.HostnameVerifier` class to verify that the server the example connects to is running on the desired host

Listing 5-3 shows code fragments from the SSLSocketClient example; the complete example is located at *`SAMPLES_HOME`*`\server\examples\src\examples\security\sslclient` directory in the `SSLSocketClient.java` file. (The SSLClientServlet example in the `sslclient` directory is a simple servlet wrapper of the SSLClient example.)

Listing 5-3 SSLSocketClient Sample Code Fragments

```
package examples.security.sslclient;

import java.io.*;
import java.security.KeyStore;
import java.security.PrivateKey;
import java.security.cert.Certificate;
import javax.net.ssl.HandshakeCompletedListener;
import javax.net.ssl.SSLSocket;
import weblogic.security.SSL.HostnameVerifier;
import weblogic.security.SSL.SSLContext;
import weblogic.security.SSL.SSLSocketFactory;
import weblogic.security.SSL.TrustManager;

...
```

```
      SSLContext sslCtx = SSLContext.getInstance("https");
      File KeyStoreFile  = new File ("mykeystore");
...
    // Open the keystore, retrieve the private key, and certificate chain
      KeyStore ks = KeyStore.getInstance("jks");
      ks.load(new FileInputStream("mykeystore"), null);
      PrivateKey key = (PrivateKey)ks.getKey("mykey",
                      "testkey".toCharArray());
      Certificate [] certChain = ks.getCertificateChain("mykey");
      sslCtx.loadLocalIdentity(certChain, key);

      HostnameVerifier hVerifier = null;
      if (argv.length < 3)
        hVerifier = new NulledHostnameVerifier();
      else
         hVerifier = (HostnameVerifier)
                     Class.forName(argv[2]).newInstance();

      sslCtx.setHostnameVerifier(hVerifier);
      TrustManager tManager = new NulledTrustManager();
      sslCtx.setTrustManager(tManager);
      System.out.println(" Creating new SSLSocketFactory with SSLContext");
      SSLSocketFactory sslSF = (SSLSocketFactory)
                               sslCtx.getSocketFactory();
      System.out.println(" Creating and opening new SSLSocket with
                          SSLSocketFactory");

      // using createSocket(String hostname, int port)
      SSLSocket sslSock = (SSLSocket) sslSF.createSocket(argv[0],
                          new Integer(argv[1]).intValue());
      System.out.println(" SSLSocket created");

      HandshakeCompletedListener mListener = null;
       mListener = new MyListener();

      sslSock.addHandshakeCompletedListener(new MyListener());
      ...
```

Using Two-Way SSL Authentication

When using certificate authentication, WebLogic Server sends a digital certificate to the requesting client. The client examines the digital certificate to ensure that it is authentic, has not expired, and matches the WebLogic Server instance that presented it.

With two-way SSL authentication (a form of mutual authentication), the requesting client also presents a digital certificate to WebLogic Server. When the instance of WebLogic Server is configured for two-way SSL authentication, requesting clients are required to present digital certificates from a specified set of certificate authorities. WebLogic Server accepts only digital certificates that are signed by trusted certificate authorities.

For information on how to configure WebLogic Server for two-way SSL authentication, see the Configuring SSL in *Securing WebLogic Server*.

The following sections describe the different ways two-way SSL authentication can be implemented in WebLogic Server.

- "Two-Way SSL Authentication with JNDI" on page 5-15
- "Using Two-Way SSL Authentication Between WebLogic Server Instances" on page 5-19
- "Using Two-Way SSL Authentication with Servlets" on page 5-21

Two-Way SSL Authentication with JNDI

When using JNDI for two-way SSL authentication in a Java client, use the `setSSLClientCertificate()` method of the WebLogic JNDI `Environment` class. This method sets a private key and chain of X.509 digital certificates for client authentication.

To pass digital certificates to JNDI, create an array of `InputStreams` opened on files containing DER-encoded digital certificates and set the array in the JNDI hash table. The first element in the array must contain an `InputStream` opened on the Java client's private key file. The second element must contain an `InputStream` opened on the Java client's digital certificate file. (This file contains the public key for the Java client.) Additional elements may contain the digital certificates of the root certificate authority and the signer of any digital certificates in a certificate chain. A certificate chain allows WebLogic Server to authenticate the digital certificate of the Java client if that digital certificate was not directly issued by the server's trusted certificate authority.

You can use the `weblogic.security.PEMInputStream` class to read digital certificates stored in Privacy Enhanced Mail (PEM) files. This class provides a filter that decodes the base 64-encoded certificate from a PEM file.

Listing 5-4 demonstrates how to use two-way SSL authentication in a Java client.

Listing 5-4 Example of a Two-Way SSL Authentication Client That Uses JNDI

```
import javax.naming.Context;
import javax.naming.InitialContext;
import javax.naming.NamingException;
import weblogic.jndi.Environment;
import weblogic.security.PEMInputStream;
import java.io.InputStream;
import java.io.FileInputStream;

public class SSLJNDIClient
{
  public static void main(String[] args) throws Exception
  {
    Context context = null;
    try {
      Environment env = new Environment();

      // set connection parameters
      env.setProviderUrl("t3s://localhost:7002");
      // The next two set methodes are optional if you are using
      // a UserNameMapper interface.
      env.setSecurityPrincipal("system");
      env.setSecurityCredentials("weblogic");

      InputStream key = new FileInputStream("certs/demokey.pem");
      InputStream cert = new FileInputStream("certs/democert.pem");

      // wrap input streams if key/cert are in pem files
      key = new PEMInputStream(key);
      cert = new PEMInputStream(cert);

      env.setSSLClientCertificate(new InputStream[] { key, cert});


      env.setInitialContextFactory(Environment.DEFAULT_INITIAL_CONTEXT_FAC
TORY);
      context = env.getInitialContext();
```

```
      Object myEJB = (Object) context.lookup("myEJB");
    }
    finally {
      if (context != null) context.close();
    }
  }
}
```

When the JNDI `getInitialContext()` method is called, the Java client and WebLogic Server execute mutual authentication in the same way that a Web browser performs mutual authentication to get a secure Web server connection. An exception is thrown if the digital certificates cannot be validated or if the Java client's digital certificate cannot be authenticated in the default (active) security realm. The authenticated user object is stored on the Java client's server thread and is used for checking the permissions governing the Java client's access to any protected WebLogic resources.

When you use the WebLogic JNDI `Environment` class, you must create a new `Environment` object for each call to the `getInitialContext()` method. Once you specify a `User` object and security credentials, both the user and their associated credentials remain set in the `Environment` object. If you try to reset them and then call the JNDI `getInitialContext()` method, the original user and credentials are used.

When you use two-way SSL authentication from a Java client, WebLogic Server gets a unique Java Virtual Machine (JVM) ID for each client JVM so that the connection between the Java client and WebLogic Server is constant. Unless the connection times out from lack of activity, it persists as long as the JVM for the Java client continues to execute. The only way a Java client can negotiate a new SSL connection reliably is by stopping its JVM and running another instance of the JVM.

The code in Listing 5-4, "Example of a Two-Way SSL Authentication Client That Uses JNDI," on page 5-16 generates a call to the WebLogic Identity Assertion provider that implements the `weblogic.security.providers.authentication.UserNameMapper` interface. The class that implements the `UserNameMapper` interface returns a user object if the digital certificate is valid. WebLogic Server stores this authenticated user object on the Java client's thread in WebLogic Server and uses it for subsequent authorization requests when the thread attempts to use WebLogic resources protected by the default (active) security realm.

Note: Your `CLASSPATH` must specify the implementation of the `weblogic.security.providers.authentication.UserNameMapper` interface.

If you have not configured an Identity Assertion provider that performs certificate-based authentication, a Java client running in a JVM with an SSL connection can change the WebLogic Server user identity by creating a new JNDI `InitialContext` and supplying a new user name and password in the JNDI `SECURITY_PRINCIPAL` and `SECURITY_CREDENTIALS` properties. Any digital certificates passed by the Java client after the SSL connection is made are not used. The new WebLogic Server user continues to use the SSL connection negotiated with the initial user's digital certificate.

If you have configured an Identity Assertion provider that performs certificate-based authentication, WebLogic Server passes the digital certificate from the Java client to the class that implements the `UserNameMapper` interface and the `UserNameMapper` class maps the digital certificate to a WebLogic Server user name. Therefore, if you want to set a new user identity when you use the certificate-based identity assertion, you cannot change the identity. This is because the digital certificate is processed only at the time of the first connection request from the JVM for each `Environment`.

Caution: **Restriction:** Multiple, concurrent, user logins to WebLogic Server from a single client JVM when using two-way SSL and JNDI is not supported. If multiple logins are executed on different threads, the results are undeterminable and might result in one user's requests being executed on another user's login, thereby allowing one user to access another user's data. WebLogic Server does not support multiple, concurrent, certificate-based logins from a single client JVM. For information on JNDI contexts and threads and how to avoid potential JNDI context problems, see "JNDI Contexts and Threads" and "How to Avoid JNDI Context Problems" in *Programming WebLogic JNDI*.

Writing a User Name Mapper

When using two-way SSL, WebLogic Server verifies the digital certificate of the Web browser or Java client when establishing an SSL connection. However, the digital certificate does not identify the Web browser or Java client as a user in the WebLogic Server security realm. If the Web browser or Java client requests a WebLogic Server resource protected by a security policy, WebLogic Server requires the Web browser or Java client to have an identity. To handle this requirement, the WebLogic Identity Assertion provider allows you to enable a user name mapper that maps the digital certificate of a Web browser or Java client to a user in a WebLogic Server security realm. The user name mapper must be an implementation the `weblogic.security.providers.authentication.UserNameMapper` interface.

You have the option of the using the default implementation of the `weblogic.security.providers.authentication.UserNameMapper` interface, `DefaultUserNameMapperImpl`, or developing your own implementation.

The WebLogic Identity Assertion provider can call the implementation of the `UserNameMapper` interface for the following types of identity assertion token types:

- X.509 digital certificates passed via the SSL handshake
- X.509 digital certificates passed via CSIv2
- X.501 distinguished names passed via CSIv2

If you need to map different types of certificates, write your own implementation of the `UserNameMapper` interface.

To implement a `UserNameMapper` interface that maps a digital certificate to a user name, write a `UserNameMapper` class that performs the following operations:

1. Instantiates the `UserNameMapper` implementation class.
2. Creates the `UserNameMapper` interface implementation.
3. Uses the `mapCertificateToUserName()` method to map a certificate to a user name based on a certificate chain presented by the client.
4. Maps a string attribute type to the corresponding `Attribute Value Assertion` field type.

Using Two-Way SSL Authentication Between WebLogic Server Instances

You can use two-way SSL authentication in server-to-server communication in which one WebLogic Server instance is acting as the client of another WebLogic Server instance. Using two-way SSL authentication in server-to-server communication enables you to have dependable, highly-secure connections, even without the more common client/server environment.

Listing 5-5 shows an example of how to establish a secure connection from a servlet running in one instance of WebLogic Server to a second WebLogic Server instance called `server2.weblogic.com`.

Listing 5-5 Establishing a Secure Connection to Another WebLogic Server Instance

```
FileInputStream [] f = new FileInputStream[3];
   f[0]= new FileInputStream(“demokey.pem”);
```

```
   f[1]= new FileInputStream(“democert.pem”);
   f[2]= new FileInputStream(“ca.pem”);
Environment e = new Environment ();
e.setProviderURL(“t3s://server2.weblogic.com:443”);
e.setSSLClientCertificate(f);
e.setSSLServerName(“server2.weblogic.com”);
e.setSSLRootCAFingerprints(“ac45e2d1ce492252acc27ee5c345ef26”);

e.setInitialContextFactory
       (“weblogic.jndi.WLInitialContextFactory”);
Context ctx = new InitialContext(e.getProperties())
```

In Listing 5-5, the WebLogic JNDI `Environment` class creates a hash table to store the following parameters:

- `setProviderURL`—specifies the URL of the WebLogic Server instance acting as the SSL server. The WebLogic Server instance acting as SSL client calls this method. The URL specifies the t3s protocol which is a WebLogic Server proprietary protocol built on the SSL protocol. The SSL protocol protects the connection and communication between the two WebLogic Servers instances.
- `setSSLClientCertificate`—specifies the private key and certificate chain to use for the SSL connection. You use this method to specify an input stream array that consists of a private key (which is the first input stream in the array) and a chain of X.509 certificates (which make up the remaining input streams in the array). Each certificate in the chain of certificates is the issuer of the certificate preceding it in the chain.
- `setSSLServerName`—specifies the name of the WebLogic Server instance acting as the SSL server. When the SSL server presents its digital certificate to the WebLogic Server acting as the SSL client, the name specified using the `setSSLServerName` method is compared to the common name field in the digital certificate. In order for hostname verification to succeed, the names must match. This parameter is used to prevent man-in-the-middle attacks.
- `setSSLRootCAFingerprint`—specifies digital codes that represent a set of trusted certificate authorities, thus specifying trust based on a trusted certificate fingerprint. The root certificate in the certificate chain received from the WebLogic Server instance acting as the SSL server has to match one of the fingerprints specified with this method in order

to be trusted. This parameter is used to prevent man-in-the-middle attacks. It provides an addition to the default level of trust, which for clients running on WebLogic Server is that specified by the WebLogic Server trust configuration.

Note: For information on JNDI contexts and threads and how to avoid potential JNDI context problems, see "JNDI Contexts and Threads" and "How to Avoid JNDI Context Problems" in *Programming WebLogic JNDI*.

Using Two-Way SSL Authentication with Servlets

To authenticate Java clients in a servlet (or any other server-side Java class), you must check whether the client presented a digital certificate and if so, whether the certificate was issued by a trusted certificate authority. The servlet developer is responsible for asking whether the Java client has a valid digital certificate. When developing servlets with the WebLogic Servlet API, you must access information about the SSL connection through the `getAttribute()` method of the `HTTPServletRequest` object.

The following attributes are supported in WebLogic Server servlets:

- `javax.servlet.request.X509Certificate` `java.security.cert.X509Certificate []`—returns an array of the X.509 certificate.
- `javax.servlet.request.cipher_suite`—returns a string representing the cipher suite used by HTTPS.
- `javax.servlet.request.key_size`— returns an integer (0, 40, 56, 128, 168) representing the bit size of the symmetric (bulk encryption) key algorithm.
- `weblogic.servlet.request.SSLSession` `javax.net.ssl.SSLSession`—returns the SSL session object that contains the cipher suite and the dates on which the object was created and last used.

You have access to the user information defined in the digital certificates. When you get the `javax.servlet.request.X509Certificate` attribute, it is an array of type `java.security.cert.X509Certificate`. You simply cast the array to that type and examine the certificates.

A digital certificate includes information, such as the following:

- The name of the subject (holder, owner) and other identification information required to verify the unique identity of the subject.
- The subject's public key

- The name of the certificate authority that issued the digital certificate
- A serial number
- The validity period (or lifetime) of the digital certificate (as defined by a start date and an end date)

Using a Custom Hostname Verifier

A hostname verifier validates that the host to which an SSL connection is made is the intended or authorized party. A hostname verifier is useful when a WebLogic client or a WebLogic Server instance is acting as an SSL client to another application server. It helps prevent man-in-the-middle attacks.

Note: Demonstration digital certificates are generated during installation so they do contain the hostname of the system on which the WebLogic Server software installed. Therefore, you should leave hostname verification on when using the demonstration certificates for development or testing purposes.

By default, WebLogic Server, as a function of the SSL handshake, compares the CN field of the SSL server certificate Subject DN with the hostname in the URL used to connect to the server. If these names do not match, the SSL connection is dropped.

The dropping of the SSL connection is caused by the SSL client, which validates the hostname of the server against the digital certificate of the server. If anything but the default behavior is desired, you can either turn off hostname verification or register a custom hostname verifier. Turning off hostname verification leaves the SSL connections vulnerable to man-in-the-middle attacks.

You can turn off hostname verification in the following ways:

- In the Administration Console, specify None in the Hostname Verification field that is located on the Advanced Options pane under the Keystore & SSL tab for the server (for example, `myserver`).
- On the command line of the SSL client, enter the following argument:

  ```
  -Dweblogic.security.SSL.ignoreHostnameVerification=true
  ```

You can write a custom hostname verifier. The `weblogic.security.SSL.HostnameVerifier` interface provides a callback mechanism so that implementers of this interface can supply a policy on whether the connection to the URL's hostname should be allowed. The policy can be certificate-based or can depend on other authentication schemes.

To use a custom hostname verifier, create a class that implements the `weblogic.security.SSL.HostnameVerifier` interface and define the methods that capture information about the server's security identity.

Note: This interface takes new style certificates and replaces the `weblogic.security.SSL.HostnameVerifierJSSE` interface, which is deprecated.

Before you can use a custom hostname verifier, you need to specify the class for your implementation in the following ways:

- In the Administration Console, set the SSL.HostName Verifier field on the SSL tab under Server Configuration to the name of a class that implements this interface. The specified class must have a public no-arg constructor.
- On the command line, enter the following argument:

  `-Dweblogic.security.SSL.hostnameVerifier=`*`hostnameverifier`*

  The value for *`hostnameverifier`* is the name of the class that implements the custom hostname verifier.

Listing 5-6 shows code fragments from the NulledHostnameVerifier example; the complete example is located at *`SAMPLES_HOME`*`\server\examples\src\examples\security\sslclient` directory in the `NulledHostnameVerifier.java` file. This code example contains a `NulledHostnameVerifier` class which always returns true for the comparison. The sample allows the WebLogic SSL client to connect to any SSL server regardless of the server's hostname and digital certificate SubjectDN comparison.

Listing 5-6 Hostname Verifier Sample Code Fragment

```
public class NulledHostnameVerifier implements
                    weblogic.security.SSL.HostnameVerifier {
  public boolean verify(String urlHostname, javax.net.ssl.SSLSession
session) {
    return true;
  }
}
```

Using a Trust Manager

The `weblogic.security.SSL.TrustManager` interface provides the ability to:

- Ignore specific certificate validation errors
- Perform additional validation on the peer certificate chain

Note: This interface takes new style certificates and replaces the `weblogic.security.SSL.TrustManagerJSSE` interface, which is deprecated.

When an SSL client connects to an instance of WebLogic Server, the server presents its digital certificate chain to the client for authentication. That chain could contain an invalid digital certificate. The SSL specification says that the client should drop the SSL connection upon discovery of an invalid certificate. You can use a custom implementation of the `TrustManager` interface to control when to continue or discontinue an SSL handshake. Using a trust manager, you can ignore certain validation errors, optionally perform custom validation checks, and then decide whether or not to continue the handshake.

Use the `weblogic.security.SSL.TrustManager` interface to create a trust manager. The interface contains a set of error codes for certificate verification. You can also perform additional validation on the peer certificate and interrupt the SSL handshake if need be. After a digital certificate has been verified, the `weblogic.security.SSL.TrustManager` interface uses a callback function to override the result of verifying the digital certificate. You can associate an instance of a trust manager with an SSL context through the `setTrustManager()` method.

You can only set up a trust manger programmatically; its use cannot be defined through the Administration Console or on the command-line.

Note: Depending on the checks performed, use of a trust manager may potentially impact performance.

Listing 5-7 shows code fragments from the NulledTrustManager example; the complete example is located at *`SAMPLES_HOME`*`\server\examples\src\examples\security\sslclient` directory in the `NulledTrustManager.java` file. The SSLSocketClient example uses the custom trust manager. The SSLSocketClient shows how to set up a new SSL connection by using an SSL context with the trust manager.

Listing 5-7 NulledTrustManager Sample Code Fragments

```
package examples.security.sslclient;
```

```
import weblogic.security.SSL.TrustManager;
import java.security.cert.X509Certificate;

...

public class NulledTrustManager implements TrustManager{

 public boolean certificateCallback(X509Certificate[] o, int validateErr) {
  System.out.println(" --- Do Not Use In Production ---\n" +
                     " By using this NulledTrustManager, the trust in" +
                       " the server's identity is completely lost.\n" +
                     " --------------------------------");
  for (int i=0; i<o.length; i++)
    System.out.println(" certificate " + i + " -- " + o[i].toString());
  return true;
 }
}
```

Using the CertPath Trust Manager

The CertPathTrustManager, `weblogic.security.SSL.CertPathTrustManager`, makes use of the default security realm's configured CertPath validation providers to perform extra validation such as revocation checking.

By default, application code using outbound SSL in the server has access only to the built-in SSL certificate validation. However, application code can specify the CertPathTrustManager in order to access any additional certificate validation that the administrator has configured for the server. If you want your application code to also run the CertPath validators, the application code should use the CertPathTrustManager.

There are three ways to use this class:

- The Trust Manager calls the configured CertPathValidators only if the administrator has set a switch on the SSLMBean stating that outbound SSL should use the validators. That is, the application completely delegates validation to whatever the administrator configures. You use the `setUseConfiguredSSLValidation()` method for this purpose. This is the default.
- The Trust Manager always calls any configured CertPathValidators. You use the `setBuiltinSSLValidationAndCertPathValidators()` method for this purpose.

- The Trust Manager never calls any configured CertPathValidators. You use the `setBuiltinSSLValidationOnly()` method for this purpose.

Using a Handshake Completed Listener

The `javax.net.ssl.HandshakeCompletedListener` interface defines how an SSL client receives notifications about the completion of an SSL protocol handshake on a given SSL connection. Listing 5-8 shows code fragments from the MyListener example; the complete example is located at *SAMPLES_HOME*`\server\examples\src\examples\security\sslclient` directory in the `MyListener.java` file.

Listing 5-8 MyListener (HandshakeCompletedListener) Sample Code Fragments

```
package examples.security.sslclient;

import java.io.File;
import java.io.IOException;
import java.io.InputStream;
import java.io.OutputStream;
import java.io.FileInputStream;
import javax.net.ssl.HandshakeCompletedListener;
import java.util.Hashtable;
import javax.net.ssl.SSLSession;

...
  public class MyListener implements HandshakeCompletedListener
  {
    public void handshakeCompleted(javax.net.ssl.HandshakeCompletedEvent
                                   event)
    {
      SSLSession session = event.getSession();
      System.out.println("Handshake Completed with peer " +
                         session.getPeerHost());
      System.out.println("   cipher: " + session.getCipherSuite());
      Certificate[] certs = null;
      try
      {
```

```
      certs = session.getPeerCertificates();
    }
    catch (SSLPeerUnverifiedException puv)
    {
      certs = null;
    }
    if  (certs != null)
    {
      System.out.println("   peer certificates:");
      for (int z=0; z<certs.length; z++)
            System.out.println("      certs["+z+"]: " + certs[z]);
    }
    else
    {
      System.out.println("No peer certificates presented");
    }
  }
}
```

Using an SSLContext

The `SSLContext` class is used to programmatically configure SSL and to retain SSL session information. Each instance can be configured with the keys, certificate chains, and trusted CA certificates that will be used to perform authentication. SSL sockets created with the same SSLContext and used to connect to the same SSL server could potentially reuse SSL session information. Whether the session information is actually reused depends on the SSL server.

For more information on session caching see SSL Session Behavior in *Securing WebLogic Server*. To associate an instance of a trust manager class with its SSL context, use the `weblogic.security.SSL.SSLContext.setTrustManager()` method.

You can only set up an SSL context programmatically; not by using the Administration Console or the command line. A Java `new` expression or the `getInstance()` method of the `SSLContext` class can create an `SSLContext` object. The `getInstance()` method is static and it generates a new `SSLContext` object that implements the specified secure socket protocol. An example of using the `SSLContext` class is provided in the `SSLSocketClient.java` sample in the `SAMPLES_HOME\server\examples\src\examples\security\sslclient` directory. The

SSLSocketClient example shows how to create a new SSL socket factory that will create a new SSL socket using `SSLContext`.

Listing 5-9 shows a sample instantiation using the `getInstance()` method.

Listing 5-9 SSL Context Code Example

```
import weblogic.security.SSL.SSLContext;

  SSLcontext sslctx = SSLContext.getInstance ("https")
```

Using URLs to Make Outbound SSL Connections

You can use a `URL` object to make an outbound SSL connection from a WebLogic Server instance acting as a client to another WebLogic Server instance. WebLogic Server supports both one-way and two-way SSL authentication for outbound SSL connections.

For one-way SSL authentication, you use the `java.net.URL`, `java.net.URLConnection`, and `java.net.HTTPURLConnection` classes to make outbound SSL connections using `URL` objects. Listing 5-10 shows a `simpleURL` class that supports both HTTP and HTTPS URLs and that only uses these Java classes (that is, no WebLogic classes are required). To use the `simpleURL` class for one-way SSL authentication (HTTPS) on WebLogic Server, all that is required is that "`weblogic.net`" be defined in the system property for `java.protocols.handler.pkgs`.

Note: Because the `simpleURL` sample shown in Listing 5-10 defaults trust and hostname checking, this sample requires that you connect to a real Web server that is trusted and that passes hostname checking by default. Otherwise, you must override trust and hostname checking on the command line.

Listing 5-10 One-Way SSL Authentication URL Outbound SSL Connection Class That Uses Java Classes Only

```
import java.net.URL;
import java.net.URLConnection;
import java.net.HttpURLConnection;
import java.io.IOException;

public class simpleURL
{
```

```
public static void main (String [] argv)
{
  if (argv.length != 1)
  {
    System.out.println("Please provide a URL to connect to");
    System.exit(-1);
  }
  setupHandler();
  connectToURL(argv[0]);
}

private static void setupHandler()
{
  java.util.Properties p = System.getProperties();
  String s = p.getProperty("java.protocol.handler.pkgs");
  if (s == null)
    s = "weblogic.net";
  else if (s.indexOf("weblogic.net") == -1)
    s += "|weblogic.net";
  p.put("java.protocol.handler.pkgs", s);
  System.setProperties(p);
}

private static void connectToURL(String theURLSpec)
{
  try
  {
    URL theURL = new URL(theURLSpec);
    URLConnection urlConnection = theURL.openConnection();
    HttpURLConnection connection = null;
    if (!(urlConnection instanceof HttpURLConnection))
    {
      System.out.println("The URL is not using HTTP/HTTPS: " +
                         theURLSpec);
      return;
    }
    connection = (HttpURLConnection) urlConnection;
    connection.connect();
    String responseStr = "\t\t" +
```

```
                connection.getResponseCode() + " -- " +
                connection.getResponseMessage() + "\n\t\t" +
                     connection.getContent().getClass().getName() + "\n";
        connection.disconnect();
        System.out.println(responseStr);
      }
      catch (IOException ioe)
      {
        System.out.println("Failure processing URL: " + theURLSpec);
        ioe.printStackTrace();
      }
    }
}
```

For two-way SSL authentication, the `weblogic.net.http.HttpsURLConnection` class provides a way to specify the security context information for a client, including the digital certificate and private key of the client. Instances of this class represent an HTTPS connection to a remote object.

The SSLClient sample code demonstrates using the WebLogic `URL` object to make an outbound SSL connection (see Listing 5-11). The code example shown in Listing 5-11 is excerpted from the `SSLClient.java` file in the *`SAMPLES_HOME`*`\server\examples\src\examples\security\sslclient` directory.

Listing 5-11 WebLogic Two-Way SSL Authentication URL Outbound SSL Connection Code Example

```
wlsUrl = new URL("https", host, Integer.valueOf(sport).intValue(),
                 query);
weblogic.net.http.HttpsURLConnection sconnection =
         new weblogic.net.http.HttpsURLConnection(wlsUrl);

...

InputStream [] ins = new InputStream[2];
      ins[0] = new FileInputStream("clientkey.pem");
      ins[1] = new FileInputStream("client2certs.pem");
```

```
 String pwd = "clientkey";
sconnection.loadLocalIdentity(ins[0], ins[1], pwd.toCharArray());
```

SSL Client Code Examples

A complete working SSL authentication sample is provided with the WebLogic Server product. The sample is located in the *SAMPLES_HOME*`\server\examples\src\examples\security\sslclient` directory. For a description of the sample and instructions on how to build, configure, and run this sample, see the `package.html` file in the sample directory. You can modify this code example and reuse it.

CHAPTER 6

Securing Enterprise JavaBeans (EJBs)

WebLogic Server supports the Java EE architecture security model for securing Enterprise JavaBeans (EJBs), which includes support for declarative authorization (also referred to in this document as declarative security) and programmatic authorization (also referred to in this document as programmatic security).

The following topics are covered in this section:

Note: You can use deployment descriptor files, the Administration Console, and JACC to secure EJBs. For information on using the Administration Console to secure EJBs, see *Securing WebLogic Resources Using Roles and Policies*. For information on JACC, see "Using the Java Authorization Contract for Containers" on page 8-6.

Java EE Architecture Security Model

The document *Designing Enterprise Applications with the J2EE Platform, Second Edition*, published by Sun Microsystems, Inc., states in Section 9.3 Authorization:

"In the J2EE architecture, a container serves as an authorization boundary between the components it hosts and their callers. The authorization boundary exists inside the container's authentication boundary so that authorization is considered in the context of successful

authentication. For inbound calls, the container compares security attributes from the caller's credential with the access control rules for the target component. If the rules are satisfied, the call is allowed. Otherwise, the call is rejected."

"There are two fundamental approaches to defining access control rules: capabilities and permissions. Capabilities focus on what a caller can do. Permissions focus on who can do something. The J2EE application programming model focuses on permissions. In the J2EE architecture, the job of the deployer is to map the permission model of the application to the capabilities of users in the operational environment."

The same document then discusses two ways to control access to application resources using the Java EE architecture, declarative authorization and programmatic authorization.

The document *Designing Enterprise Applications with the J2EE Platform, Second Edition*, published by Sun Microsystems, Inc., in available online at `http://java.sun.com/blueprints/guidelines/designing_enterprise_applications_2e/security/security4.html`.

Declarative Authorization

The document *Designing Enterprise Applications with the J2EE Platform, Second Edition*, published by Sun Microsystems, Inc., states in Section 9.3.1 Authorization:

"The deployer establishes the container-enforced access control rules associated with a J2EE application. The deployer uses a deployment tool to map an application permission model, which is typically supplied by the application assembler, to policy and mechanisms specific to the operational environment. The application permission model is defined in a deployment descriptor."

WebLogic Server supports the use of deployment descriptors to implement declarative authorization in EJBs.

Note: Declarative authorization is also referred in this document as declarative security.

The document *Designing Enterprise Applications with the J2EE Platform, Second Edition*, published by Sun Microsystems, Inc., in available online at `http://java.sun.com/blueprints/guidelines/designing_enterprise_applications_2e/security/security4.html`.

Programmatic Authorization

The document *Designing Enterprise Applications with the J2EE Platform, Second Edition*, published by Sun Microsystems, Inc., states in Section 9.3.2 Programmatic Authorization:

"A J2EE container makes access control decisions before dispatching method calls to a component. The logic or state of the component doesn't factor in these access decisions. However, a component can use two methods, *`EJBContext.isCallerInRole`* (for use by enterprise bean code) and *`HttpServletRequest.isUserInRole`* (for use by Web components), to perform finer-grained access control. A component uses these methods to determine whether a caller has been granted a privilege selected by the component based on the parameters of the call, the internal state of the component, or other factors such as the time of the call."

"The application component provider of a component that calls one of these functions must declare the complete set of distinct roleName values to be used in all calls. These declarations appear in the deployment descriptor as `security-role-ref` elements. Each `security-role-ref` element links a privilege name embedded in the application as a roleName to a security role. Ultimately, the deployer establishes the link between the privilege names embedded in the application and the security roles defined in the deployment descriptor. The link between privilege names and security roles may differ for components in the same application."

"In addition to testing for specific privileges, an application component can compare the identity of its caller, acquired using `EJBContext.getCallerPrincipal` or `HttpServletRequest.getUserPrincipal`, to the distinguished caller identities embedded in the state of the component when it was created. If the identity of the caller is equivalent to a distinguished caller, the component can allow the caller to proceed. If not, the component can prevent the caller from further interaction. The caller principal returned by a container depends on the authentication mechanism used by the caller. Also, containers from different vendors may return different principals for the same user authenticating by the same mechanism. To account for variability in principal forms, an application developer who chooses to apply distinguished caller state in component access decisions should allow multiple distinguished caller identities, representing the same user, to be associated with components. This is recommended especially where application flexibility or portability is a priority."

WebLogic Server supports the use of the `EJBContext.isCallerInRole` and `EJBContext.getCallerPrincipal` methods and the use of the `security-role-ref` element in deployment descriptors to implement programmatic authorization in EJBs.

Note: Programmatic authorization is also referred in this document as programmatic security.

The document *Designing Enterprise Applications with the J2EE Platform, Second Edition*, published by Sun Microsystems, Inc., in available online at `http://java.sun.com/blueprints/guidelines/designing_enterprise_applications_2e/security/security4.html`.

Declarative Versus Programmatic Authorization

The document *Designing Enterprise Applications with the J2EE Platform, Second Edition*, published by Sun Microsystems, Inc., states in Section 9.3.3 Declarative Versus Programmatic Authorization:

"There is a trade-off between the external access control policy configured by the deployer and the internal policy embedded in the application by the component provider. The external policy is more flexible after the application has been written. The internal policy provides more flexible functionality while the application is being written. In addition, the external policy is transparent and completely comprehensible to the deployer, while internal policy is buried in the application and may only be completely understood by the application developer. These trade-offs should be considered in choosing the authorization model for particular components and methods."

The document *Designing Enterprise Applications with the J2EE Platform, Second Edition*, published by Sun Microsystems, Inc., in available online at `http://java.sun.com/blueprints/guidelines/designing_enterprise_applications_2e/security/security4.html`.

Using Declarative Security With EJBs

There are three ways to implement declarative security:

1. Security providers via the Administration Console, as described in *Securing WebLogic Resources Using Roles and Policies*.
2. Java Authorization Contract for Containers (JACC), as described in "Using the Java Authorization Contract for Containers" on page 8-6.
3. Deployment descriptors, which are discussed in this section.

Which of these three methods is used is defined by the JACC flags and the security model. (Security models are described in Options for Securing EJB and Web Application Resources in *Securing WebLogic Resources Using Roles and Policies*.)

To implement declarative security in EJBs you can use deployment descriptors (`ejb-jar.xml` and `weblogic-ejb-jar.xml`) to define the security requirements. Listing 6-1 shows examples of how to use the `ejb-jar.xml` and `weblogic-ejb-jar.xml` deployment descriptors to map security role names to a security realm. The deployment descriptors map the application's logical security requirements to its runtime definitions. And at runtime, the EJB container uses the security definitions to enforce the requirements.

To configure security in the EJB deployment descriptors, perform the following steps (see Listing 6-1):

1. Use a text editor to create `ejb-jar.xml` and `weblogic-ejb-jar.xml` deployment descriptor files.
2. In the `ejb-jar.xml` file, define the security role name, the EJB name, and the method name (see bold text).

Note: When specifying security role names, observe the following conventions and restrictions:

Note: The proper syntax for a security role name is as defined for an `Nmtoken` in the Extensible Markup Language (XML) recommendation available on the Web at: `http://www.w3.org/TR/REC-xml#NT-Nmtoken`.

- Do not use blank spaces, commas, hyphens, or any characters in this comma-separated list: \t, < >, #, |, &, ~, ?, ( ), { }.
- Security role names are case sensitive.
- The BEA suggested convention for security role names is that they be singular.

For more information on configuring security in the `ejb-jar.xml` file, see the *Sun Microsystems Enterprise JavaBeans Specification, Version 2.0* which is at this location on the Internet: `http://java.sun.com/products/ejb/docs.html`.

3. In the WebLogic-specific EJB deployment descriptor file, `weblogic-ejb-jar.xml`, define the security role name and link it to one or more principals (users or groups) in a security realm.

   For more information on configuring security in the `weblogic-ejb-jar.xml` file, see `weblogic-ejb-jar.xml` Deployment Descriptor Reference in *Programming WebLogic Enterprise JavaBeans*.

Listing 6-1 Using the ejb-jar.xml and weblogic-ejb-jar.xml Files to Map Security Role Names to a Security Realm

```
ejb-jar.xml entries:

         ...
<assembly-descriptor>
  <security-role>
        <role-name>manger</role-name>
```

```
  </security-role>
  <security-role>
        <role-name>east</role-name>
  </security-role>
  <method-permission>
        <role-name>manager</role-name>
        <role-name>east</role-name>
        <method>
          <ejb-name>accountsPayable</ejb-name>
          <method-name>getReceipts</method-name>
        </method>
  </method-permission>
         ...
</assembly-descriptor>
          ...
weblogic-ejb-jar.xml entries:
  <security-role-assignment>
      <role-name>manager</role-name>
      <principal-name>al</principal-name>
      <principal-name>george</principal-name>
      <principal-name>ralph</principal-name>
  </security-role-assignment>
     ...
```

EJB Security-Related Deployment Descriptors

The following topics describe the deployment descriptor elements that are used in the `ejb-jar.xml` and `weblogic-ejb-jar.xml` files to define security requirements in EJBs:

- "ejb-jar.xml Deployment Descriptors" on page 6-6
- "weblogic-ejb-jar.xml Deployment Descriptors" on page 6-14

ejb-jar.xml Deployment Descriptors

The following `ejb-jar.xml` deployment descriptor elements are used to define security requirements in WebLogic Server:

method

The `method` element is used to denote a method of an enterprise bean's home or component interface, or, in the case of a message-driven bean, the bean's `onMessage` method, or a set of methods.

The following table describes the elements you can define within an `method` element.

Table 6-1 `method` Element

Element	Required/ Optional	Description
`<description>`	Optional	A text description of the method.
`<ejb-name>`	Required	Specifies the name of one of the enterprise beans declared in the `ejb-jar.xml` file.
`<method-intf>`	Optional	Allows you to distinguish between a method with the same signature that is multiply defined across both the home and component interfaces of the enterprise bean.
`<method-name>`	Required	Specifies a name of an enterprise bean method or the asterisk (*) character. The asterisk is used when the element denotes all the methods of an enterprise bean's component and home interfaces.
`<method-params>`	Optional	Contains a list of the fully-qualified Java type names of the method parameters.

Used Within

The `method` element is used within the `method-permission` element.

Example

For an example of how to use the `method` element, see Listing 6-1, "Using the ejb-jar.xml and weblogic-ejb-jar.xml Files to Map Security Role Names to a Security Realm," on page 6-5.

method-permission

The `method-permission` element specifies that one or more security roles are allowed to invoke one or more enterprise bean methods. The `method-permission` element consists of an optional description, a list of security role names or an indicator to state that the method is unchecked for authorization, and a list of method elements.

The security roles used in the `method-permission` element must be defined in the `security-role` elements of the deployment descriptor, and the methods must be methods defined in the enterprise bean's component and/or home interfaces.

The following table describes the elements you can define within a `method-permission` element.

Table 6-2 `method-permission` Element

Element	Required/ Optional	Description
`<description>`	Optional	A text description of this security constraint.
`<role-name>` or <unchecked>	Required	The `role-name` element or the `unchecked` element must be specified. The `role-name` element contains the name of a security role. The name must conform to the lexical rules for an `NMTOKEN`. The `unchecked` element specifies that a method is not checked for authorization by the container prior to invocation of the method.
<method>	Required	Specifies a method of an enterprise bean's home or component interface, or, in the case of a message-driven bean, the bean's `onMessage` method, or a set of methods.

Used Within

The `method-permission` element is used within the `assembly-descriptor` element.

Example

For an example of how to use the `method-permission` element, see Listing 6-1, "Using the ejb-jar.xml and weblogic-ejb-jar.xml Files to Map Security Role Names to a Security Realm," on page 6-5.

role-name

The role-name element contains the name of a security role. The name must conform to the lexical rules for an `NMTOKEN`.

Used Within

The role-name element is used within the `method-permission`, `run-as`, `security-role, and security-role-ref elements.`

Example

For an example of how to use the `role-name` element, see Listing 6-1, "Using the ejb-jar.xml and weblogic-ejb-jar.xml Files to Map Security Role Names to a Security Realm," on page 6-5.

run-as

The `run-as` element specifies the run-as identity to be used for the execution of the enterprise bean. It contains an optional description, and the name of a security role.

Used Within

The run-as element is used within the `security-identity` element.

Example

For an example of how to use the `run-as` element, see Listing 6-8, "run-as-role-assignment Element Example," on page 6-24.

security-identity

The `security-identity` element specifies whether the caller's security identity is to be used for the execution of the methods of the enterprise bean or whether a specific run-as identity is to be used. It contains an optional description and a specification of the security identity to be used.

The following table describes the elements you can define within an `security-identity` element.

Table 6-3 `security-identity` Element

Element	Required/ Optional	Description
`<description>`	Optional	A text description of the security identity.
`<use-caller-identity>` or `<run-as>`	Required	The `use-caller-identity` element or the `run-as` element must be specified. The `use-caller-identity` element specifies that the caller's security identity be used as the security identity for the execution of the enterprise bean's methods. The `run-as` element specifies the run-as identity to be used for the execution of the enterprise bean. It contains an optional description, and the name of a security role.

Used Within

The `security-identity` element is used within the `entity`, `message-driven`, and `session` elements.

Example

For an example of how to use the `security-identity` element, see Listing 6-3, "use-caller-identity Element Example," on page 6-13 and Listing 6-8, "run-as-role-assignment Element Example," on page 6-24.

security-role

The `security-role` element contains the definition of a security role. The definition consists of an optional description of the security role, and the security role name.

Used Within

The `security-role` element is used within the `assembly-descriptor` element.

Example

For an example of how to use the `assembly-descriptor` element, see Listing 6-1, "Using the ejb-jar.xml and weblogic-ejb-jar.xml Files to Map Security Role Names to a Security Realm," on page 6-5.

security-role-ref

The `security-role-ref` element contains the declaration of a security role reference in the enterprise bean's code. The declaration consists of an optional description, the security role name used in the code, and an optional link to a security role. If the security role is not specified, the Deployer must choose an appropriate security role.

The value of the `role-name` element must be the String used as the parameter to the `EJBContext.isCallerInRole(String roleName)` method or the `HttpServletRequest.isUserInRole(String role)` method.

Used Within

The `security-role-ref` element is used within the `entity` and `session` elements.

Example

For an example of how to use the security-role-ref element, see Listing 6-2.

Listing 6-2 Security-role-ref Element Example

```
<!DOC<weblogic-ejb-jar xmlns="http://www.bea.com/ns/weblogic/90"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www.bea.com/ns/weblogic/90
http://www.bea.com/ns/weblogic/90/weblogic-ejb-jar.xsd">

<ejb-jar>
 <enterprise-beans>
   ...
   <session>
     <ejb-name>SecuritySLEJB</ejb-name>
     <home>weblogic.ejb20.security.SecuritySLHome</home>
     <remote>weblogic.ejb20.security.SecuritySL</remote>
     <ejb-class>weblogic.ejb20.security.SecuritySLBean</ejb-class>
     <session-type>Stateless</session-type>
```

```
      <transaction-type>Container</transaction-type>
      <security-role-ref>
         <role-name>rolenamedifffromlink</role-name>
         <role-link>role121SL</role-link>
      </security-role-ref>
      <security-role-ref>
         <role-name>roleForRemotes</role-name>
         <role-link>roleForRemotes</role-link>
      </security-role-ref>
      <security-role-ref>
         <role-name>roleForLocalAndRemote</role-name>
         <role-link>roleForLocalAndRemote</role-link>
      </security-role-ref>
   </session>
    ...
 </enterprise-beans>
</ejb-jar>
```

unchecked

The `unchecked` element specifies that a method is not checked for authorization by the container prior to invocation of the method.

Used Within

The `unchecked` element is used within the `method-permission` element.

Example

For an example of how to use the `unchecked` element, see Listing 6-1, “Using the ejb-jar.xml and weblogic-ejb-jar.xml Files to Map Security Role Names to a Security Realm,” on page 6-5.

use-caller-identity

The `use-caller-identity` element specifies that the caller's security identity be used as the security identity for the execution of the enterprise bean's methods.

Used Within

The `use-caller-identity` element is used within the `security-identity` element.

Example

For an example of how to use the `use-caller-identity` element, see Listing 6-3.

Listing 6-3 use-caller-identity Element Example

```
<ejb-jar>
  <enterprise-beans>

    <session>
      <ejb-name>SecurityEJB</ejb-name>
      <home>weblogic.ejb20.SecuritySLHome</home>
      <remote>weblogic.ejb20.SecuritySL</remote>
      <local-home>
          weblogic.ejb20.SecurityLocalSLHome
      </local-home>
      <local>weblogic.ejb20.SecurityLocalSL</local>
      <ejb-class>weblogic.ejb20.SecuritySLBean</ejb-class>
      <session-type>Stateless</session-type>
      <transaction-type>Container</transaction-type>
    </session>

    <message-driven>
      <ejb-name>SecurityEJB</ejb-name>
      <ejb-class>weblogic.ejb20.SecuritySLBean</ejb-class>
      <transaction-type>Container</transaction-type>
      <security-identity>
         <use-caller-identity/>
      </security-identity>
    </message-driven>

  </enterprise-beans>
</ejb-jar>
```

weblogic-ejb-jar.xml Deployment Descriptors

The following `weblogic-ejb-jar.xml` deployment descriptor elements are used to define security requirements in WebLogic Server:

client-authentication

The `client-authentication` element specifies whether the EJB supports or requires client authentication.

The following table defines the possible settings.

Table 6-4 `client-authentication` **Element**

Setting	Definition
`none`	Client authentication is not supported.
`supported`	Client authentication is supported, but not required.
`required`	Client authentication is required.

Example

For an example of how to use the `client-authentication` element, see Listing 6-6, "iiop-security-descriptor Element Example," on page 6-20.

client-cert-authentication

The `client-cert-authentication` element specifies whether the EJB supports or requires client certificate authentication at the transport level.

The following table defines the possible settings.

Table 6-5 `client-cert-authentication` **Element**

Setting	Definition
`none`	Client certificate authentication is not supported.
`supported`	Client certificate authentication is supported, but not required.
`required`	Client certificate authentication is required.

Example

For an example of how to use the `client-cert-authentication` element, see Listing 6-10, "transport-requirements Element Example," on page 6-29.

confidentiality

The `confidentiality` element specifies the transport confidentiality requirements for the EJB. Using the `confidentiality` element ensures that the data is sent between the client and server in such a way as to prevent other entities from observing the contents.

The following table defines the possible settings.

Table 6-6 `confidentiality` Element

Setting	Definition
`none`	Confidentiality is not supported.
`supported`	Confidentiality is supported, but not required.
`required`	Confidentiality is required.

Example

For an example of how to use the `confidentiality` element, see Listing 6-10, "transport-requirements Element Example," on page 6-29.

externally-defined

The `externally-defined` element lets you explicitly indicate that you want the security roles defined by the `role-name` element in the `weblogic-ejb-jar.xml` deployment descriptors to use the mappings specified in the Administration Console. The element gives you the flexibility of not having to specify a specific security role mapping for each security role defined in the deployment descriptors for a particular Web application. Therefore, within the same security realm, deployment descriptors can be used to specify and modify security for some applications while the Administration Console can be used to specify and modify security for others.

Note: Starting in version 9.0, the default role mapping behavior is to create empty role mappings when none are specified. In version 8.1, EJB required that role mappings be defined in the `weblogic-ejb-jar.xml` descriptor or deployment would fail. With 9.0, EJB and WebApp behavior are consistent in creating empty role mappings.

For information on role mapping behavior and backward compatibility settings, see the section Understanding the Combined Role Mapping Enabled Setting in the *Securing WebLogic Resources Using Roles and Policies* manual. The role mapping behavior for a server depends on which security deployment model is selected on the Administration Console. For information on security deployment models, see Options for Securing Web Application and EJB Resources in *Securing WebLogic Resources Using Roles and Policies*.

When specifying security role names, observe the following conventions and restrictions:

- The proper syntax for a security role name is as defined for an `Nmtoken` in the Extensible Markup Language (XML) recommendation available on the Web at: `http://www.w3.org/TR/REC-xml#NT-Nmtoken`.
- Do not use blank spaces, commas, hyphens, or any characters in this comma-separated list: \t, < >, #, |, &, ~, ?, ( ), { }.
- Security role names are case sensitive.
- The BEA suggested convention for security role names is that they be singular.

Listing 6-4 and Listing 6-5 show by comparison how to use the `externally-defined` element in the `weblogic-ejb-jar.xml` file. In Listing 6-5, the specification of the "manager" `externally-defined` element in the `weblogic-ejb-jar.xml` means that for security to be correctly configured on the `getReceipts` method, the principals for `manager` will have to be created in the Administration Console.

Listing 6-4 Using the ejb-jar.xml and weblogic-ejb-jar.xml Deployment Descriptors to Map Security Roles in EJBs

`ejb-jar.xml entries:`

```
         ...
<assembly-descriptor>
  <security-role>
        <role-name>manger</role-name>
  </security-role>
  <security-role>
        <role-name>east</role-name>
  </security-role>
  <method-permission>
        <role-name>manager</role-name>
        <role-name>east</role-name>
        <method>
          <ejb-name>accountsPayable</ejb-name>
          <method-name>getReceipts</method-name>
        </method>
  </method-permission>
         ...
```

```
</assembly-descriptor>
          ...
weblogic-ejb-jar.xml entries:
  <security-role-assignment>
      <role-name>manager</role-name>
      <principal-name>joe</principal-name>
      <principal-name>Bill</principal-name>
      <principal-name>Mary</principal-name>
      ...
</security-role-assignment>
   ...
```

Listing 6-5 Using the externally-defined Element in EJB Deployment Descriptors for Role Mapping

```
ejb-jar.xml entries:
         ...
<assembly-descriptor>
  <security-role>
        <role-name>manger</role-name>
  </security-role>
  <security-role>
        <role-name>east</role-name>
  </security-role>
  <method-permission>
        <role-name>manager</role-name>
        <role-name>east</role-name>
        <method>
          <ejb-name>accountsPayable</ejb-name>
          <method-name>getReceipts</method-name>
        </method>
  </method-permission>
         ...
</assembly-descriptor>
          ...
weblogic-ejb-jar.xml entries:
```

```
<security-role-assignment>
    <role-name>manager</role-name>
    <externally-defined/>
    ...
</security-role-assignment>
 ...
```

For more information on using the Administration Console to configure security for EJBs, see *Securing WebLogic Resources Using Roles and Policies*.

identity-assertion

The `identity-assertion` element specifies whether the EJB supports identity assertion.

The following table defines the possible settings.

Table 6-7 `identity-assertion` **Element**

Setting	Definition
`none`	Identity assertion is not supported
`supported`	Identity assertion is supported, but not required.
`required`	Identity assertion is required.

Used Within

The `identity-assertion` element is used with the `iiop-security-descriptor` element.

Example

For an example of how to the `identity-assertion` element, see Listing 6-6, "iiop-security-descriptor Element Example," on page 6-20.

iiop-security-descriptor

The `iiop-security-descriptor` element specifies security configuration parameters at the bean-level. These parameters determine the IIOP security information contained in the interoperable object reference (IOR).

Example

For an example of how to use the `iiop-security-descriptor` element, see Listing 6-6.

Listing 6-6 iiop-security-descriptor Element Example

```
<weblogic-enterprise-bean>
  <iiop-security-descriptor>
       <transport-requirements>
              <confidentiality>supported</confidentiality>
              <integrity>supported</integrity>
              <client-cert-authorization>
                  supported
              </client-cert-authentication>
       </transport-requirements>
       <client-authentication>supported<client-authentication>
       <identity-assertion>supported</identity-assertion>
  </iiop-security-descriptor>
</weblogic-enterprise-bean>
```

integrity

The `integrity` element specifies the transport integrity requirements for the EJB. Using the integrity element ensures that the data is sent between the client and server in such a way that it cannot be changed in transit.

The following table defines the possible settings.

Table 6-8 `integrity` Element

Setting	Definition
`none`	Integrity is not supported.
`supported`	Integrity is supported, but not required.
`required`	Integrity is required.

Used Within

The `integrity` element is used within the `transport-requirements` element.

Example

For an example of how to use the `integrity` element, see Listing 6-10, "transport-requirements Element Example," on page 6-29.

principal-name

`The principal-name` element specifies the name of the principal in the WebLogic Server security realm that applies to role name specified in the security-role-assignment element. At least one `principal` is required in the `security-role-assignment` element. You may define more than one `principal-name` for each role name.

Note: If you need to list a significant number of principals, consider specifying groups instead of users. There are performance issues if you specify too many users.

Used Within

The `principal-name` element is used within the `security-role-assignment` element.

Example

For an example of how to use the `principal-name` element, see Listing 6-1, "Using the ejb-jar.xml and weblogic-ejb-jar.xml Files to Map Security Role Names to a Security Realm," on page 6-5.

role-name

The `role-name` element identifies an application role name that the EJB provider placed in the companion `ejb-jar.xml` file. Subsequent principal-name elements in the stanza map WebLogic Server principals to the specified `role-name`.

Used Within

The `role-name` element is used within the `security-role-assignment` element.

Example

For an example of how to use the `role-name` element, see Listing 6-1, "Using the ejb-jar.xml and weblogic-ejb-jar.xml Files to Map Security Role Names to a Security Realm," on page 6-5.

run-as-identity-principal

The `run-as-identity-principal` element specifies which security principal name is to be used as the run-as principal for a bean that has specified a security-identity run-as role-name in its ejb-jar deployment descriptor. For an explanation of how of run-as role-names to are mapped to run-as-identity-principals (or run-as-principal-names, see "run-as-role-assignment" on page 6-24.

Note: **Deprecated:** The `run-as-identity-principal` element is deprecated in the WebLogic Server 8.1. Use the `run-as-principal-name` element instead.

Used Within

The `run-as-identity-principal` element is used within the `run-as-role-assignment` element.

Example

For an example of how to use the `run-as-identity-principal` element, see Listing 6-7.

Listing 6-7 `run-as-identity-principal Element Example`

```
ebj-jar.xml:

<ejb-jar>
 <enterprise-beans>
 <session>
   <ejb-name>Caller2EJB</ejb-name>
   <home>weblogic.ejb11.security.CallerBeanHome</home>
   <remote>weblogic.ejb11.security.CallerBeanRemote</remote>
   <ejb-class>weblogic.ejb11.security.CallerBean</ejb-class>
   <session-type>Stateful</session-type>
   <transaction-type>Container</transaction-type>
   <ejb-ref><ejb-ref-name>Callee2Bean</ejb-ref-name>
     <ejb-ref-type>Session</ejb-ref-type>
     <home>weblogic.ejb11.security.CalleeBeanHome</home>
     <remote>weblogic.ejb11.security.CalleeBeanRemote</remote>
   </ejb-ref>
   <security-role-ref>
     <role-name>users1</role-name>
```

```
     <role-link>users1</role-link>
   </security-role-ref>
   <security-identity>
    <run-as>
      <role-name>users2</role-name>
    </run-as>
   </security-identity>
  </session>
 </enterprise-beans>
</ejb-jar>
```

woblogic-ejb-jar.xml:

```
<weblogic-ejb-jar>
  <weblogic-enterprise-bean>
    <ejb-name>Caller2EJB</ejb-name>
    <reference-descriptor>
     <ejb-reference-description>
       <ejb-ref-name>Callee2Bean</ejb-ref-name>
        <jndi-name>security.Callee2Bean</jndi-name>
     </ejb-reference-description>
    </reference-descriptor>
    <run-as-identity-principal>wsUser3</run-as-identity-principal>
  </weblogic-enterprise-bean>
  <security-role-assignment>
    <role-name>user</role-name>
    <principal-name>wsUser2</principal-name>
    <principal-name>wsUser3</principal-name>
    <principal-name>wsUser4</principal-name>
  </security-role-assignment>
</weblogic-ejb-jar>
```

run-as-principal-name

The `run-as-principal-name` element specifies which security principal name is to be used as the run-as principal for a bean that has specified a security-identity run-as role-name in its ejb-jar

deployment descriptor. For an explanation of how the run-as role-names map to run-as-principal-names, see "run-as-role-assignment" on page 6-24.

Used Within

The `run-as-principal-name` element is used within the `run-as-role-assignment` element.

Example

For an example of how to use the `run-as-principal-name` element, see Listing 6-8, "run-as-role-assignment Element Example," on page 6-24.

run-as-role-assignment

The `run-as-role-assignment` element is used to map a given security-identity run-as role-name that is specified in the `ejb-jar.xml` file to a `run-as-principal-name` specified in the `weblogic-ejb-jar.xml` file. The value of the `run-as-principal-name` element for a given role-name is scoped to all beans in the `ejb-jar.xml` file that use the specified role-name as their security-identity. The value of the `run-as-principal-name` element specified in `weblogic-ejb-jar.xml` file can be overridden at the individual bean level by specifying a `run-as-principal-name` element under that bean's `weblogic-enterprise-bean` element.

Note: For a given bean, if there is no `run-as-principal-name` element specified in either a `run-as-role-assignment` element or in a bean specific `run-as-principal-name` element, then the EJB container will choose the first `principal-name` of a security user in the weblogic-enterprise-bean `security-role-assignment` element for the `role-name` and use that `principal-name` as the `run-as-principal-name`.

Example

For an example of how to use the run-as-role-assignment element, see Listing 6-8.

Listing 6-8 run-as-role-assignment Element Example

```
In the ejb-jar.xml file:

// Beans "A_EJB_with_runAs_role_X" and "B_EJB_with_runAs_role_X"
// specify a security-identity run-as role-name "runAs_role_X".
// Bean "C_EJB_with_runAs_role_Y" specifies a security-identity
// run-as role-name "runAs_role_Y".
```

```
<ejb-jar>
  <enterprise-beans>
    <session>
      <ejb-name>SecurityEJB</ejb-name>
      <home>weblogic.ejb20.SecuritySLHome</home>
      <remote>weblogic.ejb20.SecuritySL</remote>
      <local-home>
          weblogic.ejb20.SecurityLocalSLHome
      </local-home>
      <local>weblogic.ejb20.SecurityLocalSL</local>
      <ejb-class>weblogic.ejb20.SecuritySLBean</ejb-class>
      <session-type>Stateless</session-type>
      <transaction-type>Container</transaction-type>
    </session>
    <message-driven>
      <ejb-name>SecurityEJB</ejb-name>
      <ejb-class>weblogic.ejb20.SecuritySLBean</ejb-class>
      <transaction-type>Container</transaction-type>
      <security-identity>
           <run-as>
                 <role-name>runAs_role_X</role-name>
           </run-as>
      </security-identity>
      <security-identity>
            <run-as>
                 <role-name>runAs_role_Y</role-name>
            </run-as>
      </security-identity>
    </message-driven>
  </enterprise-beans>
</ejb-jar>
```

weblogic-ejb-jar file:

```
<weblogic-ejb-jar>
   <weblogic-enterprise-bean>
     <ejb-name>A_EJB_with_runAs_role_X</ejb-name>
   </weblogic-enterprise-bean>
```

```
    <weblogic-enterprise-bean>
      <ejb-name>B_EJB_with_runAs_role_X</ejb-name>
      <run-as-principal-name>Joe</run-as-principal-name>
    </weblogic-enterprise-bean>

    <weblogic-enterprise-bean>
      <ejb-name>C_EJB_with_runAs_role_Y</ejb-name>
    </weblogic-enterprise-bean>

    <security-role-assignment>
      <role-name>runAs_role_Y</role-name>
      <principal-name>Harry</principal-name>
      <principal-name>John</principal-name>
    </security-role-assignment>

    <run-as-role-assignment>
      <role-name>runAs_role_X</role-name>
      <run-as-principal-name>Fred</run-as-principal-name>
    </run-as-role-assignment>
</weblogic-ejb-jar>
```

Each of the three beans shown in Listing 6-8 will choose a different principal name to run as.

- A_EJB_with_runAs_role_X

  This bean's run-as role-name is `runAs_role_X`. The jar-scoped `<run-as-role-assignment>` mapping will be used to look up the name of the principal to use. The `<run-as-role-assignment>` mapping specifies that for <role-name> `runAs_role_X` we are to use `<run-as-principal-name>` `Fred`. Therefore, `Fred` is the principal name that will be used.

- B_EJB_with_runAs_role_X

  This bean's run-as role-name is also `runAs_role_X`. This bean will not use the jar scoped `<run-as-role-assignment>` to look up the name of the principal to use because that value is overridden by this bean's `<weblogic-enterprise-bean>` `<run-as-principal-name>` value `Joe`. Therefore `Joe` is the principal name that will be used.

- C_EJB_with_runAs_role_Y

This bean's run-as role-name is `runAs_role_Y`. There is no explicit mapping of `runAs_role_Y` to a run-as principal name, that is, there is no jar scoped `<run-as-role-assignment>` for `runAs_role_Y` nor is there a bean scoped `<run-as-principal-name>` specified in this bean's `<weblogic-enterprise-bean>`. To determine the principal name to use, the `<security-role-assignment>` for `<role-name>` `runAs_role_Y` is examined. The first `<principal-name>` corresponding to a user that is not a Group is chosen. Therefore, `Harry` is the principal name that will be used.

security-permission

The `security-permission` element specifies a security permission that is associated with a Java EE Sandbox.

Example

For an example of how to use the `security-permission` element, see Listing 6-9, "security-permission-spec Element Example," on page 6-27.

security-permission-spec

The `security-permission-spec` element specifies a single security permission based on the Security policy file syntax.

For more information, see Sun's implementation of the security permission specification:

http://java.sun.com/j2se/1.5.0/docs/guide/security/PolicyFiles.html#FileSyntax

Note: Disregard the optional `codebase` and `signedBy` clauses.

Used Within

The `security-permission-spec` element is used within the `security-permission` element.

Example

For an example of how to use the `security-permission-spec` element, see Listing 6-9.

Listing 6-9 security-permission-spec Element Example

```
<weblogic-ejb-jar>
  <security-permission>
     <description>Optional explanation goes here</description>
```

```
     <security-permission-spec>
<!
A single grant statement following the syntax of
http://java.sun.com/j2se/1.5.0/docs/guide/security/PolicyFiles.html#FileSy
ntax, without the codebase and signedBy clauses, goes here. For example:
-->
      grant {
      permission java.net.SocketPermission *, resolve;
      };
     </security-permission-spec>
   </security-permission>
</weblogic-ejb-jar>
```

In Listing 6-9, `permission java.net.SocketPermission` is the permission class name, `"*"` represents the target name, and `resolve` (resolve host/IP name service lookups) indicates the action.

security-role-assignment

The `security-role-assignment` element maps application roles in the `ejb-jar.xml` file to the names of security principals available in WebLogic Server.

Note: For information on using the `security-role-assignment` element in a `weblogic-application.xml` deployment descriptor for an enterprise application, see Enterprise Application Deployment Descriptor Elements in *Developing Applications with WebLogic Server*.

Example

For an example of how to use the `security-role-assignment` element, see Listing 6-1, "Using the ejb-jar.xml and weblogic-ejb-jar.xml Files to Map Security Role Names to a Security Realm," on page 6-5.

transport-requirements

The `transport-requirements` element defines the transport requirements for the EJB.

Used Within

The `transport-requirements` element is used within the `iiop-security-descriptor` element.

Example

For an example of how to use the `transport-requirements` element, see Listing 6-10.

Listing 6-10 transport-requirements Element Example

```
<weblogic-enterprise-bean>
  <iiop-security-descriptor>
       <transport-requirements>
              <confidentiality>supported</confidentiality>
              <integrity>supported</integrity>
              <client-cert-authorization>
                   supported
              </client-cert-authentication>
</transport-requirements>
  </iiop-security-descriptor>
<weblogic-enterprise-bean>
```

Using Programmatic Security With EJBs

To implement programmatic security in EJBs, use the `javax.ejb.EJBContext.getCallerPrincipal()` and the `javax.ejb.EJBContext.isCallerInRole()` methods.

getCallerPrincipal

Use the `getCallerPrincipal()` method to determine the caller of the EJB. The `javax.ejb.EJBContext.getCallerPrincipal()` method returns a `WLSUser Principal` if one exists in the `Subject` of the calling user. In the case of multiple `WLSUser Principals`, the method returns the first in the ordering defined by the `Subject.getPrincipals().iterator()` method. If there are no `WLSUser Principals`, then the `getCallerPrincipal()` method returns the first non-`WLSGroup Principal`. If there are no `Principals` or all `Principals` are of type `WLSGroup`, this method returns

`weblogic.security.WLSPrincipals.getAnonymousUserPrincipal()`. This behavior is similar to the semantics of `weblogic.security.SubjectUtils.getUserPrincipal()` except that `SubjectUtils.getUserPrincipal()` returns a `null` whereas `EJBContext.getCallerPrincipal()`returns `WLSPrincipals.getAnonmyousUserPrincipal()`.

For more information about how to use the `getCallerPrincipal()` method, see http://java.sun.com/javaee/5/docs/tutorial/doc/Security-JavaEE3.html.

isCallerInRole

The `isCallerInRole()` method is used to determine if the caller (the current user) has been assigned a security role that is authorized to perform actions on the WebLogic resources in that thread of execution. For example, the method `javax.ejb.EJBContext.isCallerInRole("admin")`will return `true` if the current user has `admin` privileges.

For more information about how to use the `isCallerInRole()` method, see http://java.sun.com/javaee/5/docs/tutorial/doc/Security-JavaEE3.html.

For Javadoc for the `isCallerInRole()` method, see http://java.sun.com/javaee/5/docs/api/javax/ejb/EJBContext.html.

CHAPTER 7

Using Network Connection Filters

This section covers the following topics:

The Benefits of Using Network Connection Filters

Security roles and security policies let you secure WebLogic resources at the domain level, the application level, and the application-component level. Connection filters let you deny access at the network level. Thus, network connection filters provide an additional layer of security. Connection filters can be used to protect server resources on individual servers, server clusters, or an entire internal network.

Connection filters are particularly useful for controlling access through the Administration port. Depending on your network firewall configuration, you might be able to use a connection filter to further restrict administration access. A typical use is to restrict access to the Administration port to only the servers and machines in the domain. Even if an attacker gets access to a machine

inside the firewall, they will not be able to perform administration operations unless they are on one of the permitted machines.

Network connection filters are a type of firewall in that they can be configured to filter on protocols, IP addresses, and DNS node names. For example, you can deny any non-SSL connections originating outside of your corporate network. This would ensure that all access from systems on the Internet would be secure.

Network Connection Filter API

This section describes the `weblogic.security.net` package. This API provides interfaces and classes for developing network connection filters. It also includes a class, `ConnectionFilterImpl`, which is a ready-to-use implementation of a network connection filter. For more information, see Javadocs for WebLogic Classes for this release of WebLogic Server.

This section covers the following topics:

Connection Filter Interfaces

To implement connection filtering, write a class that implements the connection filter interfaces. The following `weblogic.security.net` interfaces are provided for implementing connection filters:

ConnectionFilter Interface

This interface defines the `accept()` method, which is used to implement connection filtering. To program the server to perform connection filtering, instantiate a class that implements this interface and then configure that class in the Administration Console. This interface is the minimum implementation requirement for connection filtering.

Note: Implementing this interface alone does not permit the use of the Administration Console to enter and modify filtering rules to restrict client connections; you must use some other form (such as a flat file, which is defined in the Administration Console) for that purpose.

To use the Administration Console to enter and modify filtering rules, you must also implement the `ConnectionFilterRulesListener` interface. For a description of the `ConnectionFilterRulesListener` interface, see "ConnectionFilterRulesListener Interface" on page 7-3.

For code examples that demonstrate of how to use this interface, see "Connection Filter Examples" on page 7-8.

ConnectionFilterRulesListener Interface

The server uses this interface to determine whether the rules specified in the Administration Console in the `ConnectionFilterRules` field are valid during startup and at runtime.

Note: You can implement this interface or just use the WebLogic connection filter implementation, `weblogic.security.net.ConnectionFilterImpl`, which is provided as part of the WebLogic Server product.

This interface defines two methods that are used to implement connection filtering: `setRules()` and `checkRules()`. Implementing this interface in addition to the `ConnectionFilter` interface allows the use of the Administration Console to enter filtering rules to restrict client connections.

Note: In order to enter and edit connection filtering rules on the Administration Console, you must implement the `ConnectionFilterRulesListener` interface; otherwise some other means must be used. For example, you could use a flat file.

For a code example of how to use this interface, see "Connection Filter Examples" on page 7-8.

Connection Filter Classes

Two `weblogic.security.net` classes are provided for implementing connection filters:

- "ConnectionFilterImpl Class" on page 7-3
- "ConnectionEvent Class" on page 7-4

ConnectionFilterImpl Class

This class is the WebLogic connection filter implementation of the `ConnectionFilter` and `ConnectionFilterRulesListener` interfaces. Once configured using the Administration Console, this connection filter accepts all incoming connections by default, and also provides static factory methods that allow the server to obtain the current connection filter. To use this connection to deny access, simply enter connection filter rules using the Administration Console.

This class is provided as part of the WebLogic Server product. To configure this class for use, see "Configuring the WebLogic Connection Filter" on page 7-7.

ConnectionEvent Class

This is the class from which all event state objects are derived. All events are constructed with a reference to the object, that is, the source that is logically deemed to be the object upon which a specific event initially occurred. To create a new `ConnectionEvent` instance, applications use the methods provided by this class: `getLocalAddress()`, `getLocalPort()`, `getRemoteAddress`(), `getRemotePort()`, and `hashcode()`.

For a code example of how to use this class, see Listing 7-1, "Example of Filtering Network Connections," on page 7-9.

Guidelines for Writing Connection Filter Rules

This section describes how connection filter rules are written and evaluated. If no connection rules are specified, all connections are accepted.

Depending on how you implement connection filtering, connection filter rules can be written in a flat file or input directly on the Administration Console. The "Connection Filter Examples" on page 7-8 demonstrate both methods.

The following sections provide information and guidelines for writing connection filter rules:

Connection Filter Rules Syntax

The syntax of connection filter rules is as follows:

- Each rule must be written on a single line.
- Tokens in a rule are separated by white space.
- A pound sign (#) is the comment character. Everything after a pound sign on a line is ignored.
- Whitespace before or after a rule is ignored.
- Lines consisting only of whitespace or comments are skipped.

The format of filter rules differ depending on whether you are using a filter file to enter the filter rules or you enter the filter rules on the Administration Console.

- When entering the filter rules on the Administration Console, enter them in the following format:

  ```
  targetAddress localAddress localPort action protocols
  ```

- When specifying rules in the filter file, enter them in the following format:

  ```
  targetAddress action protocols
  ```

  - `targetAddress` specifies one or more systems to filter.
  - `localAddress` defines the host address of the WebLogic Server instance. (If you specify an asterisk (`*`), the match returns all local IP addresses.)
  - `localPort` defines the port on which the WebLogic Server instance is listening. (If you specify an asterisk (`*`), the match returns all available ports on the server).
  - `action` specifies the action to perform. This value must be `allow` or `deny`.
  - `protocols` is the list of protocol names to match. The following protocols may be specified: `http`, `https`, `t3`, `t3s`, `ldap`, `ldaps`, `iiop`, `iiops`, and `com`. (Although the `giop`, `giops`, and `dcom` protocol names are still supported, their use is deprecated as of release 9.0; you should use the equivalent `iiop`, `iiops`, and `com` protocol names.)

    Note: The `SecurityConfigurationMBean` provides a `CompatibilityConnectionFiltersEnabled` attribute for enabling compatibility with previous connection filters.

  - If no protocol is defined, all protocols will match a rule.

Types of Connection Filter Rules

Two types of filter rules are recognized:

- Fast rules

  A fast rule applies to a hostname or IP address with an optional netmask. If a hostname corresponds to multiple IP addresses, multiple rules are generated (in no particular order). Netmasks can be specified either in numeric or dotted-quad form. For example:

  ```
  dialup-555-1212.pa.example.net 127.0.0.1 7001 deny t3 t3s #http(s) OK
  192.168.81.0/255.255.254.0   127.0.0.1 8001 allow   #23-bit netmask
  192.168.0.0/16   127.0.0.1 8002 deny   #like /255.255.0.0
  ```

  Hostnames for fast rules are looked up once at startup of the WebLogic Server instance. While this design greatly reduces overhead at connect time, it can result in the filter obtaining out of date information about what addresses correspond to a hostname. BEA recommends using numeric IP addresses instead.

- Slow rules

  A slow rule applies to part of a domain name. Because a slow rule requires a connect-time DNS lookup on the client-side in order to perform a match, it may take much longer to run than a fast rule. Slow rules are also subject to DNS spoofing. Slow rules are specified as follows:

  ```
  *.script-kiddiez.org 127.0.0.1 7001 deny
  ```

  An asterisk only matches at the head of a pattern. If you specify an asterisk anywhere else in a rule, it is treated as part of the pattern. Note that the pattern will never match a domain name since an asterisk is not a legal part of a domain name.

How Connection Filter Rules are Evaluated

When a client connects to WebLogic Server, the rules are evaluated in the order in which they were written. The first rule to match determines how the connection is treated. If no rules match, the connection is permitted.

To further protect your server and only allow connections from certain addresses, specify the last rule as:

```
0.0.0.0/0  *  *  deny
```

With this as the last rule, only connections that are allowed by preceding rules are allowed, all others are denied. For example, if you specify the following rules:

```
<Remote IP Address> * * allow https
0.0.0.0/0  *  *  deny
```

Only machines with the Remote IP Address are allowed to access the instance of WebLogic Server running connection filter. All other systems are denied access.

Note: The default connection filter implementation interprets a target address of 0 (0.0.0.0/0) as meaning “the rule should apply to all IP addresses.” By design, the default filter does not evaluate the port or the local address, just the action. To clearly specify restrictions when using the default filter, modify the rules.

Another option is to implement a custom connection filter. A sample filter is available at http://dev.bea.com/code/security.jsp; the `FastFilterEntry.java` example contains `match()` methods, which determine how to process the rules.

Configuring the WebLogic Connection Filter

WebLogic Server provides an out-of-the-box network connection filter. To use the filter, simply configure it using the Administration Console. For information on how to configure connection filters, see *Securing WebLogic Server*.

Developing Custom Connection Filters

If you decide not to use the WebLogic connection filter and want to develop you own, your can use the application programming interface (API) provided in the `weblogic.security.net` package to do so. For a description of this API, see "Network Connection Filter API" on page 7-2.

To develop custom connection filters with WebLogic Server, perform the following steps:

1. Write a class that implements the `ConnectionFilter` interface (minimum requirement).

   Or, optionally, if you want to use the Administration Console to enter and modify the connection filtering rules directly, write a class that implements both the `ConnectionFilter` interface and the `ConnectionFilterRulesListener` interface.

2. If you choose the minimum requirement in step 1 (only implementing the `ConnectionFilter` interface), enter the connection filtering rules in a flat file and define the location of the flat file in the class that implements the `ConnectionFilter` interface. Then use the Administration Console to configure the class in WebLogic Server. For instructions for configuring the class in the Administration Console, see the "Configuring Connection Filtering" section in *Securing WebLogic Server*. For an example of how to use a flat file to implement connection filtering, see the referenced `SimpleConnectionFilter.java` file in "Connection Filter Examples" on page 7-8.

3. If you choose to implement both interfaces in step 1, use the Administration Console to configure the class and to enter the connection filtering rules. For instructions on configuring the class in the Administration Console, see "Configuring Connection Filtering" in *Securing WebLogic Server*. For an example of how to use the `ConnectionFilterRulesListener` interface to implement connection filtering, see the referenced `SimpleConnectionFilter2.java` file in "Connection Filter Examples" on page 7-8.

Note that if connection filtering is implemented when a Java or Web browser client tries to connect to a WebLogic Server instance, The WebLogic Server instance constructs a `ConnectionEvent` object and passes it to the `accept()` method of your connection filter class. The connection filter class examines the `ConnectionEvent` object and accepts the connection by returning, or denies the connection by throwing a `FilterException`.

Both implemented classes (the class that implements only the `ConnectionFilter` interface and the class that implements both the `ConnectionFilter` interface and the `ConnectionFilterRulesListener` interface) must call the `accept()` method after gathering information about the client connection. However, if you only implement the `ConnectionFilter` interface, the information gathered includes the remote IP address and the connection protocol: `http`, `https`, `t3`, `t3s`, `ldap`, `ldaps`, `iiop`, `iiops`, or `com`. If you implement both interfaces, the information gathered includes the remote IP address, remote port number, local IP address, local port number and the connection protocol.

Connection Filter Examples

This section refers to sample code which is available online at BEA's dev2dev web site. The `net` directory contains `ant` build files, a `package.html` file which contains instructions, a connection `filter` file, and the following Java files which include examples of two connection filters:

- `FastFilterEntry.java`
- `FilterEntry.java`
- `SimpleConnectionFilter.java`
- `SimpleConnectionFilter2.java`
- `SlowFilterEntry.java`

Each connection filter example provides an efficient, generalized connection filter which parses the rules and sets up a rule-matching algorithm so that connection filtering adds minimal overhead to a WebLogic Server connection. If necessary, you can modify this sample code and reuse it. You might, for example, want to accommodate the local or remote port number in your filter or a more site-specific algorithm that will reduce filtering overhead. For instructions on how to build, configure, and run these samples, see the `package-summary.html` file included with in the examples.

The `SimpleConnectionFilter` example implements the `ConnectionFilter` interface and filters connections using rules that you define in the filter file.

```
public class SimpleConnectionFilter implements ConnectionFilter {
  public static final String FILTER_FILE = "filter";

  private FilterEntry[] rules;
  ...
```

The `SimpleConnectionFilter2` example implements the `ConnectionFilter` and `ConnectionFilterRulesListener` interfaces and filters connections using the rules that you define using the Administration Console.

```
public class SimpleConnectionFilter2
  implements ConnectionFilter, ConnectionFilterRulesListener {

  private FilterEntry[] rules;
  private Vector entries;
  ...
```

In Listing 7-1, WebLogic Server calls the `SimpleConnectionFilter.accept()` method with a `ConnectionEvent`. The `SimpleConnectionFilter.accept()` method gets the remote address and protocol and converts the protocol to a bitmask to avoid string comparisons in rule-matching. Then the `SimpleConnectionFilter.accept()` method compares the remote address and protocol against each rule until it finds a match.

This code fragment is taken from the `SimpleConnectionFilter.java` file in the Network Connection Filter code example.

Listing 7-1 Example of Filtering Network Connections

```
  public void accept(ConnectionEvent evt)
    throws FilterException
  {
    InetAddress remoteAddress = evt.getRemoteAddress();
    String protocol = evt.getProtocol().toLowerCase();
    int bit = protocolToMaskBit(protocol);

    if (bit == 0xdeadbeef)
    {
      bit = 0;
    }
    // Check rules in the order in which they were written.
    for (int i = 0; i < rules.length; i++)
    {
      switch (rules[i].check(remoteAddress, bit))
      {
      case FilterEntry.ALLOW:
        return;
```

```
      case FilterEntry.DENY:
        throw new FilterException("rule " + (i + 1));
      case FilterEntry.IGNORE:
        break;
      default:
        throw new RuntimeException("connection filter internal error!");
      }
    }
    // If no rule matched, we allow the connection to succeed.
    return;
  }
```

CHAPTER 8

Using Java Security to Protect WebLogic Resources

This section discusses the following topics:

Using Java EE Security to Protect WebLogic Resources

WebLogic Server supports the use of Java EE security to protect URL (Web), Enterprise JavaBeans (EJBs), and Connector components. In addition, WebLogic Server extends the connector model of specifying additional security policies in the deployment descriptor to the URL and EJB components.

Note: Java EE has requirements for Java 2 security default permissions for different application types (see the Java EE 5.0 specification) as does the Java EE Connector Architecture specification.

The connector specification provides for deployment descriptors to specify additional security policies using the `<security-permission>` tag (see Listing 8-1):

Listing 8-1 Security-Permission Tag Sample

```
<security-permission>
<description> Optional explanation goes here </description>
<security-permission-spec>
<!—
```

```
A single grant statement following the syntax of
http://java.sun.com/j2se/1.4.2/docs/guide/security/PolicyFiles.html#FileSy
ntax without the “codebase” and “signedBy” clauses goes here. For example:
-->
grant {
permission java.net.SocketPermission “*”, “resolve”;
};
</security-permission-spec>
</security-permission>
```

Besides support of the `<security-permission>` tag in the `rar.xml` file, WebLogic Server adds the `<security-permission>` tag to the `weblogic.xml` and `weblogic-ejb-jar.xml` files. This extends the connector model to the two other application types, Web applications and EJBs, provides a uniform interface to security policies across all component types, and anticipates future Java EE specification changes.

Using the Java Security Manager to Protect WebLogic Resources

The Java Security Manager can be used with WebLogic Server to provide additional protection for resources running in a Java Virtual Machine (JVM). Using a Java Security Manager is an optional security step. The following sections describe how to use the Java Security Manager with WebLogic Server:

- “Setting Up the Java Security Manager” on page 8-2
- “Using the Java Authorization Contract for Containers” on page 8-6

For more information on Java Security Manager, see the Java Security Web page at `http://java.sun.com/j2se/1.5.0/docs/guide/security/index.html`.

Setting Up the Java Security Manager

When you run WebLogic Server under Java 2 (SDK 1.2 or later), WebLogic Server can use the Java Security Manager in Java 2, which prevents untrusted code from performing actions that are restricted by the Java security policy file.

The JVM has security mechanisms built into it that allow you to define restrictions to code through a Java security policy file. The Java Security Manager uses the Java security policy file to enforce a set of permissions granted to classes. The permissions allow specified classes running in that instance of the JVM to permit or not permit certain runtime operations. In many cases, where the threat model does not include malicious code being run in the JVM, the Java Security Manager is unnecessary. However, when untrusted third-parties use WebLogic Server and untrusted classes are being run, the Java Security Manager may be useful.

To use the Java Security Manager with WebLogic Server, specify the `-Djava.security.policy` and `-Djava.security.manager` arguments when starting WebLogic Server. The `-Djava.security.policy` argument specifies a filename (using a relative or fully-qualified pathname) that contains Java 2 security policies.

WebLogic Server provides a sample Java security policy file, which you can edit and use. The file is located at *`WL_HOME`*`\server\lib\weblogic.policy`.

If you enable the Java Security Manager but do not specify a security policy file, the Java Security Manager uses the default security policies defined in the `java.policy` file in the *`$JAVA_HOME`*`\jre\lib\security` directory.

Define security policies for the Java Security Manager in one of the following ways:

- "Modifying the weblogic.policy file for General Use" on page 8-3
- "Setting Application-Type Security Policies" on page 8-4
- "Setting Application-Specific Security Policies" on page 8-5

Modifying the weblogic.policy file for General Use

To use the Java Security Manager security policy file with your WebLogic Server deployment, you must specify the location of the `weblogic.policy` file to the Java Security Manager when you start WebLogic Server. To do this, you set the following arguments on the Java command line you use to start the server:

- `java.security.manager` tells the JVM to use a Java security policy file.
- `java.security.policy` tells the JVM the location of the Java security policy file to use. The argument is the fully qualified name of the Java security policy, which in this case is `weblogic.policy`.

For example:

```
java...-Djava.security.manager \
   -Djava.security.policy==c:\weblogic\weblogic.policy
```

Note: Be sure to use == instead of = when specifying the `java.security.policy` argument so that only the `weblogic.policy` file is used by the Java Security Manager. The == causes the `weblogic.policy` file to override any default security policy. A single equal sign (=) causes the `weblogic.policy` file to be appended to an existing security policy.

If you have extra directories in your `CLASSPATH` or if you are deploying applications in extra directories, add specific permissions for those directories to your `weblogic.policy` file.

BEA recommends taking the following precautions when using the `weblogic.policy` file:

- Make a backup copy of the `weblogic.policy` file and put the backup copy in a secure location.
- Set the permissions on the `weblogic.policy` file via the operating system such that the administrator of the WebLogic Server deployment has write and read privileges and no other users have access to the file.

Caution: The Java Security Manager is partially disabled during the booting of Administration and Managed Servers. During the boot sequence, the current Java Security Manager is disabled and replaced with a variation of the Java Security Manager that has the `checkRead()` method disabled. While disabling this method greatly improves the performance of the boot sequence, it also minimally diminishes security. The startup classes for WebLogic Server are run with this partially disabled Java Security Manager and therefore the classes need to be carefully scrutinized for security considerations involving the reading of files.

For more information about the Java Security Manager, see the Javadoc for the `java.lang.SecurityManager` class.

Setting Application-Type Security Policies

Set default security policies for Servlets, EJBs, and Java EE Connector Resource Adapters in the Java security policy file. The default security policies for Servlets, EJBs, and Resource Adapters are defined in the Java security policy file under the following codebases:

- Servlets—`"file:/weblogic/application/defaults/Web"`
- EJBs—`"file:/weblogic/application/defaults/EJB"`
- Resource Adapters—`"file:/weblogic/application/defaults/Connector"`

Note: These security policies apply to all Servlets, EJBs, and Resource Adapters deployed in the particular instance of WebLogic Server.

Setting Application-Specific Security Policies

Set security policies for a specific Servlet, EJB, or Resource Adapter by adding security policies to their deployment descriptors. Deployment descriptors are defined in the following files:

- Servlets—`weblogic.xml`
- EJBs—`weblogic-ejb-jar.xml`
- Resource Adapters—`rar.xml`

Note: The security policies for Resource Adapters follow the Java EE standard while the security policies for Servlets and EJBs follow the WebLogic Server extension to the Java EE standard.

Listing 8-2 shows the syntax for adding a security policy to a deployment descriptor:

Listing 8-2 Security Policy Syntax

```
<security-permission>
 <description>
  Allow getting the J2EEJ2SETest4 property
 </description>
 <security-permission-spec>
  grant {
   permission java.util.PropertyPermission "welcome.J2EEJ2SETest4","read";
  };
 </security-permission-spec>
</security-permission>
```

Note: The `<security-permission-spec>` tag cannot currently be added to a `weblogic-application.xml` file, you are limited to using this tag within a `weblogic-ejb-jar.xml`, `rar.xml`, or `weblogic.xml` file. Also, variables are not supported in the `<security-permission-spec>` attribute.

Using the Java Authorization Contract for Containers

The Java Authorization Contract for Containers (JACC) is part of Java EE. JACC extends the Java 2 permission-based security model to EJBs and Servlets. JACC is defined by JSR-115.

JACC provides an alternate authorization mechanism for the EJB and Servlet containers in a WebLogic Server domain. As shown in Table 8-1, when JACC is configured, the WebLogic Security framework access decisions, adjudication, and role mapping functions are not used for EJB and Servlet authorization decisions.

WebLogic Server implements a JACC provider which, although fully compliant with JSR-115, is not as optimized as the WebLogic Authorization provider. The Java JACC classes are used for rendering access decisions. Because JSR-115 does not define how to address role mapping, WebLogic JACC classes are used for role-to-principal mapping. See http://java.sun.com/j2ee/javaacc for information on developing a JACC provider.

Note: The JACC classes used by WebLogic Server do not include an implementation of a Policy object for rendering decisions but instead rely on the `java.security.Policy` object.

This section discusses the following topics:

- "Comparing the WebLogic JACC Provider with the WebLogic Authentication Provider" on page 8-7
- "Enabling the WebLogic JACC Provider" on page 8-8

Table 8-1 shows which providers are used for role mapping when JACC is enabled.

Table 8-1 When JACC is Enabled

	Provider used for EJB/Servlet Authorization and Role Mapping	Provider used for all other Authorization and Role Mapping	EJB/Servlet Roles and Policies Can be Viewed and Modified by the Administration Console
JACC is enabled	JACC provider	WebLogic Security Framework providers	No
JACC is not enabled	WebLogic Security Framework providers	WebLogic Security Framework providers	Yes, depending on settings

Note: In a domain, either enable JACC on all servers or on none. The reason is that JACC is server-specific while the WebLogic Security Framework is realm/domain specific. If you enable JACC, either by using the WebLogic JACC provider or (recommended) by creating your own JACC provider, you are responsible for keeping EJB and Servlet authorization policies synchronized across the domain. For example, applications are redeployed each time a server boots. If a server configured for JACC reboots without specifying the JACC options on the command line, the server will use the default WebLogic Authorization provider for EJB and Servlet role mapping and authorization decisions.

Comparing the WebLogic JACC Provider with the WebLogic Authentication Provider

The WebLogic JACC provider fully complies with JSR-115; however, it does not support dynamic role mapping, nor does it address authorization decisions for resources other than EJBs and Servlets. For better performance, and for more flexibility regarding security features, BEA recommends using SSPI-based providers.

Table 8-2 compares the features provided by the WebLogic JACC provider with those of the WebLogic Authorization provider.

Table 8-2 Comparing the WebLogic JACC Provider with the WebLogic Authorization Provider

WebLogic JACC Provider	WebLogic Authorization Provider
Implements the JACC specification (JSR-115)	Value-added security framework
Addresses only EJB and Servlet deployment/authorization decisions	Addresses deployment/authorization decisions
Uses the `java.security.Policy` object to render decisions	Allows for multiple authorization/role providers
Static role mapping at deployment time	Dynamic role mapping
J2SE permissions control access	Entitlements engine controls access
Role and role-to-principal mappings are modifiable only through deployment descriptors	Roles and role-to-principal mappings are modifiable through deployment descriptors and the Administration Console

Enabling the WebLogic JACC Provider

To enable the WebLogic JACC Provider from the command line, you must specify the following system property/value pairs:

- Property: `java.security.manager`
  `Value:` No value required.
- Property: `java.security.policy`
  `Value:` A valid `weblogic.policy` file, specified using either a relative or an absolute pathname
- Property: `javax.security.jacc.PolicyConfigurationFactory`
  `Value: weblogic.security.jacc.PolicyConfigurationFactoryImpl`
- Property: `javax.security.jacc.PolicyConfigurationFactory`
  Value: `weblogic.security.jacc.PolicyConfigurationFactoryImpl`
- Property: `javax.security.jacc.policy.provider`
  Value: `weblogic.security.jacc.simpleprovider.SimpleJACCPolicy`
- Property: `weblogic.security.jacc.RoleMapperFactory.provider`
  Value: `weblogic.security.jacc.simpleprovider.RoleMapperFactoryImpl`

For example, assuming a properly configured `weblogic.policy` file, the following command line will enable the WebLogic JACC provider:

```
# ./startWebLogic.sh -Djava.security.manager\
-Djava.security.policy=<pathname>/weblogic.policy \
-Djavax.security.jacc.policy.provider=\
weblogic.security.jacc.simpleprovider.SimpleJACCPolicy \
-Djavax.security.jacc.PolicyConfigurationFactory.provider=\
weblogic.security.jacc.simpleprovider.PolicyConfigurationFactoryImpl \
-Dweblogic.security.jacc.RoleMapperFactory.provider=\
weblogic.security.jacc.simpleprovider.RoleMapperFactoryImpl
```

Note: Use `-Djava.security.policy==<pathname>/weblogic.security` if you want to override any default security policy. A single equal sign (=) causes the `weblogic.policy` file to be appended to an existing security policy.

CHAPTER 9

SAML APIs

The Security Assertion Markup Language, SAML, is an XML-based protocol for exchanging security information between disparate entities. The SAML standard defines a framework for exchanging security information between software entities on the Web. SAML security is based on the interaction of asserting and relying parties.

SAML provides single sign-on capabilities; users can authenticate at one location and then access service providers at other locations without having to log in multiple times.

WebLogic Server supports SAML version 1.1. The WebLogic Server implementation:

- Supports both the Browser/POST and Browser/Artifact Profiles
- Supports SAML authentication and attribute statements (does not support SAML authorization statements)

For a general description of SAML and SAML assertions in a WebLogic Server environment, see Security Assertion Markup Language (SAML) in *Understanding WebLogic Security*. For information on configuring a SAML credential mapping provider, see Configuring a SAML Credential Mapping Provider in *Securing WebLogic Server*.

For access to the SAML specifications, go to http://www.oasis-open.org. Also see the *Technical Overview of the OASIS Security Assertion Markup Language (SAML) V1.1* at www.oasis-open.org.

This section covers the following topics:

SAML API Description

Table 9-1 lists the WebLogic SAML APIs. See the Javadoc for details.

Table 9-1 WebLogic SAML APIs

WebLogic SAML API	Description
`weblogic.security.providers.saml`	The WebLogic SAML package.
`SAMLAssertionStore`	Interface which defines methods for storing and retrieving assertions for the Artifact profile. This interface is deprecated in favor of SAMLAssertionStoreV2.
`SAMLAssertionStoreV2`	The SAMLAssertionStoreV2 interface extends the SAMLAssertionStore interface, adding methods to support identification and authentication of the destination site requesting an assertion from the SAML ARS. Note that V2 refers to the second version of the WebLogic SAML provider, not to version 2 of the SAML specification.
`SAMLAssertionStoreV2.AssertionInfo`	The AssertionInfo class is returned by SAMLAssertionStoreV2.retrieveAssertionInfo(). It contains the retrieved assertion and related information. An implementation of the SAMLAssertionStoreV2 interface would have to return this class.
`SAMLCredentialNameMapper`	Interface which defines methods used to map subject information to fields in a SAML assertion.
`SAMLIdentityAssertionNameMapper`	Interface which defines methods used to map information from a SAML assertion to user and group names.

Table 9-1 WebLogic SAML APIs

`SAMLUsedAssertionCache`	Interface which defines methods for caching assertion IDs so that the POST profile one-use policy can be enforced. Classes implementing this interface must have a public no-arg constructor.
`SAMLNameMapperInfo`	Instances of this class are used to pass user and group information to and from the name mappers. The class also defines several useful constants.

Note: The SAML name mapper classes are required to be in the system classpath. If you create a custom SAMLIdentityAssertionNameMapper, SAMLCredentialNameMapper, SAMLAssertionStore, or SAMLUsedAssertionCache, you must place the respective class in the system classpath.

Custom POST Form Parameter Names

The parameters names passed to the POST form when a custom POST form is specified for SAML POST profile handling depend on which SAML provider is configured.

- For the WebLogic Server 9.1and higher, Federation Services implementation (in effect when V2 providers are configured), see Table 9-2, "SAML V2 Provider Custom POST Form Parameters," on page 9-4.
- For the WebLogic Server 9.0 SAML services implementation (in effect when V1 providers are configured), see Table 9-3, "SAML V1 Provider Custom POST Form Parameters," on page 9-4.

The tables provide the parameter names and their data types (required for casting the returned Java Object).

For both implementations, the SAML response itself is passed using the parameter name specified by SAML:

SAMLResponse (String): The base64-encoded SAML Response element.

Table 9-2 SAML V2 Provider Custom POST Form Parameters

Parameter	Description
TARGET (String)	The TARGET URL specified as a query parameter on the incoming Intersite Transfer Service (ITS) request.
SAML_AssertionConsumerURL (String)	The URL of the Assertion Consumer Service (ACS) at the destination site (where the form should be POSTed).
SAML_AssertionConsumerParams (Map)	A Map containing name/value mappings for the assertion consumer parameters configured for the relying party. Names and values are Strings.
SAML_ITSRequestParams (Map)	A Map containing name/value mappings for the query parameters received with the ITS request. Names and values are Strings. The Map may be empty. TARGET and Rich Presence Information Data Format (RPID) parameters are removed from the map before passing it to the form.

Table 9-3 SAML V1 Provider Custom POST Form Parameters

Parameter	Description
targetURL (String)	The TARGET URL specified as a query parameter on the incoming ITS request.
consumerURL (String)	The URL of the ACS at the destination site (where the form should be POSTed).

CHAPTER 10

Using CertPath Building and Validation

The WebLogic Security service provides the Certificate Lookup and Validation (CLV) API that finds and validates X509 certificate chains.

A CertPath is a JDK class that stores a certificate chain in memory. The term CertPath is also used to refer to the JDK architecture and framework that is used to locate and validate certificate chains. The CLV framework extends and completes the JDK CertPath functionality. CertPath providers rely on a tightly-coupled integration of WebLogic and JDK interfaces.

Your application code can use the default CertPath providers provided by WebLogic Server to build and validate certificate chains, or any custom CertPath providers.

The following topics are covered in this section:

CertPath Building

To use a CertPath Builder in your application, follow these steps:

1. "Instantiate a CertPathSelector" on page 10-2
2. "Instantiate a CertPathBuilderParameters" on page 10-3
3. "Use the JDK CertPathBuilder Interface" on page 10-4

Instantiate a CertPathSelector

The CertPathSelector interface (`weblogic.security.pk.CertPathSelector`) contains the selection criteria for locating and validating a certification path. Because there are many ways to look up certification paths, a derived class is implemented for each type of selection criteria.

Each selector class has one or more methods to retrieve the selection data and a constructor.

The classes in `weblogic.security.pk` that implement the CertPathSelector interface, one for each supported type of certificate chain lookup, are as follows:

- EndCertificateSelector - used to find and validate a certificate chain given its end certificate.
- IssuerDNSerialNumberSelector - used to find and validate a certificate chain from its end certificate's issuer DN and serial number.
- SubjectDNSelector - used to find and validate a certificate chain from its end certificate's subject DN.
- SubjectKeyIdentifierSelector - used to find and validate a certificate chain from its end certificate's subject key identifier (an optional field in X509 certificates).

Notes: The selectors that are supported depend on the configured CertPath providers. The configured CertPath providers are determined by the administrator.

The WebLogic CertPath provider uses only the `EndCertificateSelector` selector.

Listing 10-1 shows an example of choosing a selector.

Listing 10-1 Make a certificate chain selector

```
// you already have the end certificate
// and want to use it to lookup and
// validate the corresponding chain
X509Certificate endCertificate = ...

// make a cert chain selector
CertPathSelector selector = new EndCertificateSelector(endCertificate);
```

Instantiate a CertPathBuilderParameters

You pass an instance of `CertPathBuilderParameters` as the `CertPathParameters` object to the JDK's `CertPathBuilder.build()` method.

The following constructor and method are provided:

CertPathBuilderParameters

```
public CertPathBuilderParameters(String realmName,
                                 CertPathSelector selector,
                                 X509Certificate[] trustedCAs,
                                 ContextHandler context)
```

Constructs a CertPathBuilderParameters.

You must provide the realm name. To do this, get the domain's SecurityConfigurationMBean. Then, get the SecurityConfigurationMBean's default realm attribute, which is a realm MBean. Finally, get the realm MBean's name attribute. You must use the runtime JMX MBean server to get the realm name.

You must provide the `selector`. You use one of the `weblogic.security.pk.CertPathSelector` interfaces derived classes, described in "Instantiate a CertPathSelector" on page 10-2 to specify the selection criteria for locating and validating a certification path.

Specify trusted CAs if you have them. Otherwise, the server's trusted CAs are used. These are just a hint to the configured CertPath builder and CertPath validators which, depending on their lookup/validation algorithm, may or may not use these trusted CAs.

ContextHandler is used to pass in an optional list of name/value pairs that the configured CertPathBuilder and CertPathValidators may use to look up and validate the chain. It is

symmetrical with the context handler passed to other types of security providers. Setting context to null indicates that there are no context parameters.

clone

`Object clone()`

This interface is not cloneable.

Listing 10-2 shows an example of passing an instance of CertPathBuilderParameters.

Listing 10-2 Pass An Instance of CertPathBuilderParameters

```
// make a cert chain selector
CertPathSelector selector = new EndCertificateSelector(endCertificate);

String realm = _;

// create and populate a context handler if desired, or null
ContextHandler context = _;

// pass in a list of trusted CAs if desired, or null
X509Certificate[] trustedCAs = _;

// make the params

CertPathBuilderParams params =
new CertPathBuilderParameters(realm, selector, context, trustedCAs);
```

Use the JDK CertPathBuilder Interface

The `java.security.cert.CertPathBuilder` interface is the API for the `CertPathBuilder` class. To use the JDK CertPathBuilder interface, do the following:

1. Call the static `CertPathBuilder.getInstance` method to retrieve the CLV framework's CertPathBuilder. You must specify "WLSCertPathBuilder" as the algorithm name that's passed to the call
2. Once the CertPathBuilder object has been obtained, call the "build" method on the returned CertPathBuilder. This method takes one argument - a CertPathParameters that indicates which chain to find and how it should be validated.

   You must pass an instance of `weblogic.security.pk.CertPathBuilderParameters` as

the CertPathParameters object to the JDK's CertPathBuilder.build() method, as described in "Instantiate a CertPathBuilderParameters" on page 10-3.

3. If successful, the result (including the CertPath that was built) is returned in an object that implements the CertPathBuilderResult interface. The builder determines how much of the CertPath is returned.
4. If not successful, the CertPathBuilder build method throws InvalidAlgorithmParameterException if the params is not a WebLogic CertPathBuilderParameters, if the configured CertPathBuilder does not support the selector, or if the realm name does not match the realm name of the default realm from when the server was booted.

   The CertPathBuilder build method throws CertPathBuilderException if the cert path could not be located or if the located cert path is not valid

Example Code Flow for Looking Up a Certificate Chain

Listing 10-3 Looking up a Certificate Chain

```
import weblogic.security.pk.CertPathBuilderParameters;
import weblogic.security.pk.CertPathSelector;
import weblogic.security.pk.EndCertificateSelector;
import weblogic.security.service.ContextHandler;
import java.security.cert.CertPath;
import java.security.cert.CertPathBuilder;
import java.security.cert.X509Certificate;

// you already have the end certificate
// and want to use it to lookup and
// validate the corresponding chain
X509Certificate endCertificate = ...


// make a cert chain selector
CertPathSelector selector = new EndCertificateSelector(endCertificate);


String realm = _;
```

```
// create and populate a context handler if desired
ContextHandler context = _;


// pass in a list of trusted CAs if desired
X509Certificate[] trustedCAs = _;


// make the params
CertPathBuilderParams params =
new CertPathBuilderParameters(realm, selector, context, trustedCAs);
// get the WLS CertPathBuilder
CertPathBuilder builder =
CertPathBuilder.getInstance("WLSCertPathBuilder");


// use it to look up and validate the chain
CertPath certpath = builder.build(params).getCertPath();
X509Certificate[] chain =
certpath.getCertificates().toArray(new X509Certificate[0]);
```

CertPath Validation

To use a CertPath Validator in your application, follow these steps:

1. "Instantiate a CertPathValidatorParameters" on page 10-6
2. "Use the JDK CertPathValidator Interface" on page 10-8

Instantiate a CertPathValidatorParameters

You pass an instance of `CertPathValidatorParameters` as the `CertPathParameters` object to the JDK's `CertPathValidator.validate()` method.

The following constructor and method are provided:

CertPathValidatorParameters

```
public CertPathValidatorParameters(String realmName,
                                   X509Certificate[] trustedCAs,
                                   ContextHandler context)
```

Constructs a CertPathValidatorParameters.

You must provide the realm name. To do this, get the domain's SecurityConfigurationMBean. Then, get the SecurityConfigurationMBean's default realm attribute, which is a realm MBean. Finally, get the realm MBean's name attribute. You must use the runtime JMX MBean server to get the realm name.

Specify trusted CAs if you have them. Otherwise, the server's trusted CAs are used. These are just a hint to the configured CertPath builder and CertPath validators which, depending on their lookup/validation algorithm, may or may not use these trusted CAs.

ContextHandler is used to pass in an optional list of name/value pairs that the configured CertPathBuilder and CertPathValidators may use to look up and validate the chain. It is symmetrical with the context handler passed to other types of security providers. Setting context to null indicates that there are no context parameters.

clone

```
Object clone()
```

This interface is not cloneable.

Listing 10-4 shows an example of passing an instance of CertPathValidatorParameters.

Listing 10-4 Pass an Instance of CertPathValidatorParameters

```
// get the WLS CertPathValidator
CertPathValidator validator =
CertPathValidator.getInstance("WLSCertPathValidator");


String realm = _;


// create and populate a context handler if desired, or null
ContextHandler context = _;
```

```
// pass in a list of trusted CAs if desired, or null
X509Certificate[] trustedCAs = _;


// make the params (for the default security realm)
CertPathValidatorParams params =
new CertPathValidatorParams(realm, context, trustedCAs);
```

Use the JDK CertPathValidator Interface

The `java.security.cert.CertPathValidator` interface is the API for the `CertPathValidator` class. To use the JDK CertPathValidator interface, do the following:

1. Call the static `CertPathValidator.getInstance` method to retrieve the CLV framework's CertPathValidator. You must specify "WLSCertPathValidator" as the algorithm name that's passed to the call.
2. Once the CertPathValidator object has been obtained, call the "validate" method on the returned CertPathValidator. This method takes one argument - a CertPathParameters that indicates how it should be validated.

   You must pass an instance of `weblogic.security.pk.CertPathValidatorParameters` as the CertPathParameters object to the JDK's `CertPathValidator.validate`() method, as described in "Instantiate a CertPathValidatorParameters" on page 10-6.
3. If successful, the result is returned in an object that implements the CertPathValidatorResult interface.
4. If not successful, the `CertPathValidator.validate`() method throws InvalidAlgorithmParameterException if params is not a WebLogic CertPathValidatorParameters or if the realm name does not match the realm name of the default realm from when the server was booted.

   The CertPathValidator validate method throws CertPathValidatorException if the certificates in the CertPath are not ordered (the end certificate must be the first cert) or if the CertPath is not valid.

Example Code Flow for Validating a Certificate Chain

Listing 10-5 Performing Extra Validation

```
import weblogic.security.pk.CertPathValidatorParams;
import weblogic.security.service.ContextHandler;
import java.security.cert.CertPath;
import java.security.cert.CertPathValidator;
import java.security.cert.X509Certificate;


// you already have an unvalidated X509 certificate chain
// and you want to get it validated
X509Certificate[] chain = ...


// convert the chain to a CertPath

CertPathFactory factory = CertPathFactory.getInstance("X509");
ArrayList list = new ArrayList(chain.length);
for (int i = 0; i < chain.length; i++) {
list.add(chain[i]);
}

CertPath certPath = factory.generateCertPath(list);


// get the WLS CertPathValidator
CertPathValidator validator =
CertPathValidator.getInstance(“WLSCertPathValidator”);


String realm = _;


// create and populate a context handler if desired, or null
ContextHandler context = _;
```

```
// pass in a list of trusted CAs if desired, or null
X509Certificate[] trustedCAs = _;


// make the params (for the default security realm)
CertPathValidatorParams params =
new CertPathValidatorParams(realm, context, trustedCAs);


// use it to validate the chain
validator.validate(certPath, params);
```

APPENDIX A

Deprecated Security APIs

Some or all of the Security interfaces, classes, and exceptions in the following WebLogic security packages were deprecated prior to this release of WebLogic Server:

- `weblogic.security.service`
- `weblogic.security.SSL`

For specific information on the interfaces, classes, and exceptions deprecated in each package, see the Javadocs for WebLogic Classes.