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Preface

This document introduces and explains the underlying concepts of the WebLogic Security Service in Oracle WebLogic Server 26.1.0.0.

Audience

This document is intended for the following audiences:

- Application Architects - Architects who, in addition to setting security goals and designing the overall security architecture for their organizations, evaluate WebLogic Server security features and determine how to best implement them. Application Architects have in-depth knowledge of Java programming, Java security, and network security, as well as knowledge of security systems and leading-edge, security technologies and tools.
- 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, and work with 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.
- Application Developers - Developers who are Java programmers that focus on developing client applications, adding security to Web applications and EJBs, and working with other engineering, quality assurance (QA), and database teams to implement security features. Application Developers have in-depth/working knowledge of Java (including Jakarta Platform, Enterprise Edition (Jakarta EE) components such as servlets/JSPs and JSSE) and Java security.
- Server Administrators - Administrators 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. Server administrators have in-depth knowledge of the Java security architecture, including Web services, Web application and EJB security, Public Key security, SSL, and Security Assertion Markup Language (SAML).
- Application Administrators - Administrators who work with 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.

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Diversity and Inclusion

Oracle is fully committed to diversity and inclusion. Oracle respects and values having a diverse workforce that increases thought leadership and innovation. As part of our initiative to build a more inclusive culture that positively impacts our employees, customers, and partners, we are working to remove insensitive terms from our products and documentation. We are also mindful of the necessity to maintain compatibility with our customers' existing technologies and the need to ensure continuity of service as Oracle's offerings and industry standards evolve. Because of these technical constraints, our effort to remove insensitive terms is ongoing and will take time and external cooperation.

Related Documentation

The following WebLogic Server documents contain information that is relevant to the WebLogic Security Service:

- *Administering Security for Oracle WebLogic Server* - This document explains how to configure security for WebLogic Server.
- *Developing Security Providers for Oracle 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 a Production Environment for Oracle WebLogic Server* - This document highlights essential security measures for you to consider before you deploy WebLogic Server into a production environment.
- *Securing Resources Using Roles and Policies for Oracle WebLogic Server* - This document introduces the various types of WebLogic resources, and provides information that allows you to secure these resources using WebLogic Server. The current version of this document primarily focuses on securing URL (Web) and EJB resources.
- *Upgrading Oracle WebLogic Server* - This document provides procedures and other information you need to upgrade earlier versions of WebLogic Server to the latest version. For specific information on upgrading WebLogic Server, see *Upgrading Oracle WebLogic Server*.
- *Java API Reference for Oracle WebLogic Server* - This document provides reference documentation for the WebLogic security packages that are provided with and supported by this release of WebLogic Server.

Security Samples and Tutorials

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

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New and Changed WebLogic Server Features

For a comprehensive listing of the new WebLogic Server features introduced in this release, see *What's New in Oracle WebLogic Server*.

Conventions

The following text conventions are used in this document:

Convention	Meaning
boldface	Boldface type indicates graphical user interface elements associated with an action, or terms defined in text or the glossary.
italic	Italic type indicates book titles, emphasis, or placeholder variables for which you supply particular values.
`monospace`	Monospace type indicates commands within a paragraph, URLs, code in examples, text that appears on the screen, or text that you enter.

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1

Introduction

While other security documents in the WebLogic Server documentation set guide users through specific tasks - such as programming WebLogic security, developing a custom security provider, or managing the WebLogic Security Service - this guide is intended for all users of the WebLogic Security Service. Thus, this document is the starting point for understanding the WebLogic Security Service.

> **Note**
>
> The WebLogic Security Service involves many unique terms. Before reading this manual, familiarize yourself with the terms in Glossary.

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Overview of the WebLogic Security Service

WebLogic Server includes a security architecture that provides a unique and secure foundation for applications that are available via the Web. By taking advantage of the security features in WebLogic Server, enterprises benefit from a comprehensive, flexible security infrastructure designed to address the security challenges of making applications available on the Web. WebLogic security can be used standalone to secure WebLogic Server applications or as part of an enterprise-wide, security management system that represents a best-in-breed, security management solution.

- Features of the WebLogic Security Service
- Balancing Ease of Use and Customizability

Features of the WebLogic Security Service

The open, flexible security architecture of WebLogic Server introduces an advanced security design for application servers. Companies now have a unique application server security solution that can assure the confidentiality, integrity, and availability of the server and its data.

The key features of the WebLogic Security Service include:

- A comprehensive and standards-based design.
- End-to-end security for WebLogic Server-hosted applications, from the mainframe to the Web browser.
- Legacy security schemes that integrate with WebLogic Server security, allowing companies to leverage existing investments.
- Security tools that are integrated into a flexible, unified system to ease security management across the enterprise.
- Easy customization of application security to business requirements through mapping of company business rules to security policies.
- A consistent model for applying security policies to Jakarta EE and application-defined resources.
- Security policy management using expressions that determine access to WebLogic resources.
- Easy adaptability for customized security solutions.
- A modularized architecture, so that security infrastructures can change over time to meet the requirements of a particular company.
- Support for configuring multiple security providers, as part of a transition scheme or upgrade path.
- A separation between security details and application infrastructure, making security easier to deploy, manage, maintain, and modify as requirements change.
- WebLogic security providers supply the standard security services. Available providers support authentication against the embedded LDAP server, external LDAP directories, and databases. Selected providers can use an external RDBMS security store.

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- Customization of security schemes using custom security providers
- Unified management of security rules, security policies, and security providers through the WebLogic Remote Console.
- Support for standard Java security technologies such as the Java Authentication and Authorization Service (JAAS), Java Secure Sockets Extensions (JSSE), Java Cryptography Extensions (JCE), Jakarta Authentication, Jakarta Authorization, and Jakarta Security.
- A foundation for Web services security including support for Security Assertion Markup Language (SAML) 2.0.
- Capabilities which allow WebLogic Server to participate in single sign-on (SSO) with web sites, web applications, and desktop clients.
- A framework for managing public keys which includes certificate lookup, verification, validation, and revocation as well as a certificate registry.
- Feature compatibility controls manage selected changes to security behavior. WebLogic Server 26.1 enables the associated security protections by default. Review the applicable settings and interoperability requirements when upgrading. See Managing Gated Security Features in *Administering Security for Oracle WebLogic Server*.
- The Certificate Management Service manages certificate issuance, renewal, storage, and distribution for supported WebLogic Server and Node Manager configurations. See Managing Certificates with the Certificate Management Service in *Administering Security for Oracle WebLogic Server*.

Balancing Ease of Use and Customizability

The components and services of the WebLogic Security Service seek to strike a balance between ease of use, manageability (for end users and administrators), and customizability (for application developers and security developers).

The following paragraphs highlight some examples:

Easy to use: WebLogic Server provides a Domain Configuration Wizard to help with the creation of new domains that contain an Administration Server, and optionally Managed Servers, and clusters. You can also extend existing domains by adding individual servers. The Domain Configuration Wizard also automatically generates a `config.xml` file and start scripts for the servers in the new domain.

Manageable: Administrators who configure and deploy applications in the WebLogic Server environment can use the WebLogic security providers included with the product. These default providers support all required security functions, out of the box. An administrator can store security data in the WebLogic Server-supplied, security store (an embedded, special-purpose, LDAP directory server) or use an external LDAP server, database, or user source. To simplify the configuration and management of security in WebLogic Server, a robust, default security configuration is provided.

Customizable: For application developers, WebLogic Server supports the WebLogic security API and Java security standards such as JAAS, JSSE, JCE, Jakarta Authorization, Jakarta Authentication, and Jakarta Security. Using these APIs and standards, you can create a fine-grained and customized security environment for applications that connect to WebLogic Server.

For security developers, the WebLogic Server Security Service Provider Interfaces (SSPIs) support the development of custom security providers for the WebLogic Server environment.

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Security Fundamentals

Learn about the fundamental security concepts in WebLogic Server, such as auditing, authentication, authorization, identity and trust, Security Assertion Markup Language (SAML) and more.

- Auditing
- Authentication
- Security Assertion Markup Language (SAML)
- Single Sign-On (SSO)
- Authorization
- Identity and Trust
- Secure Sockets Layer (SSL)
- Firewalls
- Jakarta EE and WebLogic Security
- Jakarta Authentication Security
- Jakarta Security

Auditing

Auditing is the process whereby information about operating requests and the outcome of those requests are collected, stored, and distributed for the purposes of non-repudiation. In other words, auditing provides an electronic trail of computer activity. In the WebLogic Server security architecture, an Auditing provider is used to provide auditing services.

When an Auditing provider is configured, the WebLogic Security Framework and security providers can send it audit events for security operations, such as authentication or authorization. Configuration changes and management operations are sent to the Security Audit Framework when the domain `ConfigurationAuditType` attribute is set to `audit` or `logaudit`. The decision to audit a particular event is made by the Auditing provider itself and can be based on specific audit criteria and/or severity levels. The records containing the audit information may be written to output repositories such as an LDAP server, database, and a simple file.

Authentication

Authentication is the process of deriving the identity of the users or system processes. WebLogic Server provides authentication services through Authentication providers. Learn about the authentication concepts and functionality.

Authentication is the mechanism by which callers prove that they are acting on behalf of specific users or systems. Authentication answers the question, "Who are you?" using credentials such as username/password combinations.

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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. During the authentication process, a Principal Validation provider provides additional security protections for the principals (users and groups) contained within the subject by signing and verifying the authenticity of those principals.

The following sections describe authentication concepts and functionality.

- Subjects and Principals
- Java Authentication and Authorization Service (JAAS)
- CallbackHandlers
- Mutual Authentication
- Servlet Authentication Filters
- Identity Assertion Providers and LoginModules
- Identity Assertion and Tokens
- Types of Authentication

> **Note**
>
> - For information on using Jakarta Authentication for authentication, see Jakarta Authentication Security.
> - For information on using the Jakarta Security specification for authentication, see Jakarta Security.

Subjects and Principals

A principal is an identity assigned to a user or group as a result of authentication. Both users and groups can be used as principals by application servers such as WebLogic Server. The Java Authentication and Authorization Service (JAAS) requires that subjects be used as containers for authentication information, including principals.

Figure 3-1 illustrates the relationships among users, groups, principals, and subjects.

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Figure 3-1 Relationships Among Users, Groups, Principals, and Subjects



During successful authentication, an Authentication provider's LoginModule populates a subject with principals. The WebLogic Security Framework uses the configured Principal Validation providers to sign supported principals. When the framework validates an identity, those providers verify the corresponding principal signatures to detect alteration. Retrieving a principal from a JAAS subject does not itself perform principal validation.

A principal representing a WebLogic Server user implements the `weblogic.security.spi.WLSUser` interface. A principal representing a WebLogic Server group implements the `weblogic.security.spi.WLSGroup` interface.

Java Authentication and Authorization Service (JAAS)

WebLogic Server uses Java Authentication and Authorization Service (JAAS) classes to authenticate clients and to implement its internal authentication services.

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 your application.

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

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JAAS LoginModules

A LoginModule is the work-horse of authentication: all LoginModules are responsible for authenticating users within the security realm and for populating a subject with the necessary principals (users/groups). LoginModules that are *not* used for perimeter authentication also verify the proof material submitted (for example, a user's password).

If there are multiple Authentication providers configured in a security realm, each of the Authentication providers' LoginModules will store principals within the same subject. Therefore, if a principal that represents a WebLogic Server user (that is, an implementation of the `WLSUser` interface) named "Joe" is added to the subject by one Authentication provider's LoginModule, any other Authentication provider in the security realm should be referring to the same person when they encounter "Joe". In other words, the other Authentication providers' LoginModules should not attempt to add another principal to the subject that represents a WebLogic Server user (for example, named "Joseph") to refer to the same person. However, it is acceptable for another Authentication provider's LoginModule to add a principal of a type other than `WLSUser` with the name "Joseph".

JAAS Control Flags

When a security realm has multiple Authentication providers, the configured provider order determines the order in which their LoginModules are considered. Each provider's Control Flag determines how that module contributes to the overall authentication result and whether processing can continue to later modules. The values are as follows:

- REQUIRED - This LoginModule must succeed. Even if it fails, authentication proceeds down the list of LoginModules for the configured Authentication providers. This setting is the default.
- REQUISITE - This LoginModule must succeed. If other Authentication providers are configured and this LoginModule succeeds, authentication proceeds down the list of LoginModules. Otherwise, return control to the application.
- `SUFFICIENT` — This LoginModule is not required to succeed. If it succeeds and no earlier `REQUIRED` LoginModule has failed, authentication can complete without executing later LoginModules. A successful `SUFFICIENT` module does not override an earlier `REQUIRED` failure. If it fails, processing continues to later modules.
- OPTIONAL - The user is allowed to pass or fail the authentication test of this Authentication provider. However, if all Authentication providers configured in a security realm have the JAAS Control Flag set to OPTIONAL, the user must pass the authentication test of one of the configured providers.

CallbackHandlers

A JAAS `CallbackHandler` supplies authentication data or displays information requested by a LoginModule. Its `handle(Callback[])` method receives callback objects, such as `NameCallback`, `PasswordCallback`, and `TextInputCallback`. These interfaces and classes are in the `javax.security.auth.callback` package.

The `NameCallback` and `PasswordCallback` return the username and password, respectively. `TextInputCallback` can be used to access the data users enter into any additional fields on a login form (that is, fields other than those for obtaining the username and password). When used, there should be one `TextInputCallback` per additional form field, and the prompt string of each `TextInputCallback` must match the field name in the form. WebLogic Server only uses the `TextInputCallback` for form-based Web application login.

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An application implements a `CallbackHandler` and passes it to underlying security services so that they may interact with the application to retrieve specific authentication data, such as usernames and passwords, or to display certain information, such as error and warning messages.

`CallbackHandlers` are implemented in an application-dependent fashion. For example, implementations for an application with a graphical user interface (GUI) may pop up windows to prompt for requested information or to display error messages. An implementation may also choose to obtain requested information from an alternate source without asking the user.

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.

Mutual Authentication

With mutual authentication, both the client and the server are required to authenticate themselves to each other. This can be done by means of certificates or other forms of proof material.

WebLogic Server supports two-way SSL/TLS authentication, a form of mutual authentication in which the client and server authenticate each other using certificates. Mutual authentication can also be implemented by application-layer protocols. See One-way/Two-way SSL Authentication.

Identity Assertion Providers and LoginModules

When used with a LoginModule, Identity Assertion providers support single sign-on. For example, an Identity Assertion provider can process a SAML assertion so that users are not asked to sign on more than once.

The LoginModule that an Identity Assertion provider uses can be:

- Part of a custom Authentication provider you develop.
- Part of the WebLogic Authentication provider that Oracle developed and packaged with WebLogic Server.
- Part of a third-party security vendor's Authentication provider.

Unlike in a simple authentication situation, the LoginModules that Identity Assertion providers use *do not* verify proof material such as usernames and passwords; they simply verify that the user exists.

Identity Assertion and Tokens

Identity Assertion providers support user name mappers, which map a valid token to a WebLogic Server user.

An Identity Assertion provider can support and activate multiple token types. Configure its `ActiveTypes` attribute to select the supported token types that it will process. Within a security realm, an active token type normally can be assigned to only one Identity Assertion provider. The `Authorization` token type is an exception: multiple providers can be configured to process it.

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> **Note**
>
> To use the WebLogic Identity Assertion provider with X.509 certificates or X.501 distinguished names, you have the option of using the default user name mapper that is supplied with the WebLogic Server product (`weblogic.security.providers.authentication. DefaultUserNameMapperImpl`) or providing your own implementation of the `weblogic.security.providers.authentication.UserNameMapper` interface. See Do You Need to Develop a Custom Identity Assertion Provider? in *Developing Security Providers for Oracle WebLogic Server*.

Challenge Identity Assertion

Challenge identity assertion schemes provide for multiple challenges, responses messages, and state.

A WebLogic Server security realm can include security providers that support authentication protocols such as Microsoft's Windows NT Challenge/Response (NTLM), Simple and Protected GSS-API Negotiation Mechanism (SPNEGO), and other challenge/response authentication mechanisms. WebLogic Server includes a SPNEGO security provider, named the Negotiate Identity Assertion provider. You can develop and deploy security providers that implement NTLM or other challenge/response authentication mechanisms. See Identity Assertion Providers in *Developing Security Providers for Oracle WebLogic Server*.

Servlet Authentication Filters

WebLogic Servlet Authentication filters allow an Authentication provider to participate in the Servlet container's authentication conversation with the client.

As defined by the Java Servlet API specification, filters are objects that can modify a request or response. Filters are preprocessors of the request before it reaches the servlet, and/or postprocessors of the response leaving the servlet. Filters provide the ability to encapsulate recurring tasks in reusable units.

Filters can be used as a substitute for container-based authentication but there are some drawbacks to this design:

- As specified by the Java Servlet API specification, filters are run after authentication and authorization. If filters are used for authentication, they must also be used for authorization thereby preventing container-managed authorization from being used. Most use cases that require extensions to the authentication process in the Servlet container do not require extensions to the authorization process. Having to implement the authorization process in a filter is awkward, time consuming, and error-prone.
- Standard Servlet filters are registered for a Web application, using deployment descriptors, annotations, or supported programmatic registration. By contrast, a WebLogic Authentication provider supplies Servlet Authentication filters to the container through the `ServletAuthenticationFilter` SSPI. This lets the configured security provider control the authentication conversation without requiring each application to package and register the mechanism separately.

JAAS LoginModules (within a WebLogic Authentication provider) can be used for customization of the login process. Servlet Authentication filters enable the LoginModule model allowing the authentication provider to control the actual conversation with the client. Customizing the location of the user database, the types of proof material required to execute

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a login, or the population of the Subject with groups is implemented via a LoginModule. On the other hand, redirecting to a remote site to execute the login, extracting login information out of the query string, and negotiating a login mechanism with a browser is implemented via a Servlet Authentication filter.

Types of Authentication

WebLogic Server establishes caller identities through configured authentication mechanisms and security providers. Depending on the mechanism and session, a caller can supply credentials or an identity token, or use an identity established by an earlier authentication. You can develop a custom security provider for additional authentication requirements.

The following sections describe authentication mechanisms supported by WebLogic Server:

- Username/Password Authentication
- Certificate Authentication
- Digest Authentication
- Perimeter Authentication

These mechanisms use the configured Authentication and Identity Assertion providers and, for certificate authentication, SSL/TLS services. See The Authentication Process and the following sections in *Administering Security for Oracle WebLogic Server*:

- Configuring WebLogic Security Providers
- Configuring SSL

Username/Password Authentication

In username/password authentication, WebLogic Server validates a user's ID and password through the configured Authentication providers. Successful authentication establishes the caller's identity. Authorization separately determines whether that identity can perform the requested operation on a resource.

Protect credentials in transit with Transport Layer Security (TLS). For HTTP connections, HTTPS uses TLS to encrypt communication between the client and WebLogic Server.

Certificate Authentication

When an SSL or HTTPS client request is initiated, WebLogic Server responds by presenting its digital certificate to the client. The client then verifies the digital certificate and an SSL connection is established. The digital certificate is issued by an entity (a trusted certificate authority), which validates the identity of WebLogic Server.

You can also use two-way SSL authentication, a form of mutual authentication. With two-way SSL authentication, both the client and server must present a certificate before the connection thread is enabled between the two. See One-way/Two-way SSL Authentication.

> **Note**
>
> Two-way SSL/TLS certificate authentication is performed by the WebLogic Server SSL/TLS implementation. To use a client certificate as an application user identity, configure the appropriate Identity Assertion provider and Authentication-provider LoginModules in the security realm.

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Digest Authentication

WebLogic Server supports WS-Security UsernameToken PasswordDigest when the configured authentication provider supplies the password information required to verify the digest.

A client includes its username, a nonce, a creation timestamp, and PasswordDigest in a WS-Security UsernameToken. WebLogic Server's built-in password-digest support requires both the nonce and creation timestamp. The digest is the Base64 encoding of SHA-1 over the decoded nonce bytes, the UTF-8 creation timestamp, and the UTF-8 password, in that order. The service verifies the digest against the corresponding password information. This is a message-level WS-Security mechanism; it is not the HTTP Digest challenge-response exchange. See PasswordDigest.

Perimeter Authentication

Perimeter authentication is used to authenticate the identity of a remote user outside of the application server domain. WebLogic Server supports SAML and SPNEGO perimeter authentication schemes.

The following sections describe perimeter authentication:

- How is Perimeter Authentication Accomplished?
- How Does WebLogic Server Support Perimeter Authentication?

How is Perimeter Authentication Accomplished?

In perimeter authentication, an external authentication service verifies the user's identity and supplies a token that a relying service can validate. The credentials and authentication method depend on the external service.

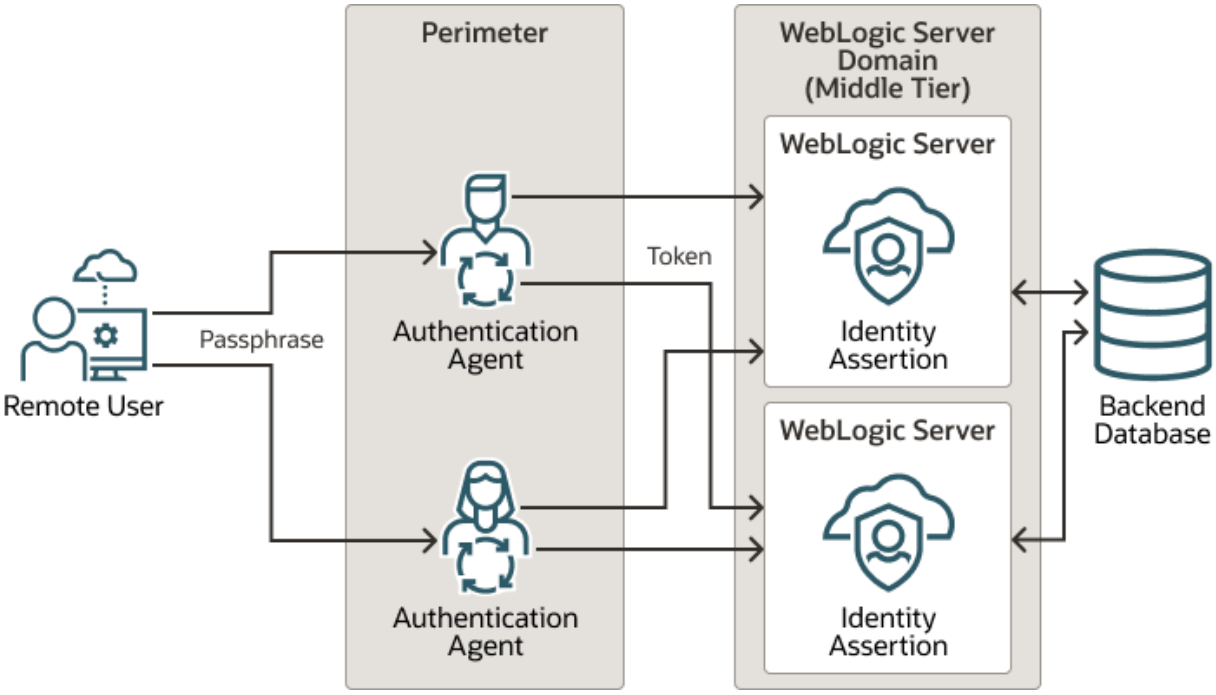
WebLogic Server uses a configured Identity Assertion provider to validate a supported token and map it to a local identity. Standard mechanisms include SAML and SPNEGO. Single sign-on depends on the configured trust relationships, token validation, and identity mapping between the participating systems; possession of an arbitrary token does not by itself establish trust.

How Does WebLogic Server Support Perimeter Authentication?

WebLogic Server is designed to extend the single sign-on concept all the way to the perimeter through support for identity assertion (see Figure 3-2). Provided as a critical piece of the WebLogic Security Framework, the concept of identity assertion allows WebLogic Server to use the authentication mechanism provided by perimeter authentication schemes such as the Security Assertion Markup Language (SAML), the Simple and Protected GSS-API Negotiation Mechanism (SPNEGO), or enhancements to protocols such as Common Secure Interoperability (CSI) v2 to achieve this functionality.

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Figure 3-2 Perimeter Authentication



Support for perimeter authentication requires the use of an Identity Assertion provider that is designed to support one or more token formats. Multiple and different Identity Assertion providers can be registered for use. The tokens are transmitted as part of any normal business request, using the mechanism provided by each of the various protocols supported by WebLogic Server. Once a request is received with WebLogic Server, the entity that handles the processing of the protocol message recognizes the existence of the token in the message. This information is used in a call to the WebLogic Security Framework that results in the appropriate Identity Assertion provider being called to handle the verification of the token. It is the responsibility of the Identity Assertion provider implementation to perform whatever actions are necessary to establish validity and trust in the token and to provide the identity of the user with a reasonable degree of assurance, without the need for the user to re-authenticate to the application.

Security Assertion Markup Language (SAML)

SAML provides single sign-on capability for web applications to ensure that user identities can be shared and protected, and allows for exchanging identity information between software entities. WebLogic Server supports SAML 2.0, SAML Web SSO profile, and the Web Services SAML Token Profile.

The SAML standard defines a common XML framework for creating, requesting, and exchanging security assertions between software entities on the Web. This framework specifies how SAML assertions and protocols may be used to provide the following:

- Browser-based single sign-on (SSO) between online business partners
- The exchange of identity information in web services security

SAML was developed by the Organization for the Advancement of Structured Information Standards (OASIS), and this release of WebLogic Server includes support for SAML 2.0, including support for the following:

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- SAML Web SSO profile

  The SAML Web SSO profile specifies how SAML assertions and protocols should be used to provide browser-based single sign-on between an Identity Provider (a producer of assertions) and a Service Provider (a consumer of assertions).

  In the SAML 2.0 Web SSO profile, a web user either invokes a resource hosted by a Service Provider site, or accesses an Identity Provider site in a way that results in an invocation on a resource hosted by the Service Provider. In either case, the web user is authenticated by the Identity Provider, which in turn generates an assertion on behalf of that user that contains information about the user's identity. The Identity Provider sends the assertion to the Service Provider, which consumes the assertion by extracting identity information about the user that is mapped to a Subject in the local security realm.

- Web Services Security (WS-Security) SAML Token profile 1.1

  The SAML Token profile is part of the core set of WS-Security standards, and specifies how SAML assertions can be used for Web services security. WebLogic Server supports SAML Token Profile 1.1, including support for SAML 2.0 assertions. SAML Token Profile 1.1 is backwards compatible with SAML Token Profile 1.0.

The following sections introduce how SAML is supported in WebLogic Server:

- SAML Framework Concepts
- SAML Components Provided in WebLogic Server

SAML Framework Concepts

The SAML framework is based on the following concepts.

- Identity Provider - A system, or administrative domain, that asserts that a user has been authenticated and is given associated attributes. For example, there is a user John Doe, he has an email address of john.doe@example.com and he authenticated to this domain using a password mechanism. An Identity Provider is also known as a *SAML authority*, *asserting party*, or *source site*, and is often abbreviated as IdP.

  You can configure a WebLogic Server instance to act in the role of Identity Provider. An Identity Provider is known by its Issuer URI (name). The SAML credential mapping provider supplies this functionality in WebLogic Server. (Note that the specific credential mapping provider you configure is specific to the version of SAML you are using.)

- Service Provider - A system, or administrative domain, that determines whether it trusts the assertions provided to it by the Identity Provider. SAML defines a number of mechanisms that enable the Service Provider to trust the assertions provided to it. A Service Provider is also known as a *relying party*, or *destination site*, and is often abbreviated as SP.

  Although a Service Provider may trust the assertions provided to it, local access policy defines whether the subject may access local resources. Therefore, even if a Service Provider trusts that a user is Dan Murphy, it does not mean Dan Murphy can access all the resources in the domain.

  You can configure a WebLogic Server instance to act in the role of Service Provider. Trust relationships with Identity Provider partners must be established. The SAML identity assertion provider supplies this functionality in WebLogic Server. (Note that the specific identity assertion provider you configure is specific to the version of SAML you are using.)

- **Assertion** - An assertion is a package of information that supplies one or more statements made by an Identity Provider. The following types of statements are supported:

  – Authentication statements, which say when and how a subject was authenticated.

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  - Attribute statements, which provide specific information about the subject (for example, what groups the Subject is a member of).
  - Authorization statements identify what the Subject is entitled to do.

> **Note**
>
> Note the following regarding SAML assertions in WebLogic Server:
>
> * SAML 2.0 attribute statements can contain group information and application-specific attributes. The SAML 2.0 Credential Mapping provider supports custom attribute mapping through `SAML2CredentialAttributeMapper`, and the SAML 2.0 Identity Assertion provider supports custom attribute processing through `SAML2IdentityAsserterAttributeMapper`. The SAML Authentication provider can use group information from an assertion when establishing a virtual user. See Configuring the SAML Authentication Provider in *Administering Security for Oracle WebLogic Server*.
> * SAML authorization is not supported in this release of WebLogic Server.

- **Protocols** - SAML defines a number of request/response protocols for obtaining assertions. A SAML request can ask for a specific known assertion or make authentication or attribute decision queries, with the SAML response providing back the requested assertions. The XML format for protocol messages with their allowable extensions is defined in an XML schema.

  WebLogic Server supports the *authentication request protocol*, which defines an authentication request (that is, a message containing an `<AuthnRequest>` statement) that causes an authentication response (that is, a message containing a `<Response>` statement) to be returned. The authentication response contains an assertion that pertains to a Principal.

  Typically the authentication request is sent by a Service Provider to an Identity Provider, which returns the authentication response. The authentication request protocol is used to support the Web Browser SSO Profile.

- **Bindings** - Bindings define the lower-level communication or messaging protocols (such as HTTP or SOAP) over which the SAML protocols can be transported. A binding details exactly how the SAML protocol maps onto transport and messaging protocols. For example, the mapping of the SAML `<AuthnRequest>` message onto HTTP.

  For SAML 2.0, WebLogic Server provides support for HTTP POST, HTTP Artifact, and HTTP Redirect bindings for the Web SSO profile.

- **Profiles** - Descriptions of particular flows of assertions and protocol messages that define how SAML can be used for a particular purpose. A profile is the combination of protocols, bindings, and the structure of assertions that are used to support a particular use case, such as the Web SSO profile and SAML Token profile supported in WebLogic Server.

- **Metadata files** - SAML 2.0 defines a new metadata schema for exchanging configuration information between partners. WebLogic Server supports this schema by providing the ability to create local site configuration data that is published to a file and shared with partners for use with the Web SSO Profile. Partners subsequently import this metadata file to retrieve this configuration data, which is used to populate partner registries and ensure that SAML messages can be transmitted and consumed more consistently and reliably. Note that metadata files are not used with the WS-Security SAML Token Profile 1.1.

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For a complete description of these concepts and how they apply to the SAML architecture, see Security Assertion Markup Language (SAML) 2.0 Technical Overview (http://www.oasis-open.org/committees/download.php/11511/sstc-saml-tech-overview-2.0-draft-03.pdf).

SAML Components Provided in WebLogic Server

Support for SAML 2.0 is provided in the following WebLogic Server components:

- SAML security providers
- Single Sign-On services
- Web services support for SAML Token Profile 1.1

SAML Security Providers

WebLogic Server provides the following security providers to support SAML 2.0:

Table 3-1 Security Providers Included in WebLogic Server to Support SAML

To support . . .	The following provider . . .	Does the following . . .
SAML 2.0	SAML 2.0 Credential Mapping provider	Generates SAML 2.0 assertions. This provider must be configured for a WebLogic Server instance that serves as an Identity Provider.
SAML 2.0	SAML 2.0 Identity Assertion provider	Consumes SAML 2.0 assertions. This provider must be configured for a WebLogic Server instance that serves as a Service Provider.
SAML 2.0	SAML Authentication provider	Enables "virtual user" functionality for the SAML 2.0 Identity Assertion provider. (See Configuring the SAML Authentication Provider in *Administering Security for Oracle WebLogic Server*.)

Single Sign-On Services

WebLogic Server can be configured to act as a SAML Identity Provider (IdP), Service Provider, or both. When acting as an IdP, the SAML credential mapping provider must be configured so that the IdP can produce assertions. When acting as a Service Provider, the SAML identity assertion provider must be configured so that the Service Provider can consume assertions.

SAML Single Sign-On Services (SSO) are configured on a per-server basis. To enable SAML SSO in two or more servers in a domain, such as in a cluster, the recommended approach is to do the following:

1. Create a domain in which the RDBMS security store is configured. See Managing the RDBMS Security Store in *Administering Security for Oracle WebLogic Server*.
2. Ensure that SSO services are configured individually and identically on each server instance.

Web Services Support for SAML Token Profile 1.1

WebLogic Server Web services supports SAML Token Profile 1.1. This feature includes support for SAML 2.0 and is backwards-compatible with SAML Token Profile 1.0.

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You configure SAML tokens for a web service through use of the appropriate WS-SecurityPolicy assertions.

> **Note**
>
> SAML Token Profile 1.1 is supported only through WS-SecurityPolicy.

When using SAML Token Profile, you must configure the SAML 2.0 credential mapping or identity assertion providers depending on the desired assertion usage.

Single Sign-On (SSO)

Single sign-on (SSO) enables users to log in securely to an application only once and gain access to many different application components, even if these components have their own authentication schemes.

WebLogic Server provides single sign-on (SSO) with the following environments:

- Web Browsers and HTTP Clients via SAML
- Desktop Clients

Web Browsers and HTTP Clients via SAML

The Security Assertion Markup Language (SAML) enables cross-platform authentication between Web applications or Web services running in a WebLogic Server domain and Web browsers or other HTTP clients. WebLogic Server supports single sign-on (SSO) based on SAML. When users are authenticated at one site that participates in a single sign-on (SSO) configuration, they are automatically authenticated at other sites in the SSO configuration and do not need to log in separately.

The following steps describe a typical scenario that shows how SAML SSO works.

1. A Web user attempts to access a target resource at a site or *Service Provider* that is configured to accept authentications through SAML assertions.
2. The Service Provider determines that the user's credentials need to be authenticated by a central site (or *Identity Provider*) that can generate a SAML assertion for that user. The Service Provider redirects the authentication request to that Identity Provider.

   The central site or Identity Provider is also sometimes called a *SAML Authority*.
3. The user logs in to the Identity Provider site, typically using a login web application hosted by that site. The Identity Provider authenticates the user, and generates a SAML assertion.
4. Information about the SAML assertion provided by the Identity Provider and associated with the user and the desired target is conveyed from the Identity Provider site to the Service Provider site by the protocol exchange.

   Through a sequence of HTTP exchanges, the user browser is transferred to an Assertion Consumer Service (ACS) at the Service Provider site. The WebLogic Server SAML Identity Assertion provider makes up a portion of the ACS.
5. The Identity Assertion provider maps the identity contained in the assertion to a Subject in the local security realm. The access policies on the requested target are evaluated to determine whether the user is authorized for that target. If access is authorized, the user

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authenticated by the Identity Provider site is accepted as an authenticated user by the Service Provider site, thereby achieving Web-based SSO.

For more background information about the OASIS SAML 2.0 standard, see the following:

- Profiles for the OASIS Security Assertion Markup Language (SAML) V2.0 (`http://docs.oasis-open.org/security/saml/v2.0/saml-profiles-2.0-os.pdf`).
- Bindings for the OASIS Security Assertion Markup Language (SAML) V2.0 (`http://docs.oasis-open.org/security/saml/v2.0/saml-bindings-2.0-os.pdf`).

For information about how SSO with web browsers and HTTP clients is implemented in WebLogic Server, see Single Sign-On with the WebLogic Security Framework.

Desktop Clients

SSO with Desktop Clients uses HTTP-based authentication with Microsoft clients that have authenticated in the Windows Active Directory environment. The Windows Active Directory environment uses Kerberos as its security protocol. Kerberos provides network authentication of heterogeneous realms. This means a user logged into a Windows domain can access a Web application running on an application server and use their Windows Active Directory credentials to authenticate to the server. The application server can run on any platform that supports Kerberos.

When a Web server receives a request from a browser it can request that the browser use the Kerberos protocol to authenticate itself. This protocol performs authentication via HTTP, and allows the browser to pass a delegated credential to allow a web application to log into subsequent Kerberos-based services on the user's behalf.

When an HTTP server wishes to login a Microsoft client, it returns a `401 Unauthorized` response with the `WWW-Authenticate: Negotiate` header. The browser then contacts the Key Distribution Center (KDC)/Ticket Granting Service (TGS) to obtain a service ticket. It chooses a special Service Principal Name for the ticket request. The returned ticket is then wrapped in a SPNEGO token which is encoded and sent back to the server using an HTTP request. The token is unwrapped and the ticket is authenticated. Once authenticated, the page corresponding to the requested URL is returned.

For information about how SSO with Microsoft clients is implemented in WebLogic Server, see Desktop SSO Process.

Authorization

Authorization is the process whereby the interactions between users and WebLogic resources are controlled, based on user identity or other information. In WebLogic Server, Authorization providers use concepts of security policies, ContextHandlers, Access Decisions, and so on, to provide authorization. An Authorization provider is used to limit the interactions between users and WebLogic resources to ensure integrity, confidentiality, and availability.

The following sections describe authorization concepts and functionality:

- WebLogic Resources
- Security Policies
- ContextHandlers
- Access Decisions
- Adjudication
- Jakarta Authorization

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WebLogic Resources

A WebLogic resource is a structured object used to represent an underlying WebLogic Server entity, which can be protected from unauthorized access using security roles and security policies.

WebLogic resources are hierarchical. Therefore, the level at which you define these security roles and security policies is up to you. For example, you can define security roles and security policies on: entire enterprise applications (EARs); an EJB JAR containing multiple EJBs; a particular EJB within that JAR; or a single method within that EJB.

WebLogic resource implementations are available for:

- Administrative resources
- Application resources
- Component Object Model (COM) resources
- Enterprise Information System (EIS) resources
- EJB resources
- Java Database Connectivity (JDBC) resources
- Java Messaging Service (JMS) resources
- Java Naming and Directory Interface (JNDI) resources
- NoSQL resources — access to globally configured NoSQL resources.
- Server resources
- Web application resources
- Web service resources
- Work Context resources

> **Note**
>
> Each of these WebLogic resource implementations is explained in detail in the *Java API Reference for Oracle WebLogic Server*.

Security Policies

Security policies replace access control lists (ACLs) and answer the question "Who has access to a WebLogic resource?" A security policy is created when you define an association between a WebLogic resource and one or more users, groups, or security roles.

You can optionally define date and time constraints for a security policy. Access to a WebLogic resource is determined by the applicable security policies, including inherited policies and policies supplied by default. The absence of an explicitly assigned policy on a resource does not by itself mean that access is unrestricted.

You assign security policies to any of the defined WebLogic resources (for example, an EJB resource or a JNDI resource) or to attributes or operations of a particular instance of a WebLogic resource (an EJB method or a servlet within a Web application). If you assign a security policy to a type of WebLogic resource, all new instances of that resource inherit that security policy. Security policies assigned to individual resources or attributes override security

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policies assigned to a type of WebLogic resource. For a list of the defined WebLogic resources, see WebLogic Resources.

Security policies are stored in an Authorization provider's database. By default, the XACML Authorization provider is configured in a domain, and security policies are stored in the embedded LDAP server.

To use a user or group to create a security policy, the user or group must be defined in the security provider database for the Authentication provider that is configured in the security realm. To use a security role to create a security policy, the security role must be defined in the security provider database for the Role Mapping provider that is configured in the security realm. By default, the WebLogic Authentication and XACML Role Mapping providers are configured in the database in the embedded LDAP server.

By default, security policies are defined in WebLogic Server for the WebLogic resources. These security policies are based on security roles and default global groups. You also have the option of basing a security policy on a user. Oracle recommends basing security policies on security roles rather than users or groups. Basing security policies on security roles allows you to manage access based on a security role that a user or group is granted, which is a more efficient method of management. For a listing of the default security policies for the WebLogic resources, see Default Root Level Security Policies in *Securing Resources Using Roles and Policies for Oracle WebLogic Server*.

ContextHandlers

A ContextHandler is a high-performing WebLogic class that obtains additional context and container-specific information from the resource container, and provides that information to security providers making access or role mapping decisions.

The `ContextHandler` interface provides a way for an internal WebLogic resource container to pass additional information to a WebLogic Security Framework call, so that a security provider can obtain contextual information beyond what is provided by the arguments to a particular method. A ContextHandler is essentially a name/value list and as such, it requires that a security provider know what names to look for. (In other words, use of a ContextHandler requires close cooperation between the WebLogic resource container and the security provider.) Each name/value pair in a ContextHandler is known as a **context element**, and is represented by a `ContextElement` object.

WebLogic resource containers and services pass ContextHandlers to the WebLogic Security Framework. Examples include Servlet, EJB, Web service, and JMX management contexts. The available context elements depend on the resource and operation. Adjudication, Identity Assertion, Authorization, Credential Mapping, and Role Mapping providers, and the LoginModules used by an Authentication provider, can inspect the context elements supplied for a call. An implementation of the `AuditContext` interface (used when a security provider is implemented to post audit events) may also examine the values of context elements.

For more information about the values of particular context elements, see ContextHandlers and WebLogic Resources in *Developing Security Providers for Oracle WebLogic Server*.

Access Decisions

Like LoginModules for Authentication providers, an Access Decision is the component of an Authorization provider that actually answers the "is access allowed?" question.

Specifically, an Access Decision is asked whether a subject has permission to perform a given operation on a WebLogic resource, with specific parameters in an application. Given this information, the Access Decision responds with a result of `PERMIT`, `DENY`, or `ABSTAIN`.

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Adjudication

Adjudication involves resolving any authorization conflicts that may occur when more than one Authorization provider is configured in a security realm, by weighing the result of each Authorization provider's Access Decision.

In WebLogic Server, an Adjudication provider is used to tally the results that multiple Access Decisions return, and determines the final `PERMIT` or `DENY` decision. An Adjudication provider may also specify what should be done when an answer of `ABSTAIN` is returned from a single Authorization provider's Access Decision.

Identity and Trust

WebLogic Server uses private keys, digital certificates, and trusted certificates issued by certification authorities to establish and verify server identity and trust.

The public key is embedded into a *digital certificate*. A private key and digital certificate provide *identity*. The trusted certificate authority (CA) certificate establishes *trust* for a certificate. Certificates and certificate chains need to be validated before a trust relationship is established.

This topic details the concepts associated with identity and trust. See the following topics:

- Private Keys
- Digital Certificates
- Certificate Authorities
- Certificate Lookup and Validation

Private Keys

WebLogic Server uses public key cryptography to authenticate peers during SSL/TLS handshakes.

A server has a *private key* and a corresponding public key, usually distributed in an X.509 certificate. The private key must be protected. Depending on the algorithm, a key pair is used for digital signatures, key agreement, or encryption and decryption. A digital signature is created with the private key and verified with the corresponding public key.

Digital Certificates

Digital certificates are electronic documents used to verify the unique identities of principals and entities over networks such as the Internet.

A digital certificate securely binds the identity of a user or entity, as verified by a trusted third party (known as a certificate authority), to a particular public key. The combination of the public key and the private key provides a unique identity to the owner of the digital certificate.

Digital certificates enable verification of the claim that a specific public key does in fact belong to a specific user or entity. A recipient of a digital certificate can use the public key in a digital certificate to verify that a digital signature was created with the corresponding private key. If such verification is successful, this chain of reasoning provides assurance that the corresponding private key is held by the subject named in the digital certificate, and that the digital signature was created by that subject.

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A digital certificate typically includes a variety of information, such as the following:

- The name of the subject (holder, owner) and other information required to confirm the unique identity of the subject, such as the URL of the Web server using the digital certificate, or an individual's e-mail address
- 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 (defined by a start date and an end date)

The most widely accepted format for digital certificates is defined by the ITU-T X.509 international standard. Digital certificates can be read or written by any application complying with the X.509 standard. The public key infrastructure (PKI) in WebLogic Server recognizes digital certificates that comply with X.509 version 3, or X.509v3. Oracle recommends obtaining digital certificates from a certificate authority such as Verisign or Entrust.

See Configuring SSL in *Administering Security for Oracle WebLogic Server*.

Certificate Authorities

Digital certificates are issued by certificate authorities (CAs).

A certificate authority (CA) issues and signs digital certificates that bind subjects to public keys. A CA can be operated by an organization for its own environment or by a third party. A certificate signature allows a recipient that trusts the CA public key to detect changes to the signed certificate.

The requesting party can verify the signature of the issuing CA by using the public key of that CA. The CA makes its public key available by providing a certificate issued from a higher-level certificate authority attesting to the validity of the public key of the lower-level certificate authority. This scheme gives rise to hierarchies of certificate authorities. This hierarchy is terminated by a top-level, self-signed certificate known as the **root certificate**, *because no other public key is needed to certify it*.

A root CA is used as a trust anchor and is commonly represented by a self-signed root certificate. An **intermediate CA** has a CA certificate issued by another CA. That **intermediate certificate** identifies the intermediate CA; its issuer may be a root CA or another intermediate CA.

If the recipient has a digital certificate containing the public key of an intermediate CA that is signed by a superior CA who the recipient already trusts, the recipient of an encrypted message can develop trust in the public key of an intermediate CA recursively. In this sense, a digital certificate is a stepping stone in digital trust. Ultimately, it is necessary to trust only the public keys of a small number of top-level CAs. Through a chain of certificates, or **certificate path**, trust in a large number of users' digital signatures can be established.

The X.509 `basicConstraints` extension can include `pathLenConstraint` in a CA certificate. This value limits the number of non-self-issued intermediate CA certificates that may follow that certificate in a valid certification path. It does not count the end-entity certificate. The trust anchor is an input to path validation and is not part of the certification path, so `pathLenConstraint` in a self-signed root certificate does not universally limit the total chain length.

In summary, digital signatures establish the identities of communicating entities, but a digital signature can be trusted only to the extent that the public key for verifying it can be trusted.

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See Configuring SSL in *Administering Security for Oracle WebLogic Server*.

Certificate Lookup and Validation

In WebLogic Server, certificate validation is performed by the Certificate Lookup and Validation (CLV) framework which completes and validates X.509 certificate chains for inbound 2-way SSL, outbound SSL, application code, and WebLogic Web services.

Applications that rely on public key technology for security must be confident that a user's public key is genuine. A user may have a chain of certificates which recursively point to the trusted CA that issued the initial certificate (referred to as the end certificate). A certificate chain must be validated before it can be used to establish trust. In addition, a user may not have a complete chain from a trusted CA to the target certificate. Completing a valid chain of certificates from the target certificate to the trusted CA is another requirement for public key technology.

The CLV framework receives a certificate or certificate chain, completes the chain (if necessary), and looks up and validates the certificates in the chain. The framework can use the end certificate, the Subject DN, the Issuer DN plus serial number, the subject key identifier and/or X.509 thumbprint to find and validate a certificate chain. In addition, the framework can perform additional validation on the certificate chain such as revocation checking.

The CLV framework is based on the JDK architecture and plug-in framework for locating and validating certificate chains. The CLV providers were built using the JDK CertPath Builder and CertPath Validator API/SPI.

Secure Sockets Layer (SSL)

WebLogic Server fully supports SSL communication, which enables secure communication between applications connected through the internet. WebLogic Server uses the Java Secure Socket Extension (JSSE) as the SSL implementation for securing incoming connections, and also for outgoing connections that use the WebLogic SSL APIs.

Applications hosted on WebLogic Server can also invoke JSSE directly for outbound SSL connections.

For complete information about JSSE, see the *Java Secure Socket Extension (JSSE) Reference Guide* in Java SE Security Developer's Guide.

The following topics are discussed in this section:

- SSL Features
- Cipher Suites
- SSL Tunneling
- One-way/Two-way SSL Authentication
- Configuring SSL
- Host Name Verification
- Trust Managers
- FIPS Support

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SSL Features

WebLogic Server uses JSSE to provide SSL/TLS communication. TLS supports peer authentication and protects the confidentiality and integrity of exchanged application data.

When SSL is used, the target (the server) always authenticates itself to the initiator (the client). Optionally, if the target requests it, the initiator can authenticate itself to the target. Encryption scrambles the data that is transmitted. An SSL connection begins with a handshake during which the applications exchange digital certificates, agree on the encryption algorithms to be used, and generate the encryption keys to be used for the remainder of the session.

SSL provides the following security features:

- Server authentication - WebLogic Server uses its digital certificate, issued by a trusted certificate authority, to authenticate to clients. SSL minimally requires the server to authenticate to the client using its digital certificate. If the client is not required to present a digital certificate, the connection type is called one-way SSL authentication.
- Client Identity Verification - Optionally, clients might be required to present their digital certificates to WebLogic Server. WebLogic Server then verifies that the digital certificate was issued by a trusted certificate authority and establishes the SSL connection. An SSL connection is not established if the digital certificate is not presented and verified. This type of connection is called two-way SSL authentication, a form of mutual authentication.
- Confidentiality - All client requests and server responses are encrypted to maintain the confidentiality of data exchanged over the network.
- Data Integrity - TLS protects records against unauthorized modification. Authenticated-encryption cipher suites, such as AES-GCM, verify an authentication tag as part of decryption. A record that fails authentication is rejected. The integrity mechanism depends on the negotiated TLS version and cipher suite.

If you are using a Web browser to communicate with WebLogic Server, you can use the Hyper-Text Transfer Protocol with SSL (HTTPS) to secure network communications.

Cipher Suites

A cipher suite identifies cryptographic algorithms used to protect a TLS connection. In TLS 1.2, suite names identify key exchange and authentication as well as record protection. In TLS 1.3, a suite identifies the authenticated-encryption algorithm and the hash used for key derivation; key exchange and signature algorithms are negotiated separately.

For example, the TLS 1.3 cipher suite `TLS_AES_128_GCM_SHA256` uses AES with a 128-bit key in GCM mode for authenticated encryption and SHA-256 with HKDF for key derivation. The suite name does not select the certificate signature or key-exchange algorithm.

The set of cipher suites supported by the JDK default JSSE provider, `SunJSSE`, is available at the following URLs:

- JDK 21: The SunJSSE Provider in *Security Developer's Guide*
- JDK 25: The SunJSSE Provider in *Security Developer's Guide*

For information about configuring WebLogic Server to use the JSSE-based SSL implementation, see Using the JSSE-Based SSL Implementation in *Administering Security for Oracle WebLogic Server*.

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SSL Tunneling

WebLogic Server tunnels the HTTP, T3, and IIOP protocols over SSL.

SSL can be used by Web browsers and Java clients as follows:

- A Web browser makes an SSL connection to a server over HTTPS. The browser then sends HTTP requests and receives HTTP responses over this SSL connection. For example:

  ```
  https://myserver.com/mypage.html
  ```

  A Web browser and WebLogic Server must support compatible TLS protocol versions and algorithms and satisfy the configured certificate and hostname-verification requirements to establish an HTTPS connection.
- Java clients can use HTTPS for HTTP requests or T3S for T3 communication over TLS. For example, the following URL identifies a T3S server endpoint:

  ```
  t3s://myserver.com:7002
  ```

  Java clients running in WebLogic Server can establish either T3S connections to other WebLogic Server instances, or HTTPS connections to other servers that support SSL, such as Web servers or secure proxy servers.

One-way/Two-way SSL/TLS Authentication

WebLogic Server supports one-way and two-way SSL/TLS authentication.

With one-way SSL/TLS authentication, the target (the server) is required to present a digital certificate to the initiator (the client) to prove its identity. The client performs two checks to validate the digital certificate:

1. The client verifies that the certificate is trusted (meaning, it was issued by the client's trusted CA), is valid (not expired), and satisfies the other certificate constraints.
2. The client verifies that the server certificate identifies the host to which it is connecting, using its configured hostname-verification rules. These rules can use Subject Alternative Names (SANs) and permitted wildcard names; they are not limited to the certificate Subject common name (CN).

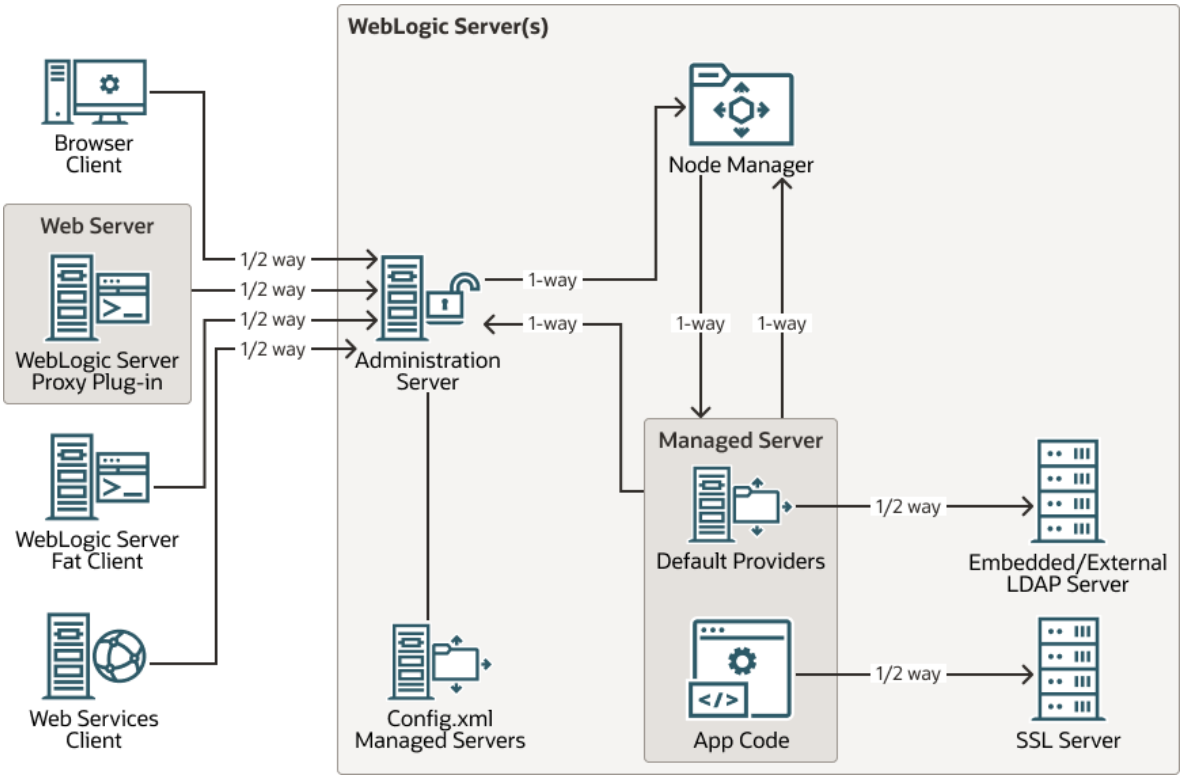
If both of the above checks return true, the SSL/TLS connection is established.

For mutual certificate authentication, configure WebLogic Server to request and enforce client certificates. Both peers then present certificates and validate the other peer’s identity. The alternative setting that requests client certificates without enforcing them permits a connection when the client does not supply a certificate; it does not require mutual certificate authentication.

Figure 3-3 illustrates WebLogic Server SSL/TLS connections and shows which connections support one-way SSL/TLS, two-way SSL/TLS, or both. The Web browser client, Web Server, Fat client, Web services client, and SSL/TLS server connections can be configured for either one-way or two-way SSL/TLS. WebLogic Server determines whether an SSL/TLS connection is configured for one-way or two-way. Use the WebLogic Remote Console or WLST to configure SSL/TLS.

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Figure 3-3 How WebLogic Server Supports SSL/TLS Connections



Configuring SSL/TLS

WebLogic Server uses one-way SSL/TLS authentication unless two-way authentication is configured. The SSL/TLS listen-port default depends on the domain mode: it is enabled in secured production mode and disabled otherwise, unless explicitly configured. A server-level SSL Enabled setting overrides the domain setting.

Using either WebLogic Remote Console or WLST, you can configure WebLogic Server for two-way SSL/TLS authentication.

- To use one-way SSL/TLS from a client to a server: enable the SSL/TLS port on the server, configure identity for the server and trust for the client.
- To require two-way SSL/TLS authentication, enable the server SSL/TLS port and configure client certificates to be requested and enforced. Configure the server identity and trust for the client certificate path. Configure the client identity, including its private key and certificate chain, and client trust for the server certificate path.

  Each peer must trust an appropriate CA in the other peer's validated certificate path. Supply the certificate chains needed to build those paths. The trust anchor need not be the direct issuer of the end-entity certificate.

To acquire a digital certificate for your server, you generate a public key, private key, and a Certificate Signing Request (CSR), which contains your public key. You send the CSR to a certificate authority and follow its procedures for obtaining a signed digital certificate.

Once you have your private keys, digital certificates, and any additional trusted CA certificates that you may need, you need to store them so that WebLogic Server can use them to verify identity. Store private keys and certificates in keystores.

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To use SSL/TLS when connecting to a WebLogic server application with your browser, you simply specify HTTPS and the secure port (port number 7002) in the URL. For example: `https://localhost:7002/examplesWebApp/SnoopServlet.jsp`, where *`localhost`* is the name of the system hosting the Web application.

For additional guidelines for configuring SSL/TLS in a production environment, see Configure SSL/TLS in *Securing a Production Environment for Oracle WebLogic Server*.

Host Name Verification

Host Name verification is the process of verifying that the name of the host to which an SSL connection is made is the intended or authorized party. Host name verification prevents man-in-the-middle attacks when a Web client (a Web browser, a WebLogic client, or a WebLogic Server acting as a client) requests an SSL connection to another application server.

By default, WebLogic Server uses its wildcard hostname verifier. It checks the requested host against the peer certificate using Subject Alternative Names (SANs), supported wildcard rules, and the applicable Common Name (CN) fallback rules. IP-address references are also checked against IP-address SANs. A connection fails hostname verification when the configured verifier does not accept the certificate for the requested host.

Trust Managers

The Trust Manager provides a way to override the default SSL trust validation rules. It allows the server to decide whether or not it trusts the client that is contacting it. Using a Trust Manager you can perform custom checks before continuing an SSL connection.

For example, you can use the Trust Manager to specify that only users from specific localities, such as towns, states, or countries, or users with other special attributes, can gain access via the SSL connection.

WebLogic Server provides interfaces that allow custom Trust Manager implementations to be called during the SSL handshake. Custom implementations can override the handshake error detected by the SSL implementation validation check, raise an error based on their own certification rules, and control whether outbound SSL uses certificate lookup and validation. See Using a Trust Manager and Using the CertPath Trust Manager in *Developing Applications with the WebLogic Security Service*.

FIPS Support

FIPS 140-3 defines security requirements for cryptographic modules. WebLogic Server 26.1 supports Oracle Jipher 20 JCE for FIPS 140-3 cryptography. Compliance depends on using the validated cryptographic module, approved algorithms, and the provider and JSSE configuration documented for the deployment. Installing or registering a provider alone does not establish FIPS compliance.

See Enabling FIPS Mode in *Administering Security for Oracle WebLogic Server*.

Firewalls

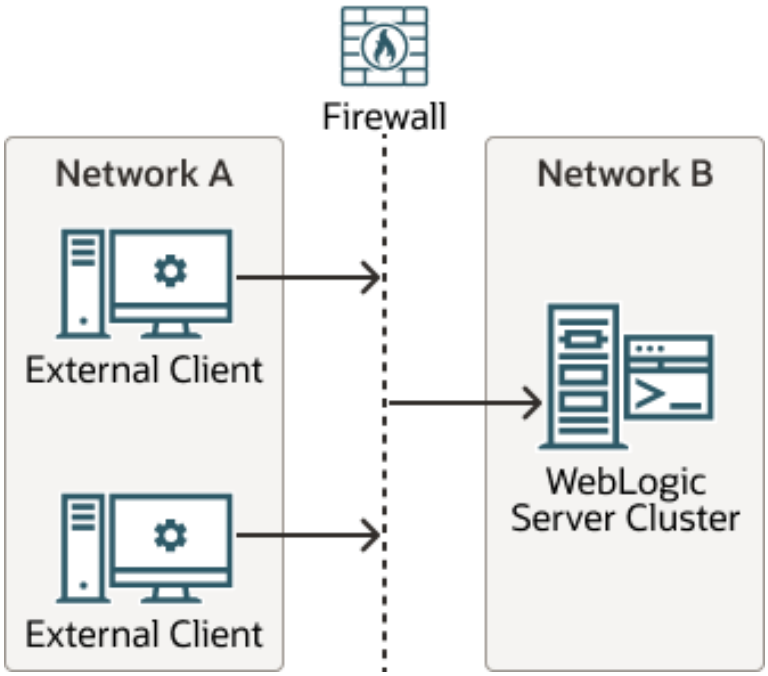
A firewall controls network traffic by acting as a barrier between a trusted and an untrusted network. Along with firewalls, you can use WebLogic Server network channels, connection filters and perimeter authentication to restrict access to resources based on user and network information.

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Firewalls can be a combination of software and hardware, including routers and dedicated gateway machines. They employ filters that allow or disallow traffic to pass based on the protocol, the service requested, routing information, and the origin and destination hosts or networks. They may also allow access for authenticated users.

Figure 3-4 illustrates a typical setup with a firewall that filters traffic destined for a WebLogic Server cluster.

Figure 3-4 Typical Firewall Setup



You can use the following features in WebLogic Server in conjunction with firewalls:

- Network Channels
- Connection Filters
- Perimeter Authentication

For details about how to secure the network in your environment using software and hardware to create firewalls, components such as network channels to isolate incoming and outgoing application traffic, and connection filters to deny access at the network level, see Secure the Network in *Securing a Production Environment for Oracle WebLogic Server*.

Network Channels

Network channels define the attributes of a network connection to WebLogic Server, such as the protocol the network supports, the listen address, listen ports for secure and non-secure communication, and so on.

Using network channels allows administrators to have more control over exposing network access to WebLogic Server. See Understanding Network Channels in *Administering Server Environments for Oracle WebLogic Server*.

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Connection Filters

You can use WebLogic Server connection filters to set up firewalls that filter network traffic based on protocols, IP addresses, and DNS node names. See Using Network Connection Filters in *Developing Applications with the WebLogic Security Service*.

Perimeter Authentication

You can use Identity Assertion providers to set up **perimeter authentication** - a special type of authentication using tokens. The WebLogic Server security architecture supports Identity Assertion providers that perform perimeter-based authentication (Web server, firewall, VPN) and handle multiple security token types/protocols (SOAP, SAML, SPNEGO, IIOP-CSIv2).

Jakarta EE and WebLogic Security

WebLogic Server utilizes the security services of the JDK for implementing and using user authentication and authorization. WebLogic Server supports Java SE and Jakarta EE security packages, and also provides support for the EJB interoperability protocol.

The Jakarta EE security services are based on standardized, modular components. 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.

WebLogic Server's support for Java security means that application developers can take advantage of the latest enhancements and developments in the area of security, thus leveraging a company's investment in Java programming expertise. By following the defined and documented Java standard, WebLogic Server's security support has a common baseline for Java developers.

The following topics are discussed in this section:

- Java Security Packages
- Common Secure Interoperability Version 2 (CSIv2)

Java Security Packages

The following sections describe Java security APIs and legacy Java Security Manager considerations for WebLogic Server.

- The Java Secure Socket Extension (JSSE)
- Java Authentication and Authorization Services (JAAS)
- The Java Security Manager
- Java Cryptography Architecture and Java Cryptography Extensions (JCE)
- Jakarta Authorization
- Jakarta Authentication
- Jakarta Security

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The Java Secure Socket Extension (JSSE)

JSSE provides Java APIs and implementations for secure communication using TLS, including TLS 1.2 and TLS 1.3. The protocols available to a connection depend on the JDK and the WebLogic Server TLS configuration.

Java Authentication and Authorization Services (JAAS)

JAAS is a set of packages that provide a framework for user-based authentication and access control. WebLogic Server uses only the authentication classes of JAAS.

> **Note**
>
> Legacy JAAS authorization based on Java Security Manager permission checks is unavailable on JDK 25, where the Security Manager is permanently disabled. Domain settings for principal comparison do not restore that enforcement. For legacy JDK 21 environments that use JAAS authorization, see Configuring a Domain to Use JAAS Authorization in *Administering Security for Oracle WebLogic Server*. JAAS authentication remains available.

JAAS is used as follows:

- For remote Java client authentication
- For authentication internally in instances of WebLogic Server in the Web and EJB containers and in the WebLogic Authentication and Identity Assertion providers.

For more information on JAAS, see Java Authentication and Authorization Service (JAAS).

The Java Security Manager

The Java Security Manager is a legacy Java SE mechanism for enforcing permissions on Java code. It is deprecated for removal in JDK 21 and permanently disabled in JDK 25.

Java Security Manager policy files cannot provide this protection when WebLogic Server runs on JDK 25. Do not enable the Security Manager or apply legacy Java policy configuration to a JDK 25 deployment. For legacy JDK 21 environments that use this mechanism, see Using Java Security to Protect WebLogic Resources in *Developing Applications with the WebLogic Security Service*.

Java Cryptography Architecture and Java Cryptography Extensions (JCE)

These security APIs provide a framework for accessing and developing cryptographic functionality for the Java platform and developing implementations for encryption, key generation and key agreement, and Message Authentication Code (MAC) algorithms.

WebLogic Server fully supports these security APIs.

Jakarta Authorization

Jakarta Authorization provides an alternate authorization mechanism for the EJB and Servlet containers in a WebLogic Server domain. When Jakarta Authorization is configured, the WebLogic Security Framework access decisions, adjudication, and role mapping functions are not used for EJB and Servlet authorization decisions. The Jakarta Authorization classes are

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used for role-to-principal mapping as well as for rendering access decisions. You cannot use the Jakarta Authorization framework in conjunction with the WebLogic Security Framework. The Jakarta Authorization classes used by WebLogic Server do not include an implementation of a Policy object for rendering decisions but instead rely on the Java `java.security.Policy` object.

The Jakarta Authorization specification was formerly called Java Authorization Contract for Containers (JACC).

Jakarta Authentication

The Jakarta Authentication specification, https://jakarta.ee/specifications/authentication/, defines a service provider interface (SPI) by which authentication providers that implement message authentication mechanisms can be integrated in server Web application message processing containers or runtimes.

You do not have to modify your Web application code to use Jakarta Authentication. Instead, you can use WebLogic Remote Console or WLST to enable Jakarta Authentication for the Web application post deployment.

For more information on how to use Jakarta Authentication with a Web application, including how to custom validate principals created by the SAM, see Using Jakarta Authentication for a Web Application in *Developing Applications with the WebLogic Security Service*.

The Jakarta Authentication specification was formerly called Java Authentication Service Provider Interface for Containers (JASPIC).

Jakarta Security

The Jakarta Security specification (`https://jakarta.ee/specifications/security/`) defines portable, plug-in interfaces for authentication and identity stores, and an injectable `SecurityContext` interface that provides an access point for programmatic security. You can use the built-in implementations of the plug-in SPIs, or write custom implementations.

In WebLogic Server, these authentication mechanisms are supported in the Web application container, including web services, and the `SecurityContext` interfaces are supported in the Servlet and EJB containers.

For details about how to use Jakarta Security with WebLogic Server, see Using Jakarta Security in *Developing Applications with the WebLogic Security Service*.

Common Secure Interoperability Version 2 (CSIv2)

WebLogic Server provides support for the Enterprise JavaBean (EJB) interoperability protocol that is based on Internet Inter-ORB (IIOP) (GIOP version 1.2) and the CORBA Common Secure Interoperability version 2 (CSIv2) specification. CSIv2 support in WebLogic Server:

- Interoperates with the Jakarta EE Platform, reference implementation.
- Allows WebLogic Server IIOP clients to specify a username and password in the same manner as T3 clients.
- Supports Generic Security Services Application Programming Interface (GSSAPI) initial context tokens. For this release, only usernames and passwords and GSSUP (Generic Security Services Username Password) tokens are supported.

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> **Note**
>
> The CSIv2 implementation in WebLogic Server passed Jakarta EE Compatibility Test Suite (CTS) conformance testing.

The external interface to the CSIv2 implementation is a JAAS LoginModule that retrieves the username and password of the CORBA object. The JAAS LoginModule can be used in a WebLogic Java client or in a WebLogic Server instance that acts as a client to another Jakarta EE application server. The JAAS LoginModule for the CSIv2 support is called `UsernamePasswordLoginModule`, and is located in the `weblogic.security.auth.login` package.

> **Note**
>
> For information related to load balancing support for CSIv2 in a WebLogic Server cluster, see Server Affinity and IIOP Client Authentication Using CSIv2 in *Administering Clusters for Oracle WebLogic Server*

Jakarta Authentication Security

WebLogic Server extends support for using Jakarta Authentication to configure an Authentication Configuration Provider for a Web application and using that instead of the default WebLogic Server authentication mechanism for that Web application.

The Jakarta Authentication specification, https://jakarta.ee/specifications/authentication/ (formerly Java Authentication Service Provider Interface for Containers (JASPIC)), defines a service provider interface (SPI) by which authentication providers that implement message authentication mechanisms can be integrated in server Web application message processing containers or runtimes.

WebLogic Server allows you to use Jakarta Authentication to delegate authentication for Web applications to your configured Authentication Configuration Providers.

This section describes the following topics:

- Overview of Jakarta Authentication
- Jakarta Authentication Programming Model

Overview of Jakarta Authentication

The Authentication Configuration Provider in Jakarta Authentication assumes responsibility for authenticating the user credentials for a Web application and returning a Subject. It authenticates incoming Web application messages and returns the identity (the expected Subject) established as a result of the message authentication to WebLogic Server. This means that if you configure an Authentication Configuration Provider for a Web application, it is used instead of the WebLogic Server authentication mechanism for that Web application.

You can use either your own Server Authentication Module (SAM) that works with the default WebLogic Server Authentication Configuration Provider, or you can create and use both your own Authentication Configuration Provider and SAM.

As described in the Jakarta Authentication specification, https://jakarta.ee/specifications/authentication/, the Authentication Configuration Provider (called "authentication context

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configuration provider" in the specification) is an implementation of the `jakarta.security.auth.message.config.AuthConfigProvider` interface. The Authentication Configuration Provider provides a configuration mechanism used to define the registered SAMs and bindings to applications that require protection from unauthenticated/unauthorized access.

> **Note**
>
> WebLogic Server supports Jakarta Authentication 3.1. WebLogic Server supports only the Servlet Profile.

The SAM represents the implementation of a server-side authentication module that is Jakarta Authentication compliant. As described in the Jakarta Authentication specification, https://jakarta.ee/specifications/authentication/, a SAM implements the `jakarta.security.auth.message.module.ServerAuthModule` interface and is invoked by WebLogic Server at predetermined points in the message processing model.

WebLogic Server allows you to:

- Enable or disable Jakarta Authentication across an entire domain. Only when Jakarta Authentication is enabled for the domain can you then decide how each Web application supports Jakarta Authentication.

  If you disable Jakarta Authentication for the domain, Jakarta Authentication is disabled for all Web applications, regardless of their configuration.
- Configure domain-wide WebLogic Authentication Configuration Providers, for which you specify the class name and properties of your own Server Authentication Module (SAM).
- Configure domain-wide Custom Authentication Providers, for which you specify the class name of this provider and its properties.
- For each of your deployed Web applications in the domain, determine whether you want Jakarta Authentication to be disabled (the default), or select one of your configured Authentication Configuration Providers to authenticate the user credentials and return a valid Subject.

Jakarta Authentication Programming Model

The Jakarta Authentication programming model is described in the Jakarta Authentication specification. See https://jakarta.ee/specifications/authentication/ (formerly Java Authentication Service Provider Interface for Containers (JASPIC)).

A sample SAM implementation is described in Adding Authentication Mechanisms to the Servlet Container in the *GlassFish Server Open Source Edition Application Development Guide*. Although written from the GlassFish Server perspective, the tips for writing a SAM, and the sample SAM itself, are instructive.

The linked GlassFish 5.0 example is a historical Java EE example. When adapting it for WebLogic Server 26.1, use the `jakarta.security.auth.message` APIs and the Jakarta Authentication 3.1 Servlet Profile. Java SE APIs such as `javax.security.auth.Subject` retain their `javax` package names.

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Jakarta Security

WebLogic Server supports Jakarta Security 4.0, which defines portable authentication and identity store interfaces, including `HttpAuthenticationMechanism` and `IdentityStore`, and an access point for programmatic security through `SecurityContext`. In WebLogic Server, these authentication mechanisms are supported in the web container, and the `SecurityContext` interface is supported in the Servlet and EJB containers.

The portable, plug-in authentication and identity store interfaces provide an advantage over standard, container-provided implementations because they allow the application to control the authentication process and the identity stores used for that authentication in a standard and portable way. Bundling the security configuration in the application, instead of configuring it externally, improves the management of the application's lifecycle, especially in a world of microservices that are distributed in containers.

The Jakarta Security specification requires that group principal names are mapped to roles of the same name by default. In WebLogic Server, if the `security-role-assignment` element in the `weblogic.xml` deployment descriptor does not declare a mapping between a security role and one or more principals in the WebLogic Server security realm, then the role name is used as the default principal.

There are no special logging requirements. Audit events triggered by implementations of the Jakarta Security specification are logged by the WebLogic Auditing Provider, if configured.

The programming model for the Jakarta Security specification is defined at `https://jakarta.ee/specifications/security/`.

For details about using Jakarta Security in WebLogic Server, see Using Jakarta Security in *Developing Applications with the WebLogic Security Service*.

These topics provide additional information about the features of the Jakarta Security specification:

- Authentication Mechanisms
- Programmatic Security

Authentication Mechanisms

WebLogic Server supports the following Jakarta Security plug-in SPIs for authentication:

- `HttpAuthenticationMechanism` (HAM) - This interface is used to authenticate callers to a web application. An application can supply its own custom `HttpAuthenticationMechanism`, or use one of the built-in mechanisms provided by the container. WebLogic Server supports the built-in BASIC, FORM, Custom FORM, and OpenID Connect authentication mechanisms, as well as application-defined implementations of `HttpAuthenticationMechanism`. The Jakarta Security OpenID Connect mechanism is configured in the application using `OpenIdAuthenticationMechanismDefinition`; it is distinct from the WebLogic OpenID Connect security provider described in Single Sign-On with OpenID Connect. The `HttpAuthenticationMechanism` interface is designed to capitalize on the strengths of existing Servlet and Jakarta Authentication mechanisms, and requires that Jakarta Authentication is enabled in WebLogic Server (the default).
- `IdentityStore` - This interface defines methods for validating a caller's credentials (such as user name and password) and returning group membership information. An application can provide its own custom `IdentityStore`, or use the built-in LDAP, database, or in-

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memory identity store. The in-memory store is configured using `InMemoryIdentityStoreDefinition`.

- `RememberMeIdentityStore` - This interface is a variation of the `IdentityStore` interface which is intended to address cases where an authenticated user's identity should be remembered for an extended period of time so that the caller can return to the application periodically without needing to present primary authentication credentials each time.

Implementations of these SPI interfaces are CDI beans. As such, applications can provide implementations that support application-specific authentication mechanisms, or validate user credentials against application-specific identity stores simply by including the interfaces in a bean archive that is part of the deployed application. For information about CDI support in WebLogic Server, see Using Contexts and Dependency Injection for the Jakarta EE Platform in *Developing Applications for Oracle WebLogic Server*.

The container is responsible for placing the `HttpAuthenticationMechanism` into service. The `IdentityStore` interface is intended primarily for use by `HttpAuthenticationMechanism` implementations, but could in theory be used by other types of authentication mechanisms (such as a Jakarta Authentication `ServerAuthModule`). `HttpAuthenticationMechanism` implementations are not required to use `IdentityStore` — they can authenticate users in any manner they choose — but the `IdentityStore` interface is a useful and convenient mechanism.

Programmatic Security

The Jakarta Security specification defines the `SecurityContext` API for use by application code to query and interact with the current security context.

The `SecurityContext` interface defines methods that allow an application to access security information about a caller, authenticate a caller, and authorize a caller. These methods include:

- `getCallerPrincipal()` - Retrieves the Principal representing the caller.
- `getPrincipalsByType()` - Retrieves all principals of the given type.
- `isCallerInRole()` - Checks if the authenticated caller is included in the specified logical application "role".
- `getAllDeclaredCallerRoles()` - Returns the declared application roles that include the current caller. In WebLogic Server, this method obtains role declarations from the current web application.
- `hasAccessToWebResource()` - Determines if the caller has access to the specified web resource for the specified HTTP methods, as determined by the security constraints configured for the application.
- `authenticate()` - Allows an application to signal to the container that it should start the authentication process with the caller.

The `getCallerPrincipal()`, `getPrincipalsByType()`, and `isCallerInRole()` methods are available in the WebLogic Servlet (including Web service) and EJB containers.

The `hasAccessToWebResource()` and the `authenticate()` APIs are supported only in the WebLogic Servlet container (including Web service).

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4

Security Realms

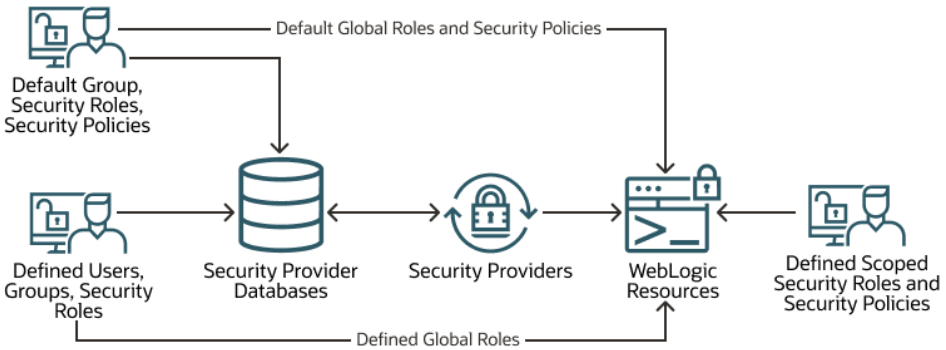
A security realm is an instance of a security configuration for a domain. Each security realm consists of a collection of users, groups, security roles, security policies, and a set of configured security providers.

- Introduction to Security Realms
- Users
- Groups
- Security Roles
- Security Policies
- Security Providers

Introduction to Security Realms

A security realm comprises mechanisms for protecting WebLogic resources. Each security realm consists of a set of configured security providers, users, groups, security roles, and security policies (see Figure 4-1). For resources that require authentication, the realm's configured providers establish the user's identity. WebLogic Server then evaluates access using the applicable security policy and, where required, the user's roles. Resources whose security configuration permits anonymous access do not require an authenticated user.

Figure 4-1 WebLogic Server Security Realm



Users

A user identity is established through the security providers configured in the realm when authentication is required. Resources that permit anonymous access do not require an authenticated user. A user can be a person, such as application end user, or a software entity, such as a client application, or other instances of WebLogic Server.

Users are entities that can be authenticated in a security realm, such as `myrealm` (see Figure 4-1).As a result of authentication, a user is assigned an identity, or principal. Each user

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is given a unique identity within the security realm. Users may be placed into groups that are associated with security roles, or be directly associated with security roles.

When users want to access WebLogic Server, they present proof material (for example, a password or a digital certificate) typically through a JAAS LoginModule to the Authentication provider configured in the security realm. If WebLogic Server can verify the identity of the user based on that username and credential, WebLogic Server associates the principal assigned to the user with a thread that executes code on behalf of the user. Before the thread begins executing code, however, WebLogic Server checks the security policy of the WebLogic resource and the principal (that the user has been assigned) to make sure that the user has the required permissions to continue.

When you use the WebLogic Authentication provider and you define a user, you also define a password for that user. WebLogic Server hashes all passwords. Subsequently, when WebLogic Server receives a client request, the password presented by the client is hashed and WebLogic Server compares it to the already hashed password to see if it matches.

> **Note**
>
> All user names and groups must be unique within a security realm.

Groups

Groups are logically ordered sets of users defined in a security realm. The members of a group have something in common.

For example, a company may separate its sales staff into two groups, Sales Representatives and Sales Managers. Companies may do this because they want their sales personnel to have different levels of access to WebLogic resources, depending on their job functions.

Managing groups is more efficient than managing large numbers of users individually. For example, an administrator can specify permissions for 50 users at one time by placing the users in a group, assigning the group to a security role, and then associating the security role with a WebLogic resource via a security policy.

All user names and groups must be unique within a security realm.

Security Roles

Like a group, a security role allows you to restrict access to WebLogic resources for several users at once.However, unlike groups, security roles:

- Are computed and granted to users or groups dynamically, based on conditions such as user name, group membership, or the time of day.
- Can be scoped to specific WebLogic resources within a single application in a WebLogic Server domain (unlike groups, which are always scoped to an entire WebLogic Server domain).

Granting a security role to a user or a group confers the defined access privileges to that user or group, as long as the user or group is "in" the security role. Multiple users or groups can be granted a single security role.

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> **Note**
>
> In WebLogic Server 6.x, security roles applied to Web applications and EJBs only. In subsequent releases, the use of security roles is expanded to include all the defined WebLogic resources.

Security Policies

A security policy is an association between a WebLogic resource and one or more users, groups, or security roles.

Security policies protect the WebLogic resource against unauthorized access. Access to a WebLogic resource is determined by the applicable security policies, including inherited policies and policies supplied by default. The absence of an explicitly assigned policy on a resource does not by itself mean that access is unrestricted. A policy condition is evaluated to determine whether access to a resource is permitted. WebLogic Server provides a set of default policy conditions. WebLogic Server includes policy conditions that access the HTTP Servlet Request and Session attributes and EJB method parameters. Date and Time policy conditions are included in the Policy Editor.

> **Note**
>
> Security policies replace the access control lists (ACLs) that were used to protect WebLogic resources in WebLogic Server 6.x.

Security Providers

Security providers provide security services to applications to protect WebLogic resources. Choose from security providers that are provided as part of WebLogic Server or develop your own custom security provider.

You can use the security providers that are provided as part of the WebLogic Server product, purchase custom security providers from third-party security vendors, or develop your own custom security providers. For information on how to develop custom security providers, see *Developing Security Providers for Oracle WebLogic Server*.

The following topics are discussed in this section.

- Security Provider Databases
- Types of Security Providers
- Security Providers and Security Realms

Security Provider Databases

The following sections explain what a security provider database is and describe how security realms affect the use of security provider databases:

- What Is a Security Provider Database?
- Security Realms and Security Provider Databases

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- Embedded LDAP Server
- RDBMS Security Store

What Is a Security Provider Database?

A **security provider database** contains the users, groups, security roles, security policies, and credentials used by some types of security providers to provide security services (see Figure 4-1). For example: an Authentication provider requires information about users and groups; an Authorization provider requires information about security policies; a Role Mapping provider requires information about security roles, and a Credential Mapping provider requires information about credentials to be used to remote applications. These security providers need this information to be available in a database in order to function properly.

The security provider database can be the embedded LDAP server (as used by the WebLogic security providers), a properties file (as used by the sample custom security providers, available on the Web), or a production-quality, customer-supplied database that you may already be using.

> **Note**
>
> WebLogic Server also includes an Oracle Identity Cloud Integrator provider that can access users, groups, and application roles stored in the Oracle Identity Cloud Service. For details about the Oracle Identity Cloud Service, see http://docs.oracle.com/en/cloud/paas/identity-cloud/index.html.

The security provider database should be initialized the first time security providers are used. (That is, before the security realm containing the security providers is set as the default (active) security realm.) This initialization can be done:

- When a WebLogic Server instance boots.
- When a call is made to one of the security provider's MBeans.

At minimum, the security provider database is initialized with the default groups, security roles, security policies provided by WebLogic Server. See Security Providers and WebLogic Resources in *Developing Security Providers for Oracle WebLogic Server*.

Security Realms and Security Provider Databases

If you have multiple security providers of the *same type* configured in the *same security realm*, these security providers may use the same security provider database. This behavior holds true for all of the WebLogic security providers and the sample security providers that are available on the Oracle Technology Network (OTN).

For example, if you configure two WebLogic Authentication providers in the default security realm (called `myrealm`), both WebLogic Authentication providers will use the same location in the embedded LDAP server as their security provider database, and thus, will use the same users and groups. Furthermore, if you or an administrator add a user or group to one of the WebLogic Authentication providers, you will see that user or group appear for the other WebLogic Authentication provider as well.

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> **Note**
>
> If you have two WebLogic security providers (or two sample security providers) of the same type configured in two different security realms, each will use its own security provider database.

Custom security providers that you develop (or the custom security providers that you obtain from third-party security vendors) can be designed so that each instance of the security provider uses its own database *or* so that all instances of the security provider in a security realm share the same database. This is a design decision that you need to make based on your existing systems and security requirements. For more information about design decisions that affect security providers, see Design Considerations in *Developing Security Providers for Oracle WebLogic Server*.

Embedded LDAP Server

WebLogic Server uses its embedded LDAP server as the database that stores user, group, security roles, and security policies for the WebLogic security providers. The embedded LDAP server is a complete LDAP server that is production quality for reasonably small environments (10,000 or fewer users). For applications that need to scale above this recommendation, the embedded LDAP server can serve as an excellent development, integration and testing environment for future export to an external LDAP server for production deployment. The embedded LDAP server supports the following access and storage functions:

- Access and modification of entries in the LDAP server
- Use of an LDAP browser to import and export security data into and from the LDAP server.
- Read and write access by the WebLogic security providers.

> **Note**
>
> WebLogic Server does not support adding attributes to the embedded LDAP server.

Table 4-1 shows how each of the WebLogic security providers uses the embedded LDAP server.

Table 4-1 Usage of the Embedded LDAP Server

WebLogic Security Provider	Embedded LDAP Server Usage
Authentication	Stores user and group information.
Identity Assertion	Stores user and group information.
Authorization	Stores security policies.
Adjudication	None.
Role Mapping	Stores role definitions and role-mapping policies.
Auditing	None.
Credential Mapping	Stores username-password credential mapping information.
Certificate Registry	Stores registered end certificates.

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RDBMS Security Store

WebLogic Server provides the option of using an external RDBMS as a datastore that is used by the following security providers:

- XACML Authorization and Role Mapping providers
- WebLogic Credential Mapping provider
- PKI Credential Mapping provider
- The following providers for SAML 2.0:
  - SAML 2.0 Identity Assertion provider
  - SAML 2.0 Credential Mapping provider
- Default Certificate Registry

When the RDBMS security store is configured in a security realm, an instance of any of the preceding security providers that has been created in the security realm automatically uses only the RDBMS security store as a datastore, and not the embedded LDAP server. Other security providers continue to use their default stores; for example, the WebLogic Authentication provider continues to use the embedded LDAP server.

Oracle recommends that you configure the RDBMS security store at the time of domain creation. The Configuration Wizard has been enhanced to simplify the process. This ensures that when the domain is booted, the security policies required to access the domain can be retrieved from the external RDBMS.

Note that the use of the RDBMS security store is required to use SAML 2.0 services in two or more WebLogic Server instances in a domain, such as in a cluster. For more information about the RDBMS security store, see Managing the RDBMS Security Store in *Administering Security for Oracle WebLogic Server*.

Types of Security Providers

The following sections describe the types of security providers that you can use with WebLogic Server:

- Authentication Providers
- Identity Assertion Providers
- Principal Validation Providers
- Authorization Providers
- Adjudication Providers
- Role Mapping Providers
- Auditing Providers
- Credential Mapping Providers
- Certificate Lookup and Validation Providers

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> **Note**
>
> You cannot develop a single security provider that merges several provider types (for example, you cannot have one security provider that does authorization and role mapping).

Authentication Providers

Authentication providers allow WebLogic Server to establish trust by validating a user. The WebLogic Server security architecture supports Authentication providers that perform: username/password authentication, certificate and digest authentication directly with WebLogic Server, and HTTP certificate authentication proxied through an external Web server.

> **Note**
>
> An Identity Assertion provider is a special type of Authentication provider that handles perimeter-based authentication and multiple security token types/protocols.
>
> WebLogic Server includes an Oracle Identity Cloud Integrator provider that combines authentication and identity assertion into a single provider. When the identity store is the Oracle Identity Cloud Service, the provider establishes identity (the Subject) on WebLogic Server with the authenticated user, the user's groups, and the user's application roles. See Configuring the Oracle Identity Cloud Integrator Provider in *Administering Security for Oracle WebLogic Server*.

A **LoginModule** is the part of an Authentication provider that actually performs the authentication of a user or system. Authentication providers also use Principal Validation providers which provide additional security by signing and verifying the authenticity of principals (users/groups). For more information about Principal Validation providers, see Principal Validation Providers in *Developing Security Providers for Oracle WebLogic Server*.

You must have at least one Authentication provider in a security realm, and you can configure multiple Authentication providers in a security realm. Having multiple Authentication providers allows you to have multiple LoginModules, each of which may perform a different kind of authentication. An administrator configures each Authentication provider to determine how multiple LoginModules are called when users attempt to login to the system. Because they add security to the principals used in authentication, a Principal Validation provider must be accessible to your Authentication providers.

Authentication providers and LoginModules are discussed in more detail in Authentication Providers in *Developing Security Providers for Oracle WebLogic Server*.

Identity Assertion Providers

Identity assertion involves establishing a client's identity using client-supplied tokens that may exist *outside* of the request. Thus, the function of an Identity Assertion provider is to validate and map a token to a username. Once this mapping is complete, an Authentication provider's LoginModule can be used to convert the username to principals. Identity Assertion providers allow WebLogic Server to establish trust by validating a user.

An Identity Assertion provider is a specific form of Authentication provider that allows users or system processes to assert their identity using tokens (in other words, perimeter authentication). You can use an Identity Assertion provider in place of an Authentication

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provider if you create a LoginModule for the Identity Assertion provider, or in addition to an Authentication provider if you want to use the Authentication provider's LoginModule. Identity Assertion providers enable perimeter authentication and support single sign-on.

WebLogic Server provides Identity Assertion providers that perform perimeter-based authentication (Web server, firewall, VPN), support token types such as Digest, SPNEGO, and SAML 2.0, and can handle multiple security protocols (Kerberos, SOAP, IIOP-CSIv2). You can also write custom Identity Assertion providers that support different token types, such as Microsoft Passport. When used with an Authentication provider's LoginModule, Identity Assertion providers support single sign-on. For example, the Identity Assertion provider can generate a token from a digital certificate, and that token can be passed around the system so that users are not asked to sign on more than once.

> **Note**
>
> To use the WebLogic Identity Assertion provider with X.509 certificates or X.501 distinguished names, you have the option of using the default user name mapper that is supplied with the WebLogic Server product (`weblogic.security.providers.authentication. DefaultUserNameMapperImpl`) or providing your own implementation of the `weblogic.security.providers.authentication.UserNameMapper` interface. See Do You Need to Develop a Custom Identity Assertion Provider?in *Developing Security Providers for Oracle WebLogic Server*.

WebLogic Server includes an Oracle Identity Cloud Integrator provider that combines authentication and identity assertion into a single provider. When the identity store is the Oracle Identity Cloud Service, the provider establishes identity (the Subject) on WebLogic Server with the authenticated user, the user's groups, and the user's application roles. See Configuring the Oracle Cloud Integrator Provider in *Administering Security for Oracle WebLogic Server*.

Multiple Identity Assertion providers can be configured in a security realm, but none are required unless identity assertion is needed. An Identity Assertion provider can support and activate multiple token types. Configure its `ActiveTypes` attribute to select the supported token types that it will process. Within a security realm, an active token type normally can be assigned to only one Identity Assertion provider. The `Authorization` token type is an exception: multiple providers can be configured to process it.

WebLogic Server provides the SAML 2.0 Identity Assertion provider to consume SAML 2.0 assertions.

Identity Assertion providers are discussed in more detail in Identity Assertion Providers in *Developing Security Providers for Oracle WebLogic Server*.

Principal Validation Providers

A Principal Validation provider is a special type of security provider that primarily acts as a "helper" to an Authentication provider. Because some LoginModules can be remotely executed on behalf of RMI clients, and because the client application code can retain the authenticated subject between programmatic server invocations, Authentication providers rely on Principal Validation providers to provide additional security protections for the principals contained within the subject.

Principal Validation providers provide these additional security protections by signing and verifying the authenticity of the principals. This principal validation provides an additional level

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of trust and may reduce the likelihood of malicious principal tampering. Verification of the subject's principals takes place during the WebLogic Server's demarshalling of RMI client requests for each invocation. The authenticity of the subject's principals is also verified when making authorization decisions.

Because you must have at least one Authentication provider in a security realm, you must also have one Principal Validation provider in a security realm. If you have multiple Authentication providers, each of those Authentication providers must have a corresponding Principal Validation provider.

> **Note**
>
> You cannot use the WebLogic Remote Console to configure Principal Validation providers directly. WebLogic Server configures the required Principal Validation providers for you when you configure your Authentication providers.

Principal Validation providers are discussed in more detail in Principal Validation Providers in *Developing Security Providers for Oracle WebLogic Server*.

Authorization Providers

Authorization providers control access to WebLogic resources based on the security role a user or group is granted, and the security policy assigned to the requested WebLogic resource. For more information about WebLogic resources, security roles, and security policies, see Understanding WebLogic Resource Security in *Securing Resources Using Roles and Policies for Oracle WebLogic Server*.

An **Access Decision** is the part of the Authorization provider that actually determines whether a subject has permission to perform a given operation on a WebLogic resource. See Principal Validation Providers in *Developing Security Providers for Oracle WebLogic Server*.

You must have at least one Authorization provider in a security realm, and you can configure multiple Authorization providers in a security realm. Having multiple Authorization providers allows you to follow a more modular design. For example, you may want to have one Authorization provider that handles Web application and EJB permissions and another that handles permissions for other types of WebLogic resources. Another example might be to have one Authorization provider that handles domestic employees, and another that handles permissions for overseas employees.

WebLogic Server includes bulk access versions of the following Authorization provider SSPI interfaces:

- BulkAuthorizationProvider
- BulkAccessDecision

The bulk access SSPI interfaces allow Authorization providers to receive multiple decision requests in one call rather than through multiple calls, typically in a '`for`' loop. The intent of the bulk SSPI variants is to allow provider implementations to take advantage of internal performance optimizations, such as detecting that many of the passed-in Resource objects are protected by the same policy and will generate the same decision result.

Authorization providers and Access Decisions are discussed in more detail in Authorization Providers in *Developing Security Providers for Oracle WebLogic Server*.

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Adjudication Providers

As part of an Authorization provider, an Access Decision determines whether a subject has permission to access a given WebLogic resource. Therefore, if multiple Authorization providers are configured, each may return a different answer to the "is access allowed?" question. These answers may be `PERMIT`, `DENY`, or `ABSTAIN`. Determining what to do if multiple Authorization providers' Access Decisions do not agree on an answer is the function of an Adjudication provider. The Adjudication provider resolves authorization conflicts by weighing each Access Decision's answer and returning a final result. If you only have one Authorization provider and no Adjudication provider, then an `ABSTAIN` returned from the single Authorization provider's Access Decision is treated like a `DENY`.

> **Note**
>
> The WebLogic Adjudication provider supports the use of the WebLogic Remote Console to control whether an abstain is treated as a permit or a deny.

You must configure an Adjudication provider in a security realm *only* if you have multiple Authorization providers configured. You can have only one Adjudication provider in a security realm.

> **Note**
>
> Because the default security realm has only one Authorization provider, it does not require an Adjudication provider, even though an Adjudication provider is provided.

WebLogic Server includes bulk access versions of the following Adjudication provider SSPI interfaces:

- BulkAdjudicationProvider
- BulkAdjudicator

The bulk access SSPI interfaces allow Adjudication providers to receive multiple decision requests in one call rather than through multiple calls, typically in a '`for`' loop. The intent of the bulk SSPI variants is to allow provider implementations to take advantage of internal performance optimizations, such as detecting that many of the passed-in Resource objects are protected by the same policy and will generate the same decision result.

Adjudication providers are discussed in more detail in Adjudication Providers in *Developing Security Providers for Oracle WebLogic Server*.

Role Mapping Providers

A Role Mapping provider supports dynamic role associations by obtaining a computed set of security roles granted to a requestor for a given WebLogic resource. The WebLogic Security Framework determines which security roles (if any) apply to a particular subject at the moment that access is required for a given WebLogic resource by:

- Obtaining security roles from the Jakarta EE and WebLogic deployment descriptor files.
- Using business logic and the current operation parameters to determine security roles.

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A Role Mapping provider supplies Authorization providers with this security role information so that the Authorization provider can answer the "is access allowed?" question for WebLogic resources that use role-based security (that is, Web application and EJB container resources).

You set security roles in Jakarta EE deployment descriptors, or create them using WebLogic Remote Console. Security roles set in deployment descriptors are applied at deployment time (unless you specifically choose to ignore deployment descriptors).

You must have at least one Role Mapping provider in a security realm, and you can configure multiple Role Mapping providers in a security realm. Having multiple Role Mapping providers allows you to work within existing infrastructure requirements (for example, configuring one Role Mapping provider for each LDAP server that contains user and security role information), or follow a more modular design (for example, configuring one Role Mapping provider that handles mappings for Web applications and EJBs, and another that handles mappings for other types of WebLogic resources).

> **Note**
>
> If multiple Role Mapping providers are configured, the WebLogic Security Framework combines the role mappings returned by the providers. A role is available to the authorization decision when any configured Role Mapping provider returns that role for the subject and resource.

WebLogic Server includes bulk access versions of the following Role Mapping provider SSPI interfaces:

- BulkRoleProvider
- BulkRoleMapper

The bulk access SSPI interfaces allow Role Mapping providers to receive multiple decision requests in one call rather than through multiple calls, typically in a '`for`' loop. The intent of the bulk SSPI variants is to allow provider implementations to take advantage of internal performance optimizations, such as detecting that many of the passed-in Resource objects are protected by the same policy and will generate the same decision result.

Role Mapping providers are discussed in more detail in Role Mapping Providers in *Developing Security Providers for Oracle WebLogic Server*.

Auditing Providers

An Auditing provider collects, stores, and distributes information about operating requests and the outcome of those requests for the purposes of non-repudiation. An Auditing provider makes the decision about whether to audit a particular event based on specific audit criteria, including audit severity levels. Auditing providers can write the audit information to output repositories such as an LDAP directory, database, or simple file. Specific actions, such as paging security personnel, can also be configured as part of an Auditing provider.

Other types of security providers (such as Authentication or Authorization providers) can request audit services before and after security operations have been performed by calling through the WebLogic Security Framework. See Auditing Events From Custom Security Providers in *Developing Security Providers for Oracle WebLogic Server*.

You can configure multiple Auditing providers in a security realm, but none are required.

Auditing providers are discussed in more detail in Auditing Providers in *Developing Security Providers for Oracle WebLogic Server*.

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Credential Mapping Providers

A **credential map** is a mapping of credentials used by WebLogic Server to credentials used in a legacy or remote system, which tell WebLogic Server how to connect to a given resource in that system. In other words, credential maps allow WebLogic Server to log into a remote system on behalf of a subject that has already been authenticated.

A Credential Mapping provider can handle several different types of credentials (for example, username/password combinations, SAML assertions, public key certificates, and alias/credential type combinations). You can set credential mappings in deployment descriptors or by using the WebLogic Remote Console. These credential mappings are applied at deploy time (unless you specifically choose to ignore the credential mappings).

You must have at least one Credential Mapping provider in a security realm, and you can configure multiple Credential Mapping providers in a security realm. If multiple Credential Mapping providers are configured, then the WebLogic Security Framework calls into each Credential Mapping provider to find out if they contain the type of credentials requested by the container. The WebLogic Security Framework then accumulates and returns all the credentials as a list.

WebLogic Server provides the SAML 2.0 Credential Mapping provider for generating SAML 2.0 assertions.

Credential Mapping providers are discussed in more detail in Credential Mapping Providers in *Developing Security Providers for Oracle WebLogic Server*.

Certificate Lookup and Validation Providers

The Certificate Lookup and Validation providers complete certificate paths and validate X509 certificate chains. There are two types of CLV providers:

- CertPath Builder - Receives a certificate, a certificate chain, or certificate reference (the end certificate in a chain or the Subject DN of a certificate) from a web service or application code. The provider looks up and validates the certificates in the chain.
- CertPath Validator - Receives a certificate chain from the SSL protocol, a web service, or application code and performs extra validation (for example, revocation checking).

There must be at least one CertPath Builder and one CertPath Validator configured in a security realm. Multiple CertPath Validators can be configured in a security realm. If multiple providers are configured, a certificate or certificate chain must pass validation with all the CertPath Validators in order for the certificate or certificate chain to be valid.

WebLogic Server provides the functionality of the CLV providers in the WebLogic CertPath provider and the Certificate Registry.

Security Provider Summary

Table 4-2 indicates whether you can configure multiple security providers of the same type in a security realm.

Table 4-2 Multiple Providers of Same Type in Same Security Realm

Type	Multiple Providers Supported?
Authentication provider	Yes
Identity Assertion provider	Yes

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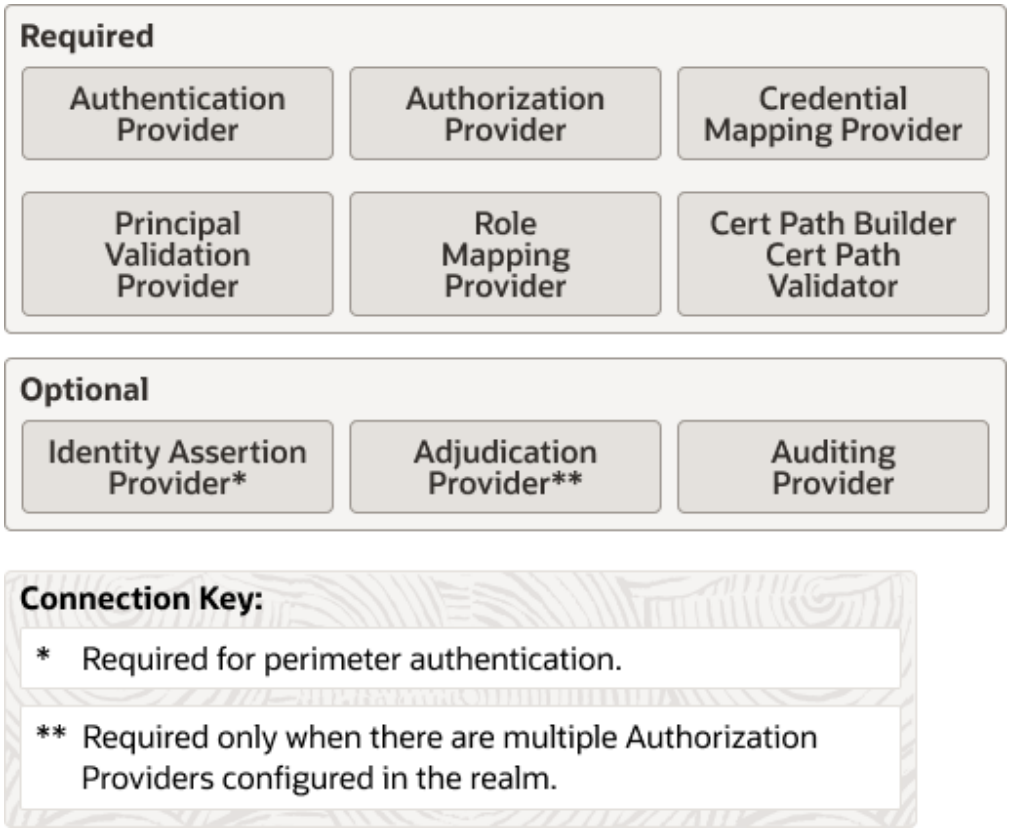
Table 4-2 (Cont.) Multiple Providers of Same Type in Same Security Realm

Type	Multiple Providers Supported?
Principal Validation provider	Yes
Authorization provider	Yes
Adjudication provider	No
Role Mapping provider	Yes
Auditing provider	Yes
Credential Mapping provider	Yes
Certificate Lookup and Validation provider	One CertPath Builder Multiple CertPath Validators

Security Providers and Security Realms

All security providers exist within the context of a security realm. The WebLogic Server security realm defined out-of-the-box as the default realm (that is, the active security realm called `myrealm`) contains the WebLogic security providers displayed in Figure 4-2.

Figure 4-2 WebLogic Security Providers in a Security Realm



Because security providers are individual modules or components that are "plugged into" a WebLogic Server security realm, you can add, replace, or remove a security provider with minimal effort. You can use the WebLogic security providers, custom security providers you

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develop, security providers obtained from third-party security vendors, or a combination of all three to create a fully-functioning security realm. However, as Figure 4-2 also shows, some types of security providers are required for a security realm to operate properly. Table 4-3 summarizes which security providers must be configured for a fully-operational security realm.

Table 4-3 Security Providers in a Security Realm

Type	Required?
Authentication provider	Yes
Identity Assertion provider	Yes, if using perimeter authentication.
Principal Validation provider	Yes
Authorization provider	Yes
Adjudication provider	Yes, if there are multiple Authorization providers configured.
Role Mapping provider	Yes
Auditing provider	No
Credential Mapping provider	Yes
Certificate Lookup and Validation providers	Yes

For more information about security realms, see Configuring WebLogic Security: Main Steps in *Administering Security for Oracle WebLogic Server*.

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5

WebLogic Security Service Architecture

The architecture of the WebLogic Security Service comprises three major components — WebLogic containers (Web and EJB), the Resource containers, and the security providers.

- WebLogic Security Framework
- Single Sign-On with the WebLogic Security Framework
- SAML Token Profile Support in WebLogic Web Services
- The Security Service Provider Interfaces (SSPIs)
- WebLogic Security Providers

WebLogic Security Framework

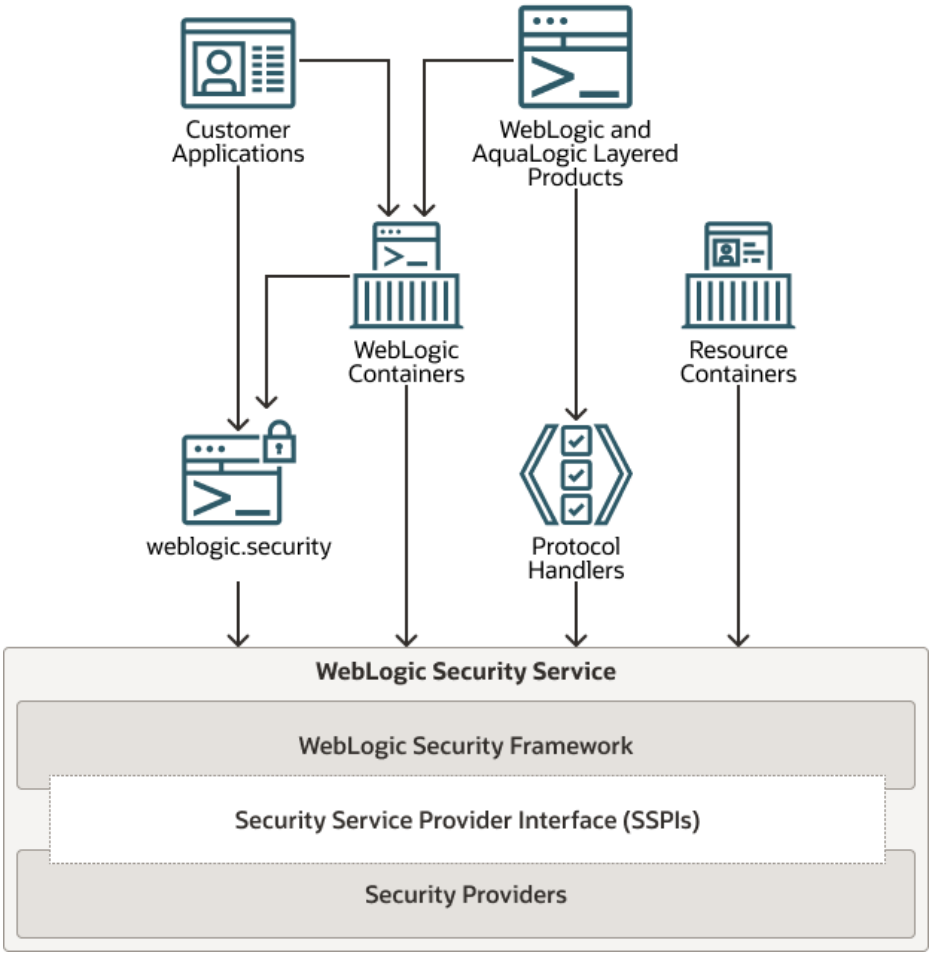
The primary function of the WebLogic Security Framework is to provide a simplified application programming interface (API) that can be used by security and application developers to define security services. Within that context, the WebLogic Security Framework also acts as an intermediary between the WebLogic containers (Web and EJB), the Resource containers, and the security providers.

WebLogic Security Framework provides a simplified application programming interface (API) that can be used by security and application developers to define security services.

Figure 5-1 shows a high-level view of the WebLogic Security Framework. The framework comprises interfaces, classes, and exceptions in the `weblogic.security.service` package.

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Figure 5-1 WebLogic Security Service Architecture



The following sections describe the interactions between the WebLogic containers and Resource containers and each of the security providers via the WebLogic Security Framework:

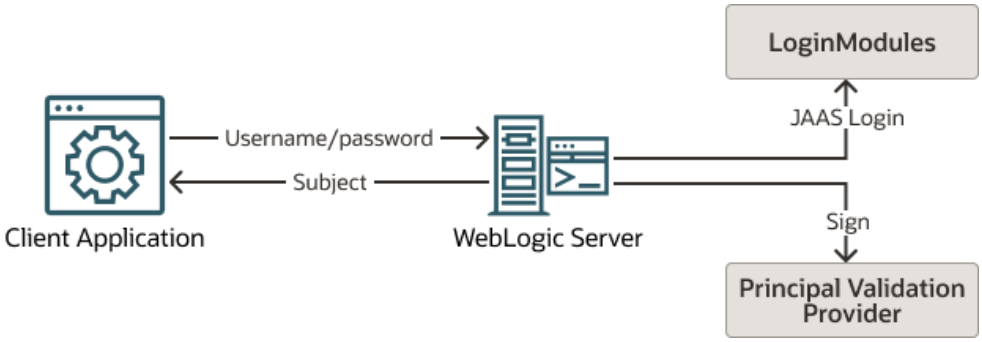
- The Authentication Process
- The Identity Assertion Process
- The Principal Validation Process
- The Authorization Process
- The Adjudication Process
- The Role Mapping Process
- The Auditing Process
- The Credential Mapping Process
- The Certificate Lookup and Validation Process

The Authentication Process

Figure 5-2 shows the authentication process for a fat-client login. JAAS runs on the server to perform the login. Even in the case of a thin-client login (that is, a Web browser client) JAAS is still run on the server.

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Figure 5-2 The Authentication Process



> **Note**
>
> Only developers of custom Authentication providers will be involved with this JAAS process directly. The client application could either use a JNDI Initial Context or JAAS to initiate the passing of the username and password.

When a user attempts to log into a system using a username/password combination, WebLogic Server establishes trust by validating that user's username and password, and returns a subject that is populated with principals per JAAS requirements. As Figure 5-2 also shows, this process requires the use of a LoginModule and a Principal Validation provider. For more information on Principal Validation providers, see WebLogic Principal Validation Provider.

After successfully proving a caller's identity, an authentication context is established, which allows an identified user or system to be authenticated to other entities. Authentication contexts may also be delegated to an application component, allowing that component to call another application component while impersonating the original caller.

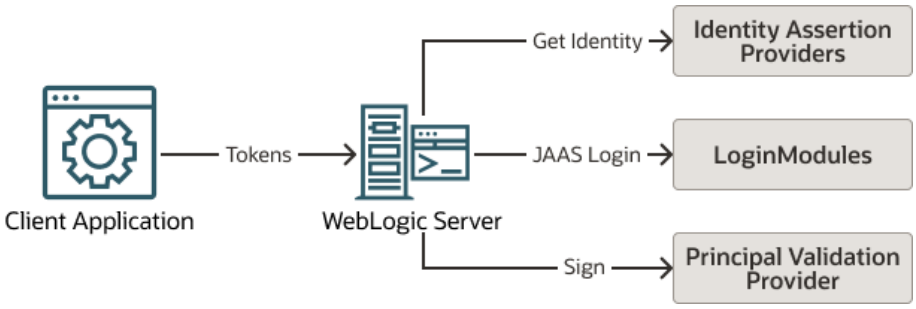
The Identity Assertion Process

Identity Assertion providers are used as part of perimeter authentication process. When perimeter authentication is used (see Figure 5-3), a token from outside of the WebLogic Server domain is passed to an Identity Assertion provider in a security realm that is responsible for validating tokens of that type and that is configured as "active". If the token is successfully validated, the Identity Assertion provider maps the token to a WebLogic Server username, and sends that username back to WebLogic Server, which then continues the authentication process. Specifically, the username is sent via a JAAS `CallbackHandler` and passed to each configured Authentication provider's LoginModule so that the LoginModule can populate the subject with the appropriate principals.

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> **Note**
>
> To use the WebLogic Identity Assertion provider with X.509 certificates or X.501 distinguished names, you have the option of using either the default user name mapper that is supplied with the WebLogic Server product (`weblogic.security.providers.authentication. DefaultUserNameMapperImpl`) or your own implementation of the `weblogic.security.providers.authentication.UserNameMapper` interface. See Do You Need to Develop a Custom Identity Assertion Provider? in *Developing Security Providers for Oracle WebLogic Server*.

Figure 5-3 Perimeter Authentication

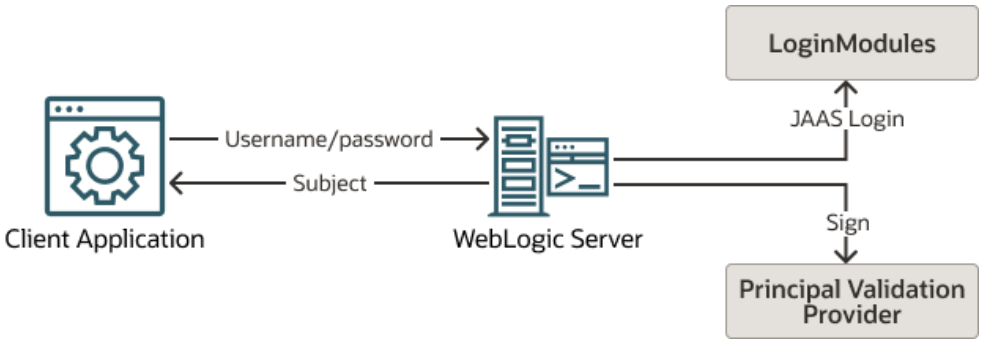


As Figure 5-3 also shows, perimeter authentication requires the same components as the authentication process, but also adds an Identity Assertion provider.

The Principal Validation Process

As shown in Figure 5-4, a user attempts to log into a system using a username/password combination. WebLogic Server establishes trust by calling the configured Authentication provider's LoginModule, which validates the user's username and password and returns a subject that is populated with principals per JAAS requirements.

Figure 5-4 The Principal Validation Process



The WebLogic Security Framework uses the configured Principal Validation providers to sign the principals in the authenticated subject. When an identity is validated, the framework asks

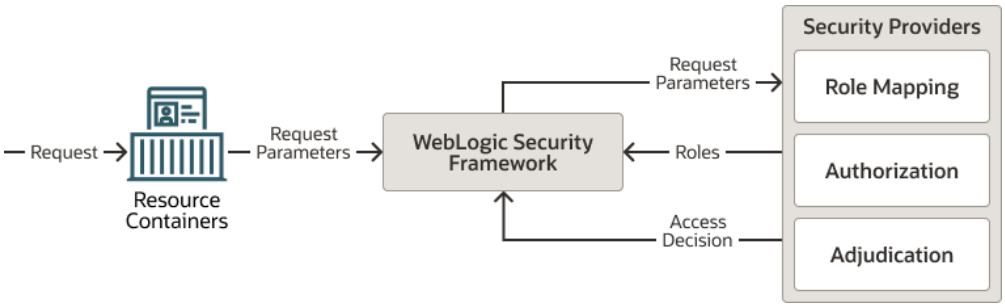
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the appropriate providers to verify that their supported principals have not changed since they were signed.

The Authorization Process

Figure 5-5 illustrates how Authorization providers (and the associated Adjudication and Role Mapping providers) interact with the WebLogic Security Framework during the authorization process.

Figure 5-5 Authorization Process



The authorization process is initiated when a user or system process requests a WebLogic resource on which it will attempt to perform a given operation. The resource container that handles the type of WebLogic resource being requested receives the request (for example, the EJB container receives the request for an EJB resource). The resource container calls the WebLogic Security Framework and passes in the request parameters, including information such as the subject of the request and the WebLogic resource being requested. The WebLogic Security Framework calls the configured Role Mapping providers and passes in the request parameters in a format that the Role Mapping providers can use. The Role Mapping providers use the request parameters to compute a list of roles to which the subject making the request is entitled and passes the list of applicable roles back to the WebLogic Security Framework. The Authorization provider determines whether the subject is entitled to perform the requested action on the WebLogic resource, that is, the Authorization provider makes the Access Decision. If there are multiple Authorization providers configured, the WebLogic Security Framework delegates the job of reconciling any conflicts in the Access Decisions rendered by the Authorization providers to the Adjudication provider and the Adjudication provider determines the ultimate outcome of the authorization decision.

The Adjudication Process

If there are multiple Authorization providers configured (see Figure 5-5), an Adjudication provider is required to tally the multiple Access Decisions and render a verdict. The Adjudication provider returns a boolean verdict to the WebLogic Security Framework, which returns the authorization result to the resource container.

- If the decision is `TRUE`, the resource container dispatches the request to the protected WebLogic resource.
- If the decision is `FALSE`, the resource container throws a security exception that indicates that the requestor was not authorized to perform the requested access on the protected WebLogic resource.

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The Role Mapping Process

The WebLogic Security Framework calls each Role Mapping provider that is configured for a security realm as part of an authorization decision. For related information, see The Authorization Process.

Figure 5-6 shows how the Role Mapping providers interact with the WebLogic Security Framework to create dynamic role associations.

Figure 5-6 Role Mapping Process



The role mapping process is initiated when a user or system process requests a WebLogic resource on which it will attempt to perform a given operation. The resource container that handles the type of WebLogic resource being requested receives the request (for example, the EJB container receives the request for an EJB resource). The resource container calls the WebLogic Security Framework and passes in the request parameters, including information such as the subject of the request and the WebLogic resource being requested. The WebLogic Security Framework calls each configured Role Mapping provider to obtain a list of the roles that apply. If a security policy specifies that the requestor is entitled to a particular role, the role is added to the list of roles that are applicable to the subject. This process continues until all security policies that apply to the WebLogic resource or the resource container have been evaluated. The list of roles is returned to the WebLogic Security Framework, where it can be used as part of other operations, such as access decisions.

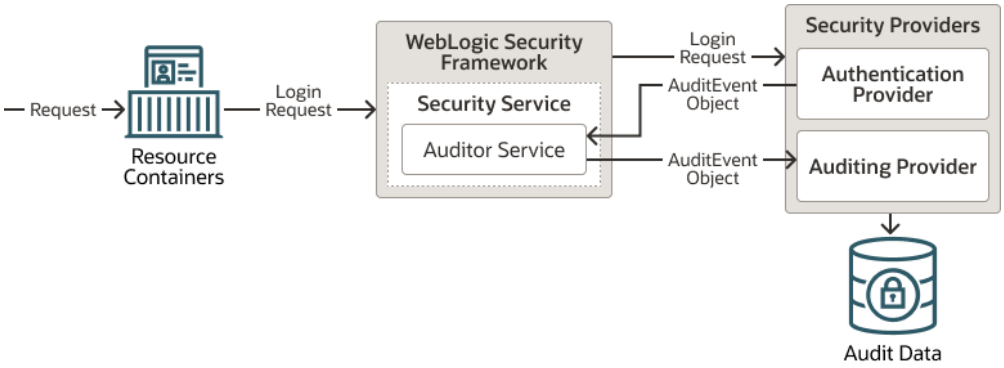
The result of the dynamic role association (performed by the Role Mapping providers) is a set of roles that apply to the principals stored in a subject at a given moment. These roles can then be used to make authorization decisions for protected WebLogic resources, as well as for resource container and application code. For example, an EJB can call `EJBContext.isCallerInRole(String roleName)` to determine whether the caller has a particular application role, and use the boolean result to decide whether its application code should retrieve fields from a database record. The method itself does not retrieve database data.

The Auditing Process

Figure 5-7 shows how Auditing providers interact with the WebLogic Security Framework and other types of security providers (using an Authentication provider as an example).

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Figure 5-7 Auditing Process

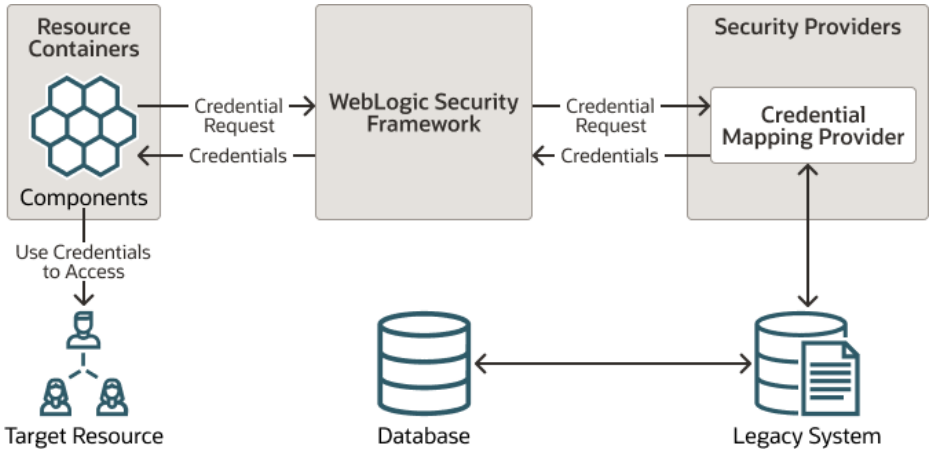


The auditing process is initiated when a resource container passes a user's authentication information (for example, a username/password combination) to the WebLogic Security Framework as part of a login request. The WebLogic Security Framework passes the information associated with the login request to the configured Authentication provider. If, in addition to providing authentication services, the Authentication provider is designed to post audit events, the Authentication provider instantiates an `AuditEvent` object. The `AuditEvent` object includes information such as the event type to be audited and an audit severity level. The Authentication provider then calls the Auditor Service in the WebLogic Security Framework, passing in the `AuditEvent` object. The Auditor Service passes the `AuditEvent` object to the configured Auditing providers' runtime classes, enabling audit event recording. The Auditing providers' runtime classes use the information obtained from the `AuditEvent` object to control audit record content. When the criteria for auditing specified by the Authentication providers in the `AuditEvent` object is met, the appropriate Auditing provider's runtime class writes out audit records. Depending on the Auditing provider implementation, audit records may be written to a file, a database, or some other persistent storage medium.

The Credential Mapping Process

Figure 5-8 illustrates how Credential Mapping providers interact with the WebLogic Security Framework during the credential mapping process.

Figure 5-8 Credential Mapping Process



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The credential mapping process is initiated when application components, such as JavaServer Pages (JSPs), servlets, EJBs, or Resource Adapters call into the WebLogic Security Framework (through the appropriate resource container) to access an Enterprise Information System (EIS), for example, some relational database like Oracle, SQL Server, and so on. As part of the call, the application component passes in the subject (that is, the "who" making the request), the WebLogic resource (that is, the "what" that is being requested) and information about the type of credentials needed to access the WebLogic resource. The WebLogic Security Framework sends the application component's request for credentials to a configured Credential Mapping provider that handles the type of credentials needed by the application component. The Credential Mapping provider consults its database to obtain a set of credentials that match those requested by the application component and returns the credentials to the WebLogic Security Framework. The WebLogic Security Framework passes the credentials back to the requesting application component through the resource container. The application component uses the credentials to access the external system.

The Certificate Lookup and Validation Process

During the certificate lookup and validation process, CertPath Builders, CertPath Validators, and the Certificate Lookup and Validation (CLV) framework all interact.

The process for building certificate chains works as follows:

1. The CLV framework receives a `CertPathSelector` identifying the certificate to locate, an optional list of trusted CAs, and an optional `ContextHandler` from a WebLogic Web service or application code. Supported selector types depend on the configured CertPath Builder; examples include an end certificate, subject DN, issuer DN with serial number, or subject key identifier.
2. The CLV framework calls the CertPath Builder to locate the certificate chain and validate it. The caller can supply trusted CAs; when that argument is `null`, the server's configured trusted CAs are used.
3. If the certificate chain is found and valid, the CLV framework calls any CertPath Validators configured in the security realm in the order they were configured.

   The certificate chain is only valid if the CertPath Builder and all the configured CertPath Validators successfully validate it.
4. The CLV framework returns a `CertPathBuilderResult` containing the validated certificate chain to the requesting party.
5. Processing continues.

The process for validating certificate chains works as follows:

1. The CLV framework receives an existing X.509 `CertPath`, an optional list of trusted CAs, and an optional `ContextHandler` from the SSL implementation, a WebLogic Web service, or application code. A `CertPathSelector` is not an input to validation.
2. The CLV framework checks that the certificate chain is ordered from the end certificate toward its issuers and that each certificate followed by an issuer certificate is signed by that issuer.
3. If the certificate chain is valid, the CLV framework calls any CertPath Validators configured in the security realm in the order they were configured.

   The certificate chain is only valid if all the configured CertPath Validators successfully validate it. Validation stops if an error occurs.
4. The CLV framework returns a `CertPathValidatorResult` indicating successful validation to the requesting party.

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5. Processing continues.

Single Sign-On with the WebLogic Security Framework

The SAML, Windows Integrated Login, and OpenID Connect features provide web-based single sign-on (SSO) functionality for WebLogic Server applications.

The following sections describe the interactions among the WebLogic containers, the security providers, and the WebLogic Security Framework during the single sign-on process:

- Single Sign-On and SAML 2.0
- Desktop SSO Process
- Single Sign-On with OpenID Connect

Single Sign-On and SAML 2.0

The SAML 2.0 Web Single Sign-On (SSO) profile supported by WebLogic Server implements the Authentication Request Protocol in conjunction with the HTTP Redirect, HTTP POST, and HTTP Artifact bindings. The following sections describe the flow of execution in both ways of that this profile can be initiated, showing the interaction among the SAML 2.0 services provided in WebLogic Server and the WebLogic Security Service:

- Service Provider Initiated Single Sign-On
- Identity Provider Initiated Single Sign-On

Service Provider Initiated Single Sign-On

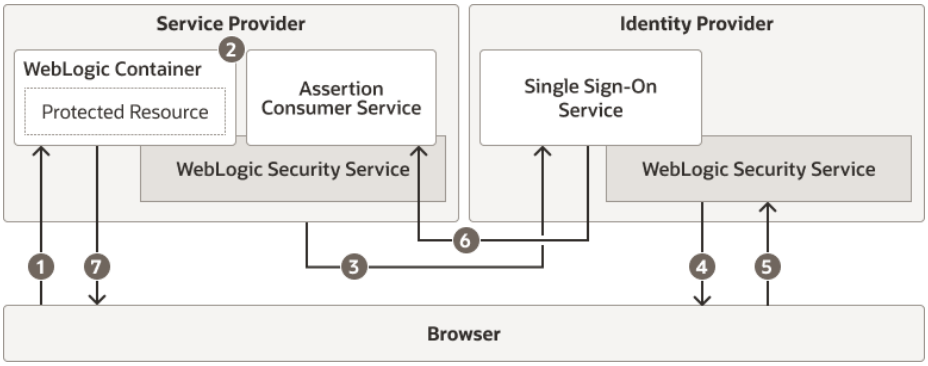
In a typical Service Provider initiated SSO scenario, an unauthenticated user tries to access a protected resource on a Service Provider site. In response, the Service Provider initiates a Web SSO session by identifying the appropriate Identity Provider partner and sending or redirecting an authentication request to that partner. The Identity Provider then authenticates the user, typically via a login web application, generates a SAML assertion containing that user's identity information, and returns the assertion to the Service Provider in the form of an authentication response.

When the Service Provider receives the authentication response, the Service Provider extracts the identity information from the assertion contained in the response and verifies the user's identity by mapping it to a Subject in the local security realm. If the user's identity is successfully mapped, the Service Provider can consequently authorize the user's access to the protected resource.

Figure 5-9 shows the flow of execution in an example of a Service Provider initiated Web single sign-on session.

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Figure 5-9 Service Provider Initiated Single Sign-On



Note the following callouts in Figure 5-9 showing the flow of execution:

1. From a web browser, a user attempts to access a protected resource running in a WebLogic container that is hosted by a Service Provider.
2. The WebLogic container invokes the WebLogic Security Service to determine if the user is authenticated.
3. Because the user is not authenticated, the Service Provider generates an authentication request identifying the requesting Service Provider and sends it to the Identity Provider's Single Sign-On Service.

   The Service Provider can be configured to use one of the following bindings for transmitting the authentication request:

   - HTTP POST - The Service Provider returns an HTML form containing the encoded authentication request. The browser submits the form by HTTP POST to the Identity Provider's Single Sign-On Service.
   - HTTP Artifact - The Service Provider sends a SAML artifact through the browser to the Identity Provider, using an HTTP redirect or an HTML form submitted by HTTP POST, as configured. The artifact references the authentication request retained by the Service Provider. The Identity Provider resolves the artifact through the Service Provider's Artifact Resolution Service (ARS) to obtain the authentication request.
   - HTTP Redirect - The Service Provider sends an HTTP redirect message to the user's browser, which sends an HTTP GET message to the Identity Provider's Single Sign-On Service.
4. The user is presented with a login web application hosted by an Identity Provider that is capable of authenticating that user. The Identity Provider challenges the user for his or her credentials.
5. The user provides his or her username and password to the Identity Provider, which completes the authentication operation.
6. The Single Sign-On Service hosted by the Identity Provider generates an assertion for the user and returns an authentication response to the Service Provider's Assertion Consumer Service (ACS).

   The Identity Provider can be configured to use the following bindings:

   - HTTP POST - The Identity Provider sends the authentication response, which contains the assertion, to the user's browser. The authentication response is transmitted to the Service Provider via an HTTP POST message.

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- HTTP Artifact - The Identity Provider sends a SAML artifact through the browser to the Service Provider's Assertion Consumer Service, using an HTTP redirect or an HTML form submitted by HTTP POST, as configured. The Service Provider resolves the artifact through the Identity Provider's Artifact Resolution Service (ARS) to obtain the authentication response containing the assertion.

  The ACS validates the assertion, extracts the identity information from that assertion, and maps that identity to a subject in the local security realm.

7. The ACS sends an HTTP redirect message to the browser, passing a cookie containing a session ID and enabling the browser to access the requested resource.

   The WebLogic Security Service performs an authorization check to determine whether the browser may access the requested resource. If the authorization check succeeds, access to the resource is granted.

When SAML Single Logout is configured for a WebLogic Server Service Provider, the application can initiate the SAML Single Logout flow to end the local session and request logout through its Identity Provider partner. The Identity Provider coordinates logout with participating Service Providers. The outcome depends on those partners completing the logout protocol; an ordinary local application logout does not by itself guarantee logout from all participating applications.

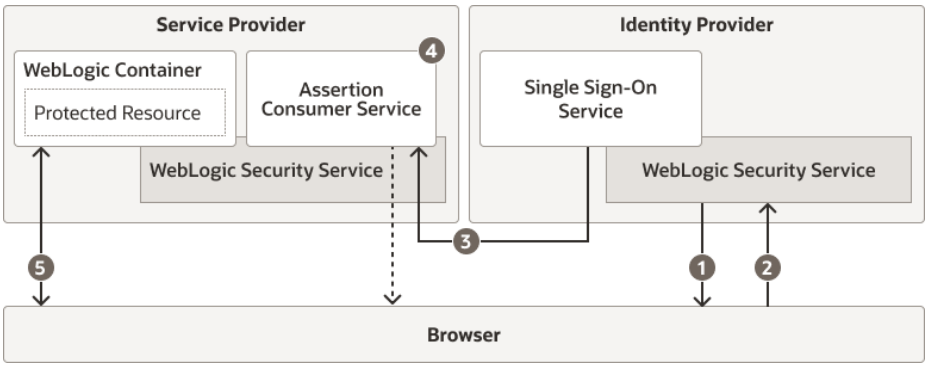
Identity Provider Initiated Single Sign-On

WebLogic Server also supports the scenario in which a web single sign-on session is initiated by an Identity Provider. In this scenario, a user is authenticated by an Identity Provider and issues a request on a resource that is hosted by a Service Provider. The Identity Provider initiates the SSO session by sending an unsolicited authentication response to the Service Provider.

When the Service Provider receives the authentication response, the Service Provider extracts the identity of the user from the assertion, maps that identity to a local subject, and performs an authorization check on the requested resource. If the authorization check succeeds, access is granted.

Figure 5-10 shows the flow of execution in a typical Identity Provider initiated SSO session.

Figure 5-10 Identity Provider Initiated Single Sign-On



Note the following callouts in Figure 5-10 showing the flow of execution:

1. The user is presented with a login web application hosted by an Identity Provider that authenticates the user. The Identity Provider challenges the user for his or her credentials.

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2. The user provides his or her username and password to the Identity Provider, which completes the authentication process.

   The user issues a request on a resource that is hosted by a Service Provider.

3. The Single Sign-On Service hosted by the Identity Provider sends an unsolicited authentication response to the Service Provider's Assertion Consumer Service (ACS).

   Regardless of how the SSO session is initiated, the Identity Provider uses the same bindings as described in Service Provider Initiated Single Sign-On.

4. The ACS validates the assertion, extracts the identity information, and maps that identity to a subject in the local security realm. The ACS sends an HTTP redirect message to the browser, passing a cookie containing a session ID and enabling the browser to access the requested resource.

5. The WebLogic Security Service performs an authorization check to determine whether the browser may access the requested resource. If the authorization check succeeds, access to the resource is granted.

Desktop SSO Process

The process works as follows:

1. The Negotiate Identity Assertion provider is configured to support the `WWW-Authenticate` and `Authorization` HTTP headers. The Negotiate Identity Assertion provider uses a servlet authentication filter to generate the appropriate WWW-Authenticate header on unauthorized responses for the negotiate protocol and handles the Authorization headers on subsequent requests.

2. A user logs into the Windows domain. The user acquires Kerberos credentials from the domain.

3. Using a browser that supports the SPNEGO protocol , the user tries to access a Web Application running on an application server. The application server can be running on a UNIX or Windows platform.

4. The browser sends a `GET` request to the application server.

5. The application server sends back an unauthorized response with the appropriate `WWW-Authenticate` headers.

6. The Servlet container gets the configured chain of servlet authentication filters from the WebLogic Security Framework.

7. The Servlet container calls the chain of servlet authentication filters. The Negotiate servlet authentication filter obtains the initial Negotiate challenge from the WebLogic Security Framework and adds the `WWW-Authenticate` response header for the Negotiate authentication scheme. The following message is sent back:

   ```
   401 Unauthorized

   WWW-Authenticate: Negotiate
   ```

8. The browser receives the `WWW-Authenticate` header and determines whether or not it can support the Negotiate authentication scheme. The browser then creates a SPNEGO token containing the supported GSS mechanism token types. It Base64 encodes the token and sends it back to the application server via an Authorization header on the original GET message as follows:

   ```
   GET...
   Authorization: Negotiate <Base64 encoded SPNEGO token>
   ```


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9. Since the request is still unauthorized, the Servlet container calls the servlet authentication filters. The Negotiate servlet authentication filter handles the Authorization request header and calls the WebLogic Security Framework. The framework passes the token to the Negotiate Identity Assertion provider.
10. The Negotiate Identity Assertion provider uses the GSS context to get the name of the initiating Principal. This name is mapped to a username and passed back to the WebLogic Security Framework via a Callback handler.

    The WebLogic Security Framework also determines to which groups the user belongs.
11. The authentication is complete and the GET request is processed.

Single Sign-On with OpenID Connect

The WebLogic OpenID Connect provider is an authentication and identity assertion provider that can manage access to web applications from users and groups stored in OpenID providers (external authorization servers that adhere to the OpenID Connect and OAuth 2.0 standards). Web applications are protected by the OAuth 2.0 Authorization code flow mechanism, enhanced with the Proof Key for Code Exchange (PKCE) extension.

The following topic describes the interactions between WebLogic Server, the web application, and an OpenID provider during the single sign-on process.

All communication between the web application and the OpenID provider uses TLS.

A successful process works as follows:

1. Register an OAuth client with an OpenID provider supported by WebLogic Server.
2. Configure the web application with the client ID, client secret, issuer, and redirect URI supplied or registered for that client.
3. Configure the WebLogic OpenID Connect provider in the security realm.
4. When an unauthenticated user requests the protected application, WebLogic Server creates a fresh PKCE code verifier and derives an S256 code challenge. It redirects the browser to the OpenID provider's authorization endpoint with the authorization request, code challenge, challenge method, and state value. The code verifier is separate from the configured OAuth client secret.
5. The OpenID provider authenticates the user and redirects the browser to the application's registered redirect URI with an authorization code and the state value.
6. WebLogic Server matches the state to the saved request and sends the authorization code and code verifier to the OpenID provider's token endpoint. It authenticates the client using the configured client ID and client secret.
7. The OpenID provider validates the code verifier against the code challenge and returns an ID token and an access token.
8. The WebLogic OpenID Connect provider validates the ID token and establishes the authenticated subject. WebLogic Server redirects the browser to the originally requested resource.
9. The application can use the access token to request resources for which that token is authorized.

SAML Token Profile Support in WebLogic Web Services

The WebLogic Web services and the WebLogic Security Framework support the generation, consumption, and validation of SAML 2.0 assertions.

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When using SAML assertions, a web service passes a SAML assertion and the accompanying proof material to the WebLogic Security Framework.If the SAML assertion is valid and trusted, the framework returns an authenticated Subject with a trusted principal back to the web service. WebLogic Web services and the WebLogic Security Framework support the following SAML assertions:

- Sender-Vouches - The asserting party (different from the subject) vouches for the verification of the subject. The receiver must have a trust relationship with the asserting party.
- Holder-of-Key - The purpose of SAML token with "holder-of-key" subject confirmation is to allow the subject to use an X.509 certificate that may not be trusted by the receiver to protect the integrity of the request messages.

  Conceptually, the asserting party inserts an X.509 public certificate (or other key info) into a SAML assertion. (More correctly, the asserting party binds a key to a subject.) In order to protect this embedded certificate, the SAML assertion itself must be signed by the asserting entity. For WebLogic Server, the Web service client signs the SAML assertion with its private key. That is, the signature on the assertion is the signature of the SAML authority, and is not based on the certificate contained in, or identified by, the assertion.
- Bearer - The subject of the assertion is the bearer of the assertion, subject to optional constraints on confirmation using attributes that may be included in the `<SubjectConfirmationData>` element of the assertion.

The following sections describe how the processing of these assertions work.

Sender-Vouches Assertions

All the Sender-Vouches assertions are basically the same, the difference is in how trust is established (meaning whether or not SSL is used for transport and whether or not the SAML assertion and the message bodies are signed).

The Sender-Vouches assertions are used in the following manner:

1. A user invokes a WebLogic Web service.
2. The Web service requests a SAML assertion from the user.
3. The user generates a SAML assertion and returns it to the Web service.
4. The Web service calls the SAML Credential Mapping provider, which generates an appropriate SAML assertion.
5. One of the following occurs. Note that this list represents the most likely scenarios and that other scenarios are possible.
   - The Web service sends an unsigned assertion and uses a non-SSL transport in a SOAP message to the destination. With this type of assertion, there is no proof material in the SOAP message so the assertion cannot be trusted nor can it be assumed that the assertion came from a trusted party.
   - The Web service uses the SSL protocol to send an unsigned assertion in a SOAP message to the destination. With this type of assertion, the client certificate is used to establish trust.
   - The Web service signs the assertion and sends it using a non-SSL transport in a SOAP message to the destination. With this type of assertion, the signature provides the proof material for trust but it can't be assumed that the connection was not compromised. However, modification of a signed assertion can be detected because any change will break the signature

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- The Web service signs the assertion and uses the SSL protocol to send the signed assertion in a SOAP message to the destination. With this type of assertion, trust is established either through the signature or the client certificate.

6. The SAML Identity Assertion provider consumes and validates the assertion and determines if the assertion is to be trusted.
7. If the assertion is to be trusted, the SAML Identity Assertion provider creates a Subject containing user principals and possibly group principals and returns the Subject with principals to the Web service.
8. The Web service returns the response to the user.

Holder-of-Key Assertion

In the Holder-of-Key assertion, the Web service client depends on the Web service server to ensure that the user is to be trusted.

The Holder-of-Key assertions are used in the following manner:

1. A user authenticates to a Web service client through some undetermined mechanism. The Web service client can be local or remote and may or may not be a WebLogic server instance.
2. The Web service client trusts the user, generates a SAML assertion containing the certificate of the user, and signs the SAML assertion with its private key. The Web service client returns the SAML assertion to the user.
3. The user inserts the SAML assertion information into a `wsse:Security` header in a SOAP message. The message body is signed with the private key of the user.
4. The user invokes a WebLogic Web service.
5. The Web service sends the SOAP message to the Web service server (in this case, a WebLogic Server instance). The Web service server makes a trust decision based on whether or not it trusts the SAML assertion and the SOAP message.
6. The Web services server receives the assertion and passes it to the SAML Identity Asserter. The SAML Identity Asserter verifies the assertion signature and verifies trust in the certificate used for that signature.

   If this succeeds, the Web service server can assume that the key in the holder-of-key assertion does in fact belong to the Subject of the assertion. Web services can then use that key to verify the signature that signs the SOAP message, which establishes that the SOAP message was generated/sent by the holder of the key. It is up to the Web service server to verify trust in the X.509 certificate itself.

   The Web service server returns a Subject with principals for the SAML assertion to the Web service client.
7. The Web service client returns the response to the user.

Optionally, the SSL protocol can be used with this assertion. If the SSL protocol is used, the client certificate can also be used as proof material.

The Security Service Provider Interfaces (SSPIs)

Developers and third-party vendors can use SSPIs to develop custom security providers for securing the WebLogic Server environment. SSPIs are available for Adjudication, Auditing, Authentication, Authorization, Credential Mapping, Identity Assertion, Role Mapping, and Certificate Lookup and Validation.

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The SSPIs allow customers to use custom security providers for securing WebLogic Server resources. Customers can use the SSPIs to develop custom security providers or they can purchase custom security providers from third-party vendors.

To assist customers in developing custom security providers, sample custom security providers are also available on the Oracle Technology Network (OTN).

For more information on developing custom security providers, see Introduction to Developing Security Providers for WebLogic Server in *Developing Security Providers for Oracle WebLogic Server*.

WebLogic Security Providers

Security providers are modules that "plug into" a WebLogic Server security realm to provide security services to applications. WebLogic Server includes security providers such as WebLogic Authentication provider, WebLogic Authorization provider, WebLogic Identity Assertion provider and many more.

This section provides descriptions of the security providers that are included in the WebLogic Server product for your use. The WebLogic Security Framework invokes the configured security providers to perform security operations on behalf of applications and WebLogic Server components.

If the security providers supplied with the WebLogic Server product do not fully meet your security requirements, you can supplement or replace them with custom security providers. You develop a custom security provider by:

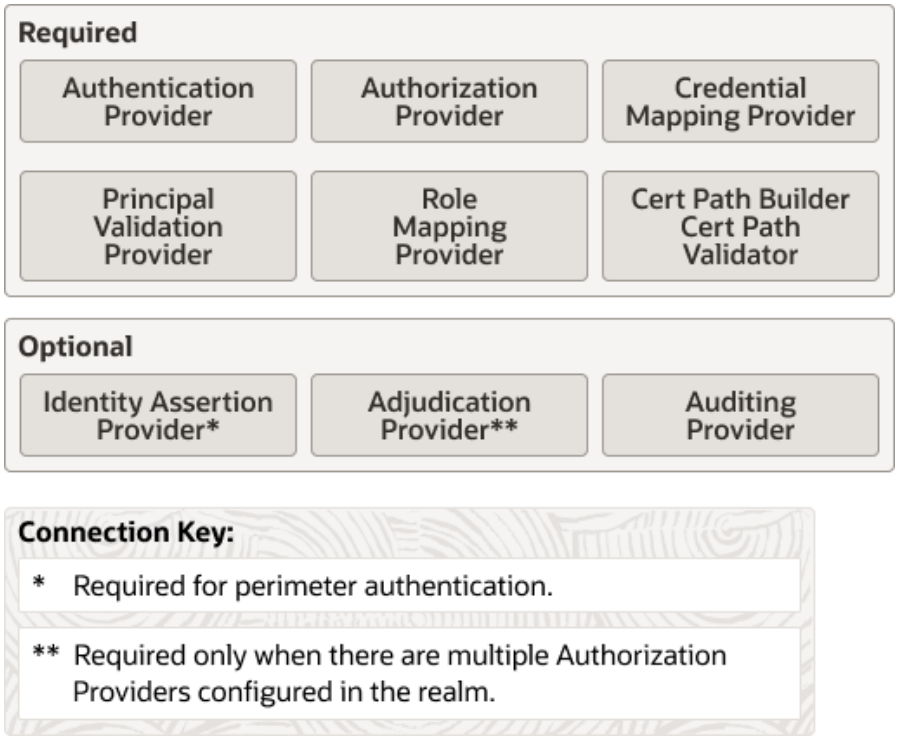
- Implementing the appropriate security service provider interfaces (SSPIs) from the `weblogic.security.spi` package to create runtime classes for the security provider.
- Creating an MBean Definition File (MDF) and using the WebLogic MBeanMaker utility to generate an MBean type, which is used to configure and manage the security provider.

See Overview of the Development Process in *Developing Security Providers for Oracle WebLogic Server*.

Figure 5-11 shows the security providers that are required and those that are optional in a WebLogic security realm.

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Figure 5-11 WebLogic Security Providers



The security providers are described in the following sections:

- WebLogic Authentication Provider
- Alternative Authentication Providers
- Password Validation Provider
- WebLogic Identity Assertion Provider
- SAML 2.0 Identity Assertion Provider
- Negotiate Identity Assertion Provider
- WebLogic OpenID Connect Provider
- WebLogic Principal Validation Provider
- WebLogic Authorization Provider
- WebLogic Adjudication Provider
- WebLogic Role Mapping Provider
- WebLogic Auditing Provider
- WebLogic Credential Mapping Provider
- SAML 2.0 Credential Mapping Provider
- PKI Credential Mapping Provider
- WebLogic CertPath Provider
- Certificate Registry
- Versionable Application Provider

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WebLogic Authentication Provider

The default (active) security realm for WebLogic Server includes a WebLogic Authentication provider. The WebLogic Authentication provider supports delegated username/password and WebLogic Server security digest authentication. It utilizes an embedded LDAP server to store user and group information. This provider allows you to edit, list, and manage users and group membership.

This provider also provides a set of attributes, such as employee number and department number, that you can assign to users.

Alternative Authentication Providers

WebLogic Server provides the following additional Authentication providers which can be used instead of or in conjunction with the WebLogic Authentication provider in the default security realm:

- A set of LDAP Authentication providers that access external LDAP stores (Open LDAP, Microsoft Active Directory, and Oracle Internet Directory).
- A set of Database Management System (DBMS) authentication providers that access user, password, group, and group membership information stored in databases for authentication purposes. Optionally, WebLogic Server can be used to manage the user, password, group, and group membership information. The DBMS Authentication provider is the upgrade path from the RDBMS security realm, which was removed from WebLogic Server 12.2.1.

  The following DBMS Authentication providers are available:

  – SQL Authentication provider - A manageable authentication provider that supports the listing and editing of user, password, group, and group membership information.

  – Read-only SQL Authentication provider - An authentication provider that supports authentication of users in a database. The authentication provider requires a specific set of SQL statements so it might not meet all customer needs.

  – Custom DBMS Authentication provider - A run-time authentication provider that only supports authentication. This provider requires customer-written code that queries the database to obtain authentication information. It allows customers to adapt a DBMS Authentication provider to meet their specific database requirements.
- An LDAP X509 Identity Assertion provider that looks up the LDAP object for the user associated with an X509 certificate, ensures that the certificate in the LDAP object matches the presented certificate, and then retrieves the name of the user from the LDAP object for the purpose of authentication.

> **Note**
>
> By default, these additional Authentication providers are available but not configured in the WebLogic default security realm.

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Password Validation Provider

WebLogic Server includes a Password Validation provider, which manages and enforces a set of password composition rules when configured with one or more of the following authentication providers:

- WebLogic Authentication provider
- SQL Authenticator provider
- LDAP Authentication provider
- Active Directory Authentication provider
- Open LDAP Authentication provider

When the Password Validation provider is configured with an authentication provider, the authentication provider invokes the Password Validation provider whenever a password is created or updated. The Password Validation provider then performs a check to determine whether the password meets the criteria established by a set of configurable composition rules.

WebLogic Identity Assertion Provider

The WebLogic Identity Assertion provider supports certificate authentication using X.509 certificates and CORBA Common Secure Interoperability version 2 (CSIv2) identity assertion. The WebLogic Identity Assertion provider validates the token type, then maps X.509 digital certificates and X.501 distinguished names to WebLogic users. It also specifies a list of trusted client principals to use for CSIv2 identity assertion. The wildcard character (*) can be used to specify that all principals are trusted. If a client is not listed as a trusted client principal, the CSIv2 identity assertion fails and the invoke is rejected.

The WebLogic Identity Assertion provider supports the following token types:

- `AU_TYPE` - for a WebLogic `AuthenticatedUser` used as a token.
- `WEBLOGIC_JWT_TOKEN_TYPE` - for the internal `weblogic-jwt-token` used by WebLogic Server internal applications. Only the WebLogic Identity Assertion provider should handle this token type.
- `X509_TYPE` - for an X.509 client certificate used as a token.
- `CSI_PRINCIPAL_TYPE` - for a CSIv2 principal name identity used as a token.
- `CSI_ANONYMOUS_TYPE` - for a CSIv2 anonymous identity used as a token.
- `CSI_X509_CERTCHAIN_TYPE` - for a CSIv2 X.509 certificate chain identity used as a token.
- `CSI_DISTINGUISHED_NAME_TYPE` - for a CSIv2 distinguished name identity used as a token.
- `WSSE_PASSWORD_DIGEST` - for a `wsse:UsernameToken` with a password type of `wsse:PasswordDigest` used as a token.

SAML 2.0 Identity Assertion Provider

The SAML 2.0 Identity Assertion provider validates SAML 2.0 assertions and verifies that the issuer is trusted. If so, identity is asserted based on the authentication statement contained in the assertion.

Provider configuration includes settings that configure and enable SAML 2.0 Service Provider services, such as the Assertion Consumer Service and Artifact Resolution Service, to run in the server.

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The SAML 2.0 Identity Assertion provider supports the following SAML Subject confirmation methods:

- `bearer`
- `sender-vouches`
- `holder-of-key`

Negotiate Identity Assertion Provider

The Negotiate Identity Assertion provider is used for SSO with Microsoft clients that support the SPNEGO protocol. Specifically, it decodes SPNEGO tokens to obtain Kerberos tokens, validates the Kerberos tokens, and maps Kerberos tokens to WebLogic users. The Negotiate Identity Assertion provider utilizes the Java Generic Security Service (GSS) Application Programming Interface (API) to accept the GSS security context via Kerberos. For more information about the Java GSS API, see Java Generic Security Services (Java GSS-API) in *Security Developer's Guide*.

The Negotiate Identity Assertion provider interacts with the WebLogic Servlet container to send challenges in `WWW-Authenticate` response headers and process tokens in `Authorization` request headers, using the Negotiate authentication scheme.

By default, the Negotiate Identity Assertion provider is available but not configured in the WebLogic default security realm. The Negotiate Identity Assertion provider can be used instead of or in addition to the WebLogic Identity Assertion provider.

WebLogic OpenID Connect Provider

The WebLogic OpenID Connect provider is an authentication and identity assertion provider that facilitates access to web applications from users and groups stored in an external authorization server that adheres to the OpenID Connect and OAuth 2.0 standards.

The WebLogic OpenID Connect provider consumes ID tokens for authenticating to applications and uses them to establish authenticated subjects.

> **Note**
>
> It is important to distinguish OpenID providers from the WebLogic OpenID *Connect* provider. OpenID providers are external authorization servers that adhere to OAuth 2.0 and OpenID Connect standards and provide authentication as a service. The WebLogic OpenID Connect provider is a WebLogic security provider, a module that integrates with the security realm to add support for authentication and identity assertion services.

The WebLogic OpenID Connect provider currently supports the following OpenID providers:

- Keycloak
- Microsoft Azure

WebLogic Principal Validation Provider

The default (active) security realm for WebLogic Server includes a WebLogic Principal Validation provider. This provider signs and verifies WebLogic Server principals. In other

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words, it signs and verifies principals that represent WebLogic Server users or WebLogic Server groups.

> **Note**
>
> You can use the WLSPrincipals class (located in the weblogic.security package) to determine whether a principal (user or group) has special meaning to WebLogic Server (that is, whether it is a predefined WebLogic Server user or WebLogic Server group). Furthermore, any principal that is going to represent a WebLogic Server user or group needs to implement the `WLSUser` and `WLSGroup` interfaces (available in the `weblogic.security.spi` package).

The WebLogic Principal Validation provider includes implementations of the `WLSUser` and `WLSGroup` interfaces, named `WLSUserImpl` and `WLSGroupImpl`. These are located in the `weblogic.security.principal` package. It also includes an implementation of the `PrincipalValidator` SSPI called `PrincipalValidatorImpl`. For more information about the `PrincipalValidator` SSPI, see Implement the PrincipalValidator SSPI in *Developing Security Providers for Oracle WebLogic Server*.

Much as an Identity Assertion provider supports a specific type of token, a Principal Validation provider signs and verifies the authenticity of a specific type of principal. Therefore, you can use the WebLogic Principal Validation provider to sign and verify principals that represent WebLogic Server users or WebLogic Server groups.

WebLogic Authorization Provider

As of version 9.1, WebLogic Server includes an Authorization provider that supports the eXtensible Access Control Markup Language (XACML) 2.0 standard from OASIS. This provider can import, export, persist and execute policy expressed using all standard XACML 2.0 functions, attributes, and schema elements.

New domains created using WebLogic Server 9.1 and later will default to using the XACML Authorization provider. Existing domains, upgraded WebLogic Server 9.1 and later, will continue to use the Authorization provider currently specified, such as third-party partner providers or the original WebLogic Server proprietary providers. If you use the WebLogic Remote Console to add a new Authorization provider, you can add the new provider as a DefaultAuthorizer or as a XACML provider.

Custom XACML providers are not supported in this release.

Version 9.1 of WebLogic Server also included the "default" WebLogic Authorization provider. This provider supplied the default enforcement of authorization for versions of WebLogic Server prior to 9.1. Using a policy-based authorization engine, the WebLogic Authorization provider returns an access decision to determine if a particular user is allowed access to a protected WebLogic resource. The WebLogic Authorization provider also supports the deployment and undeployment of security policies within the system.

WebLogic Adjudication Provider

The default (active) security realm for WebLogic Server includes a WebLogic Adjudication provider. This provider would normally be responsible for tallying the potentially differing results rendered by multiple Authorization providers' Access Decisions and rendering a final verdict on whether or not access will be granted to a WebLogic resource. However, because the default

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security realm only has one Authorization provider, only one Access Decision is produced so the WebLogic Adjudication provider is not used.

The WebLogic Adjudication provider has an attribute called Require Unanimous Permit that governs its behavior. By default, the Require Unanimous Permit attribute is set to `TRUE`, which causes the WebLogic Adjudication provider to act as follows:

- If all the Authorization providers' Access Decisions return `PERMIT`, then return a final verdict of `TRUE` (that is, permit access to the WebLogic resource).
- If some Authorization providers' Access Decisions return `PERMIT` and others return `ABSTAIN`, then return a final verdict of `FALSE` (that is, deny access to the WebLogic resource).
- If any of the Authorization providers' Access Decisions return `ABSTAIN` or `DENY`, then return a final verdict of `FALSE` (that is, deny access to the WebLogic resource).

If you change the Require Unanimous Permit attribute to `FALSE`, the WebLogic Adjudication provider acts as follows:

- If all the Authorization providers' Access Decisions return `PERMIT`, then return a final verdict of `TRUE` (that is, permit access to the WebLogic resource).
- If some Authorization providers' Access Decisions return `PERMIT` and others return `ABSTAIN`, then return a final verdict of `TRUE` (that is, permit access to the WebLogic resource).
- If any of the Authorization providers' Access Decisions return `DENY`, then return a final verdict of `FALSE` (that is, deny access to the WebLogic resource).

> **Note**
>
> You set the Require Unanimous Permit attributes when you configure the WebLogic Adjudication provider. For more information about configuring an Adjudication provider, see Configuring the WebLogic Adjudication Provider in *Administering Security for Oracle WebLogic Server*.

WebLogic Role Mapping Provider

As of version 9.1, WebLogic Server includes a Role Mapping provider that supports the eXtensible Access Control Markup Language (XACML) 2.0 standard from OASIS. This provider can import, export, persist and execute policy expressed using all standard XACML 2.0 functions, attributes, and schema elements.

New domains created using WebLogic Server 9.1 and later will default to using the XACML Role Mapping provider. Existing domains, upgraded to WebLogic Server 9.1 and later, will continue to use the Role Mapping provider currently specified, such as third-party partner providers or the original WebLogic Server proprietary providers. If you use the WebLogic Remote Console to add a new Role Mapping provider, you can add the new provider as a DefaultRoleMapper or as a XACML provider.

Custom XACML providers are not supported in this release.

Version 9.1 of WebLogic Server also included the "default" WebLogic Role Mapping provider. This provider supplied the default enforcement of role mapping for versions of WebLogic Server prior to WebLogic Server 9.1. This provider determines dynamic roles for a specific user (subject) with respect to a specific protected WebLogic resource for each of the default users and WebLogic resources. The WebLogic Role Mapping provider supports the deployment and

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undeployment of roles within the system. The WebLogic Role Mapping provider uses the same security policy engine as the WebLogic Authorization provider.

WebLogic Auditing Provider

WebLogic Server provides a WebLogic Auditing provider that you can configure in a security realm to record audit events. This provider records information from a number of security requests, which are determined internally by the WebLogic Security Framework. The WebLogic Auditing provider also records the event data associated with these security requests, and the outcome of the requests.

WebLogic Credential Mapping Provider

The default (active) security realm for WebLogic Server includes a WebLogic Credential Mapping provider. You use the WebLogic Credential Mapping provider to associate, or map, a WebLogic Server user to the appropriate credentials to be used with a Resource Adapter to access an Enterprise Information System (EIS), for example, some relational database like Oracle, SQL Server, and so on. The provider maps a user's authentication credentials (username and password) to those required for legacy applications, so that the legacy application gets the necessary credential information. For example, the EIS may be a mainframe transaction processing, database systems, or legacy applications not written in the Java programming language.

If you only want to map WebLogic Server users and groups to username/password credentials in another system, then the WebLogic Credential Mapping provider is sufficient.

SAML 2.0 Credential Mapping Provider

The SAML 2.0 Credential Mapping provider generates SAML 2.0 assertions for authenticated subjects based on the configuration of Identity Provider services and the set of Service Provider partners. Assertions contain an authentication statement and can also contain attribute statements with WebLogic Server group information or application-specific attributes supplied by a custom attribute mapper. If the requested target has not been configured and no defaults are set, an assertion will not be generated. The assertion identifies the user in its `Subject`; group membership and other mapped attributes, when configured, are included in `AttributeStatement` elements.

The WebLogic Remote Console supports configuration for SAML 2.0, including settings that configure and enable SAML 2.0 identity provider and service provider services (such as Single Sign-On, and Artifact Resolution Service) to run in the server.

The provider supports the following SAML Subject confirmation methods:

- `bearer`
- `sender-vouches`
- `holder-of-key`

PKI Credential Mapping Provider

The PKI (Public Key Infrastructure) Credential Mapping provider maps a WebLogic Server subject (the initiator) and target resource (and an optional credential action) to a public/private key pair or public certificate that should be used by the application when using the targeted resource. This provider can also map an alias to a public/private key pair or public certificate.

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The PKI Credential Mapping provider uses the subject and resource name, or the alias, to retrieve the corresponding credential from the keystore.

WebLogic CertPath Provider

The WebLogic CertPath provider is both a CertPath Builder and a CertPath Validator. The provider completes certificate paths and validates the certificates using the trusted CA configured for a particular server instance. If a certificate chain cannot be completed, it is invalid.

The WebLogic CertPath provider also checks the signatures in the chain, ensures that the chain has not expired, and checks that one of the certificates in the chain is issued by one of the trusted CAs configured for the server. If any of these checks fail, the chain is not valid.

Finally, the provider checks each certificate's basic constraints (that is, the ability of the certificate to issue other certificates) to ensure the certificate is in the proper place in the chain.

The WebLogic CertPath provider can be used as CertPath Builder or a CertPath Validator in a security realm.

Certificate Registry

The Certificate Registry allows an administrator to explicitly register trusted end certificates. When the registry is used as a CertPath Builder or CertPath Validator, the certificate chain's end certificate must be registered. Removing an end certificate from the registry causes that certificate to fail subsequent registry validation. The registry is stored in the embedded LDAP server.

Certificate Registries are configured on a per domain basis rather than a per server basis.

The Certificate Registry is both a CertPath Builder and a CertPath Validator. In either case, the Certificate Registry ensures that the chain's end certificate is stored in the registry.

Versionable Application Provider

A versionable application is an application that has an application archive version specified in the manifest of the application archive (EAR file). Versionable applications can be deployed side-by-side and active simultaneously. Versionable applications allow multiple versions of an application, where security constraints can vary between the application versions.

The Versionable Application provider SSPI enables all security providers that support application versioning to be notified when versions are created and deleted. It also enables all security providers that support application versioning to be notified when non-versioned applications are removed.

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Glossary

Access Decision

Code that determines whether a subject has permission to perform a given operation on a WebLogic resource. The result of an Access Decision is to permit, deny, or abstain from making a decision. An Access Decision is a component of an Authorization provider. See also Authorization provider, subject, WebLogic resource.

Adjudication provider and Adjudicator

A WebLogic security provider that tallies the results that multiple Access Decisions return, resolves conflicts between the Access Decisions, and determines the final `PERMIT` or `DENY` decision. The Adjudicator is a component of the Adjudication provider. See also Access Decision, security provider.

Artifact Resolution Service (ARS)

An addressable SAML service that stores the content for a SAML artifact and responds to artifact resolution requests sent by either an Identity Provider or Service Provider partner.

asserting party

When using web SSO, asserts that a user has been authenticated and given associated attributes. For example, there is a user John Doe, he has an email address of john.doe@example.com and he authenticated to this domain using a password mechanism. In web SSO, asserting parties are also known as SAML authorities. See also relying party, Security Assertion Markup Language (SAML), single sign-on.

assertion

An XML statement about whether or not a user has been logged in to a domain. Assertions can be thought of as XML representations of a Subject containing a username and groups.

asymmetric key cryptography

Cryptography that uses a related public key and private key. Depending on the algorithm, the key pair supports digital signatures, key agreement, or encryption and decryption. The public key may be distributed; the private key must remain secret. Also called public key cryptography. See also private key, public key, symmetric key cryptography.

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auditing

Process whereby information about operating requests and the outcome of those requests is collected, stored, and distributed for the purposes of non-repudiation. Auditing provides an electronic trail of computer activity. See also Auditing provider.

Auditing provider

A security provider that provides auditing services. See also auditing, security provider.

authentication

Process whereby the identity of users or system processes are proved or verified. Authentication also involves remembering, transporting, and making identity information available to various components of a system when that information is needed. Authentication typically involves username/password combinations, but can also be done using tokens. See also Authentication provider, identity assertion, LoginModule, perimeter authentication, token, user.

Authentication provider

A security provider that authenticates users and establishes their principals through LoginModules. Authentication providers can validate credentials such as a username and password. When an Identity Assertion provider maps a certificate or other token to a user, Authentication-provider LoginModules establish the corresponding user and group principals. TLS certificate validation itself is performed by the SSL/TLS implementation. See also authentication, digital certificate, security provider, user.

authorization

Process whereby a user's access to a WebLogic resource is permitted or denied based on the user's security role and the security policy assigned to the requested WebLogic resource. See also Authorization provider, security policy, user, WebLogic resource.

Authorization provider

A security provider that controls access to WebLogic resources based on the user's security role and the security policy assigned to the requested WebLogic resource. See also security provider, user, WebLogic resource.

certificate

See digital certificate.

certificate authentication

Method of providing a confident identification of a client by a server through the use of digital certificates. Certificate authentication is generally preferred over password authentication

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because it is based on what the user has (a private key), as well as what the user knows (a password that protects the private key).

certificate authority

A trusted entity that issues public key certificates. A certificate authority attests to a user's real-world identity, much as a notary public does. See also certificate chain, digital certificate, entity, private key, public key, trusted (root) certificate authority.

certificate chain

An ordered sequence of digital certificates used to establish a certification path from an end-entity certificate toward a trusted CA. Each following CA certificate certifies the issuer of the preceding certificate. The chain contains public certificates, not the private key. A private-key keystore entry stores the private key separately together with its corresponding certificate chain. Trust requires successful path validation to a configured trust anchor. See also trusted (root) certificate authority.

Certificate Lookup and Validation (CLV) framework

A WebLogic Server framework which completes certificate paths and validates X509 certificate chains. The CLV framework receives a certificate or certificate chain, completes the chain (if necessary), and validates the certificates in the chain.

Certificate Reference

A string that uniquely identifies the certificate chain. For example, a subject DN or an issuer DN plus a serial number.

Certificate Registry

A security provider that stores explicitly registered trusted end certificates in the embedded LDAP server. When used as a CertPath Builder or CertPath Validator, it requires the chain's end certificate to be registered. Removing an end certificate causes it to fail subsequent registry validation.

Certificate Revocation List (CRL)

A list of certificates that a trusted CA has revoked.

CertPath

A JDK class that stores a certificate chain in-memory. Also used to refer to the JDK architecture and framework used to locate and validate certificate chains.

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CertPath Builder

A provider in the Certificate Lookup and Validation (CLV) framework that completes the certificate path (if necessary) and validates the certificates.

CertPath Validator

A provider in the CLV framework that validates the certificates in a certificate chain.

connection filter

A programmable filter that WebLogic Server uses to determine whether the server should allow incoming connections from a network client. In addition to security policies that protect WebLogic resources based on user characteristics, you can add another layer of security by filtering based on network connections. See also security policy, user, WebLogic resource.

connector

See resource adapter

context handler

A ContextHandler is a high-performing WebLogic class that obtains additional context and container-specific information from the resource container, and provides that information to security providers making access or role mapping decisions. The `ContextHandler` interface provides a way for an internal WebLogic resource container to pass additional information to a WebLogic Security Framework call, so that a security provider can obtain contextual information beyond what is provided by the arguments to a particular method. A ContextHandler is essentially a name/value list, and as such, it requires that a security provider know what names to look for. (In other words, use of a ContextHandler requires close cooperation between the WebLogic resource container and the security provider.) See also security provider, WebLogic container, WebLogic Security Framework.

credential

Security-related attribute of a subject, which may contain information used to authenticate the subject to new services. Types of credentials include username/password combinations, Kerberos tickets, and public key certificates. See also credential mapping, Credential Mapping provider, digital certificate, Kerberos ticket, public key, subject.

credential mapping

The process whereby a Credential Mapping provider obtains credentials associated with an authenticated subject or initiator and a target resource, so that the subject can access that resource. The provider uses its configured credential mappings or credential-generation mechanism. WebLogic Server uses credential mapping to map credentials used by WebLogic Server users to credentials used in a legacy (or any remote) system. WebLogic Server then

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uses the credential maps to log in to a remote system on behalf of a subject that has already been authenticated. See also credential, Credential Mapping provider, resource.

Credential Mapping provider

A security provider that is used to provide credential mapping services and bring new types of credentials into the WebLogic Server environment. See also credential, credential mapping, security provider.

Cross-Domain Single Sign-on

WebLogic Server security feature that allows users to authenticate once but access multiple applications, even if these applications reside in different DNS domains. You can use this feature to construct a network of affiliates or partners that participate in a Single Sign-On domain. See also single sign-on.

CSIv2 protocol

A protocol that is based on IIOP (GIOP 1.2) and the CORBA Common Secure Interoperability version 2 (CSIv2) CORBA specification. The secure interoperability requirements for EJB and other Jakarta EE containers correspond to Conformance Level 0 of the CSIv2 specification. The CORBA Security Attribute Service (SAS) is the protocol that is used in CSIv2.

custom security provider

Security provider written by third-party security vendors or security developers that can be integrated into the WebLogic Security Service. Custom security providers are implementations of the Security Service Provider Interfaces (SSPIs) and are *not* supplied with the WebLogic Server product.

database delegator

Intermediary class that mediates initialization calls between a security provider and the security provider's database. See also security provider database.

Database Management System (DBMS) Authentication provider

A security provider that accesses user, password, group, and group membership information stored in databases for authentication purposes. Optionally, WebLogic Server can be used to manage the user, password, group, and group membership information.

declarative security

Security that is defined, or declared, using the application deployment descriptors. For Web applications, you define the deployment descriptors in the `web.xml` and `weblogic.xml` files. For EJBs, you define the deployment descriptors in the `ejb-jar.xml` and `weblogic-ejb-jar.xml` files.

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default realm

The active security realm. You can configure multiple security realms in a WebLogic Server domain but only one is active at a time. The active security realm is also known as the default administrative security realm. See also security realm and WebLogic Server domain.

digest authentication

In this guide, WS-Security UsernameToken PasswordDigest authentication: the service verifies a digest derived from password information, a nonce, and a creation timestamp. WebLogic Server's built-in password-digest support requires the nonce and timestamp. This is distinct from HTTP Digest authentication. See “Digest Authentication.”

digital certificate

Digital statement that associates a particular public key with a name or other attributes. The statement is digitally signed by a certificate authority. By trusting that authority to sign only true statements, you can trust that the public key belongs to the person named in the certificate. See also digital signature, public key, trusted (root) certificate authority.

digital signature

String of bits used to protect the security of data being exchanged between two entities by verifying the identities of those entities. Specifically, this string is used to verify that the data came from the sending entity of record and was not modified in transit. A digital signature is computed from an entity's signed data and private key. It can be trusted only to the extent that the public key used to verify it can be trusted. See also entity, private key, public key.

Domain Configuration Wizard

An interactive, graphical user interface (GUI) that facilitates the creation of a new WebLogic Server domain. The wizard can create WebLogic Server domain configurations for stand-alone servers, Administration Servers with Node Managers and Managed Servers, and clustered servers. You can use it to create the appropriate directory structure for your WebLogic Server domain, a basic `config.xml` file, and scripts that you can use to start the servers in your domain.

embedded LDAP server

A server that contains user, group, security role, security policy and credential information. The WebLogic Authentication, Authorization, Role Mapping, and Credential Mapping providers use the embedded LDAP server as their security provider databases. See also credential, group, security policy, security role.

end certificate

The last certificate considered in a certificate chain.

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entity

Something that exists independently as a particular and discrete unit. Persons, corporations, and objects are examples of entities.

filter

A Jakarta Servlet object that can inspect or modify requests and responses. A filter can pass processing to the next filter or target resource, or handle or reject the request without continuing the chain. Filters encapsulate reusable processing such as logging, transformation, and authentication-related tasks.

firewall

Software that monitors traffic between an internal network and the Internet, and that regulates the type of network traffic that can enter and leave the internal network. A firewall can be connected to the Internet or set up within a company's network to prevent unauthorized access to the network. Firewalls protect information on computers and information that is being carried over the network. Firewalls use various types of filters to prevent access, including limiting the types of protocols allowed and restricting access from network nodes by IP addresses and DNS node names.

global role

A security role that applies to all WebLogic resources within a security realm. For example, if the WebLogic Role Mapping provider is being used in the default security realm, global roles can be defined in terms of user, group, and hours of access. See also Role Mapping provider, scoped role, security realm, security role, WebLogic resource.

group

Collection of users that share some characteristic, such as a department, a job function, or a job title. Groups are a static identity that a server administrator assigns. Groups are associated with security roles. Giving permission to a group is the same as giving the permission to each user who is a member of the group. See also user.

host name verification

The process of verifying that the name of the host to which an SSL connection is made is the intended or authorized party. See also host name verifier, Secure Sockets Layer (SSL).

host name verifier

Code that checks whether a peer certificate identifies the host to which an SSL/TLS client is connecting. WebLogic Server uses a wildcard hostname verifier by default. It considers Subject Alternative Names (SANs), supported wildcard matches, and configured Common Name fallback behavior; IP-address references are also checked against IP-address SANs. Hostname verification complements certificate-path validation and helps prevent connections

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to an unintended peer. See also digital certificate, host name verification, Secure Sockets Layer (SSL), subject.

identity assertion

Special type of authentication whereby a client's identity is established through the use of client-supplied tokens that are generated from an outside source. Identity is asserted when these tokens are mapped to usernames. For example, the client's identity can be established by using a digital certificate, and that certificate can be passed around the system so that users are not asked to sign on more than once. Thus, identity assertion can be used to enable single sign-on. See also authentication, digital certificate, Identity Assertion provider, single sign-on, SSL tunneling, token.

Identity Assertion provider

A security provider that performs perimeter authentication - a special type of authentication using tokens. Identity Assertion providers also allow WebLogic Server to establish trust by validating a user. Thus, the function of an Identity Assertion provider is to validate and map a token to a username. See also perimeter authentication, security provider, token, user.

Identity Provider

A system, or administrative domain, that asserts that a user has been authenticated and is given associated attributes. For example, there is a user John Doe who has an email address of john.doe@example.com and he authenticated to this domain using a password mechanism. Also known as a SAML authority, or asserting party.

JAAS control flag

If a security realm has multiple Authentication providers configured, the JAAS control flag determines how the login sequence uses the Authentication providers. See also Authentication provider.

JAAS LoginModule

Responsible for authenticating users within the security realm and for populating a subject with the necessary principals (users/groups). A LoginModule is a required component of an Authentication provider, and can be a component of an Identity Assertion provider if you want to develop a separate LoginModule for perimeter authentication. LoginModules that are not used for perimeter authentication also verify the proof material submitted (for example, a user's password). See also authentication, group, Identity Assertion provider, perimeter authentication, principal, security realm, subject.

Java Authentication and Authorization Service (JAAS)

Set of Java packages that enable services to authenticate and enforce access controls upon users. JAAS implements a Java version of the standard Pluggable Authentication Module

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(PAM) framework, and supports user-based authorization. WebLogic Server only implements the authentication portion of JAAS. See also authentication, authorization, user.

Jakarta Authorization

A permissions-based security model for EJBs and servlets. Jakarta Authorization can be used as a replacement for the EJB and Servlet container deployment and authorization provided by WebLogic Server. Formerly called Java Authorization Contract for Containers (JACC).

Java Cryptography Architecture

A framework for accessing and developing cryptographic functionality for the Java platform. For a description of the Java Cryptography Architecture see Java Cryptography Architecture (JCA) Reference Guide in *Security Developer's Guide*. See also Java Cryptography Extensions (JCE).

Java Cryptography Extensions (JCE)

Set of Java packages that extends the Java Cryptography Architecture API to include APIs for encryption, key exchange, and Message Authentication Code (MAC) algorithms. (JCE should be thought of as a part of the JCA.) See Java Cryptography Architecture (JCA) Reference Guide in *Security Developer's Guide* for a description of JCE. See also Java Cryptography Architecture.

Java Naming and Directory Interface (JNDI)

The Java Naming and Directory Interface (JNDI) is an application programming interface (API) that provides naming services to Java applications. JNDI is an integral component of the Java technology and is defined to be independent of any specific naming or directory service implementation. It supports the use of a single method for accessing various new and existing services. This support allows any service-provider implementation to be plugged into the JNDI framework using the standard service provider interface (SPI) conventions. In addition, JNDI allows Java applications in WebLogic Server to access external directory services such as LDAP in a standardized fashion, by plugging in the appropriate service provider.

Java Security Manager

A legacy Java SE mechanism that enforces permissions on Java code through `java.lang.SecurityManager`. It is deprecated for removal in JDK 21 and permanently disabled in JDK 25. Java Security Manager policies do not protect a WebLogic Server process running on JDK 25. See also Java security policy file, policy condition.

Java security policy file

A legacy configuration file that grants Java permissions for enforcement by an enabled Java Security Manager. This mechanism is deprecated for removal in JDK 21 and unavailable in

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JDK 25, where the Security Manager is permanently disabled. See also Java Security Manager, policy condition.

JNDI

See Java Naming and Directory Interface (JNDI).

KDC/TGS

Key Distribution Center/Ticket Granting Service. In Kerberos authentication, the KDC maintains a list of user principals and is contacted through the kinit program for the user's initial ticket. The Ticket Granting Service maintains a list of service principals and is contacted when a user wants to authenticate to a server providing such a service.

The KDC/TGS is a trusted third party that must run on a secure host. It creates ticket-granting tickets and service tickets. The KDC and TGS are usually the same entity.

Kerberos

A network authentication service developed under Massachusetts Institute of Technology's Project Athena that strengthens security in distributed environments. Kerberos is a trusted third-party authentication system that relies on shared secrets and assumes that the third party is secure. It provides single sign-on capabilities and database link authentication (MIT Kerberos only) for users, provides centralized password storage, and enhances PC security.

Kerberos ticket

A sequence of a few hundred bytes in length that is used to control access to physically insecure networks. Kerberos tickets are based on the Kerberos protocol. Kerberos is a network authentication protocol that allows entities (users and services) communicating over networks to prove their identity to each other, while preventing eavesdropping or replay attacks. The protocol was designed to provide strong authentication for client/server applications by using secret-key cryptography. See `http://web.mit.edu/kerberos/www/`. See also private key.

keystore

A repository for cryptographic keys and certificates. A private-key entry contains a private key and its certificate chain; a trusted-certificate entry contains a certificate without a private key. Keystore implementations can persist entries and protect access to them. WebLogic Server configures identity and trust separately; a keystore used for trust is a truststore. Identity and trust keystores can be configured in WebLogic Remote Console. See `KeyStore` in Java SE and JDK API Specification . See also private key and trusted (root) certificate authority.

LDAP Authentication provider

Authentication provider that uses a Lightweight Data Access Protocol (LDAP) server to access user and group information. See also group, user.

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LoginModule

See JAAS LoginModule.

MBean

Short for "managed bean," a Java object that represents a Java Management eXtensions (JMX) manageable resource. MBeans are instances of MBean types. MBeans are used to configure and manage security providers. See also MBean type, security provider.

MBean Definition File (MDF)

An XML file used by the WebLogic MBeanMaker to generate files for an MBean type. See also MBean type, WebLogic MBeanMaker.

MBean implementation file

One of several intermediate Java files generated by the WebLogic MBeanMaker utility to create an MBean type for a custom security provider. You edit this file to supply your specific method implementations. See also MBean information file, MBean interface file, MBean type, WebLogic MBeanMaker.

MBean information file

One of several intermediate Java files generated by the WebLogic MBeanMaker utility to create an MBean type for a custom security provider. This file contains mostly metadata and therefore requires no editing. See also MBean implementation file, MBean interface file, MBean type, WebLogic MBeanMaker.

MBean interface file

One of several intermediate Java files generated by the WebLogic MBeanMaker utility to create an MBean type for a custom security provider. This file is the client-side API to the MBean that your runtime class or your MBean implementation will use to obtain configuration data, and requires no editing. See also MBean implementation file, MBean information file, MBean type, runtime class, WebLogic MBeanMaker.

MBean JAR File (MJF)

JAR file that contains the runtime classes and MBean types for a security provider. MJFs are created by the WebLogic MBeanMaker. See also MBean type, runtime class, security provider, WebLogic MBeanMaker.

MBean type

Factory for creating the MBeans used to configure and manage security providers. MBean types are created by the WebLogic MBeanMaker. See also MBean, security provider, WebLogic MBeanMaker.

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message digest

A fixed-length hash value computed from input data by a message-digest algorithm. A digest alone does not authenticate the sender or protect data from an attacker who can replace both the data and digest. Authentication requires a keyed mechanism, such as a message authentication code or a digital signature. See also message digest algorithm.

message digest algorithm

A cryptographic hash function that maps input data to a fixed-length digest. Hash functions are used within mechanisms such as message authentication codes and digital signatures; computing an unkeyed digest alone does not authenticate a message. See also message digest.

mutual authentication

Authentication in which both parties authenticate each other. Mutual TLS uses client and server certificates at the transport layer. Other protocols can provide mutual authentication at the application layer. See also authentication, digital certificate, Secure Sockets Layer (SSL), two-way SSL authentication, trusted (root) certificate authority.

nonce

An opaque token used in Digest authentication.

non-repudiation

Irrefutable evidence that a security event occurred.

one-way SSL authentication

SSL/TLS authentication in which the client authenticates the server certificate and the server does not require a client certificate. This is the default client-certificate mode. Other connection controls and application authentication and authorization requirements still apply. See also mutual authentication, two-way SSL authentication.

Password Validation provider

Security provider that can be configured with an authentication provider to enforce a set of password composition rules.

perimeter authentication

Authentication performed by a service outside the application server's local authentication process. WebLogic Server can use an Identity Assertion provider to validate a supported token from that service and map it to a local identity. SAML and SPNEGO are examples of mechanisms used for perimeter authentication. See also authentication and identity assertion.

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policy condition

A condition evaluated to determine whether access to a WebLogic resource is permitted. Policy conditions, along with the specific information you supply for the condition (such as an actual user name, group, security role, or start/stop times), are called expressions. See also policy statement.

policy expression

See policy statement.

policy statement

A policy statement is the collection of expressions that define who is granted access to a WebLogic resource, and is therefore the main part of any security policy you create. Policy statements are also referred to as policy expressions. See also policy condition.

principal

An identity represented by a `java.security.Principal` object, such as a user identity or a group identity. A subject contains the principals associated with its authenticated identity. In WebLogic Server, user and group principals implement `WLSUser` and `WLSGroup`, respectively. See also authentication, group, subject, user.

principal validation

The act of signing and later verifying that a principal has not been altered since it was signed. Principal validation establishes trust of principals. See also principal.

private key

The secret member of an asymmetric key pair. Depending on the algorithm, it is used for signing, key agreement, or decryption. Protect it against unauthorized disclosure and use. See also public key.

private key algorithm

A cryptographic operation that uses the private member of an asymmetric key pair, such as digital-signature generation or, for algorithms that support it, decryption. The corresponding public key verifies a signature. See also private key and public key.

programmatic security

Application security that is defined in servlets and EJBs using Java methods.

public key

The shareable member of an asymmetric key pair. Depending on the algorithm, it is used to verify signatures, perform key agreement, or encrypt data. A CA-signed certificate binds a

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public key to a subject; the CA does not necessarily generate the key pair. See also asymmetric key cryptography and private key.

public key algorithm

An asymmetric cryptographic algorithm based on a public/private key pair. The supported operations depend on the algorithm and may include signature verification, key agreement, or public-key encryption. See also private key, private key algorithm, and public key.

public key cryptography

See asymmetric key cryptography.

RDBMS security store

An external RDBMS containing a datastore that, when configured in a domain, is used by select security providers for storing security data.

relying party

In web SSO, determines whether assertions provided to it by an asserting party should be trusted. SAML defines a number of mechanisms that enable the relying party to trust the assertions provided to it. Although a relying party may trust the assertions provided to it, local access policy defines whether the subject may access local resources. Therefore, even if a relying party trusts that a user is John Doe, it does not mean John Doe can access all the resources in the domain. See also asserting party, Identity Provider, Security Assertion Markup Language (SAML), single sign-on.

resource

See WebLogic resource.

resource adapter

System-level software driver (also called a connector) used by an application server (such as WebLogic Server) or an application client to connect to an enterprise information system (EIS). Resource adapters contain the Java components and, if necessary, the native components required to interact with the EIS.

The WebLogic Jakarta EE Connector Architecture supports resource adapters developed by EIS vendors and third-party application developers that can be deployed in any application server supporting the Jakarta EE Platform Specification.

Responder service

The URL on the SAML source site that will process requests for SAML. See also SAML source site.

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role condition

A condition under which a security role (global or scoped) will be granted to a user or group. Role conditions, along with the specific information you supply when creating the condition (such as an actual user name, group, or start/stop times), are called expressions. See security policy, role mapping.

role expression

Specific information that you supply when creating role conditions. See role condition.

role mapping

Process by which the WebLogic Security Service compares users or groups against a security role condition to determine whether they should be dynamically granted a security role. Role mapping occurs at runtime, just prior to when an Access Decision is rendered for a protected WebLogic resource. See also Access Decision, group, principal, role condition, security role, user, WebLogic resource, WebLogic Security Service.

Role Mapping provider

A security provider that determines what security roles apply to the principals stored in a subject when the subject is attempting to perform an operation on a WebLogic resource. Because this operation usually involves gaining access to the WebLogic resource, Role Mapping providers are typically used with Authorization providers. See also Authorization provider, principal, security role, subject, WebLogic resource.

role statement

A collection of expressions that define how a security role is granted, and is therefore the main part of any security role you create. See role expression.

runtime class

Java class that implements a Security Service Provider Interface (SSPI) and contains the actual security-related behavior for a security provider. See also security provider, Security Service Provider Interfaces (SSPIs).

SAML artifact

A small data object that references a SAML protocol message retained by the sending partner. In the HTTP Artifact binding, the artifact is carried through the browser in a URL query parameter or an HTML form. The receiving partner resolves the artifact by invoking the sending partner's Artifact Resolution Service to obtain the SAML protocol message. See also Artifact Resolution Service (ARS).

SAML assertion

A package of information that supplies one or more statements made by a SAML Authority. The following types of statements are supported:

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- Authentication statements which say when and how a subject was authenticated.
- Attribute statements which provide specific information about the subject (for example, what groups the Subject is a member of).
- Authorization statements identify what the Subject is entitled to do.

SAML authority

An entity that can authoritatively assert security information in the form of SAML assertions. See also Identity Provider, asserting party, Single Sign-On Service.

SAML binding

Details exactly how the SAML protocol maps onto transport and messaging protocols.

SAML destination site

The receiver of a SAML assertion. See also Service Provider.

SAML profile

Technical descriptions of particular flows of assertions and protocol messages that define how SAML can be used for a particular purpose.

SAML source site

A system, or administrative domain, that asserts that a user has been authenticated and is given associated attributes. A SAML source can be either the site that authenticates the user (such as with the SAML Web SSO profile), or the site that is forwarding identity when acting as a client (such as with Web Services Security SAML Token profile). See also Identity Provider.

schema

A data structure associated with the data stored in a database. The DBMS Authentication providers require that the schema used to store data in the database be defined during configuration.

scoped role

A security role that applies to a specific WebLogic resource in a security realm. See also global role, Role Mapping provider, security role, security realm.

secret key cryptography

See symmetric key cryptography.

Secure Sockets Layer (SSL)

Transport security used to authenticate peers and protect data in transit. WebLogic Server uses TLS, the successor to SSL, through JSSE. TLS uses cryptographic authentication during

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the handshake and symmetric encryption with integrity protection for application data. See also authentication, digital signature, public key cryptography, symmetric key cryptography.

Security Assertion Markup Language (SAML)

An XML-based framework for exchanging security information. SAML implementations provide an interoperable, XML-based, security solution that allows authentication and authorization information to be exchanged securely. SAML is the key to enabling single sign-on capabilities for Web services. See Assertions and Protocols for the OASIS Security Assertion Markup Language (SAML) V2.0.

You can develop custom Identity Assertion providers for WebLogic Server that support different token types, including SAML. See also authentication, authorization, identity assertion, perimeter authentication, Cross-Domain Single Sign-on, and user.

security policy

An association between a WebLogic resource and a user, group, or security role that protects the WebLogic resource against unauthorized access. Access to a WebLogic resource is determined by the applicable security policies, including inherited policies and policies supplied by default. The absence of an explicitly assigned policy on a resource does not by itself mean that access is unrestricted. You can assign security policies to an individual WebLogic resource or to components of the WebLogic resource.

See also group, security role, user, and WebLogic resource.

security provider

In WebLogic Server 7.0 and later, software modules that can be "plugged into" a WebLogic Server security realm to provide security services (such as authentication, authorization, auditing, and credential mapping) to applications. A security provider consists of runtime classes and MBeans, which are created from SSPIs and MBean types, respectively. Security providers are WebLogic security providers (provided with WebLogic Server) or custom security providers. See also custom security provider, MBean, MBean type, runtime class, Security Service Provider Interfaces (SSPIs), WebLogic security provider.

security provider database

Database that contains the users, groups, security policies, roles, and credentials used by some types of security providers to provide security services. The security provider database can be the embedded LDAP server (as used by the WebLogic security providers), a properties file (as used by the sample security providers), or a production-quality database that you may already be using. See also credential, embedded LDAP server, group, security role, security policy, WebLogic security provider.

security realm

Security realms act as a scoping mechanism. Each security realm consists of a set of configured security providers, users, groups, roles, and security policies. You can configure multiple security realms in a domain but only one can be the default (active) security realm,

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which is used for domain administrative purposes. WebLogic Server provides a default security realm: `myrealm`. You can configure a new security realm and then set it as default security realm. See also default realm, Domain Configuration Wizard, security provider, and WebLogic resource.

security role

A dynamically computed privilege that is granted to users or groups based on specific conditions. The difference between groups and roles is that a group is a static identity that a server administrator assigns, while membership in a role is dynamically calculated based on data such as user name, group membership, or the time of day. Security roles are granted to individual users or to groups, and multiple roles can be used to create security policies for a WebLogic resource. Once you create a security role, you define an association between the role and a WebLogic resource. This association (called a security policy) specifies who has what access to the WebLogic resource. See also global role, group, role mapping, scoped role, security policy, user, WebLogic resource.

Security Service Provider Interfaces (SSPIs)

Set of WebLogic packages that enables custom security providers to be developed and integrated with the WebLogic Server Security Service. These interfaces are implemented by the WebLogic security providers and custom security providers. The WebLogic Security Framework calls methods in these interfaces to perform security operations. See also security provider, WebLogic Security Framework.

Service Provider

A system, or administrative domain, that determines whether it trusts the assertions provided to it by the Identity Provider. SAML defines a number of mechanisms that enable the Service Provider to trust the assertions provided to it. See also relying party.

Servlet Authentication filter

A Jakarta Servlet filter supplied by a WebLogic Authentication provider through the `ServletAuthenticationFilter` SSPI. It participates in the container's authentication process and can control the conversation with the client, such as redirecting to a login service or negotiating an authentication mechanism.

Simple and Protected GSS-API Negotiation Mechanism (SPNEGO)

A protocol that allows participation in a Kerberos SSO environment.

single sign-on

Ability to require a user to sign on to an application only once and gain access to many different application components, even though these components may have their own authentication schemes. Single sign-on is achieved using identity assertion, LoginModules,

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and tokens. See also authentication, Cross-Domain Single Sign-on, identity assertion, JAAS LoginModule, token, and user.

Single Sign-On Service

Service used in the SAML 2.0 Web Single Sign-On Profile that:

- Accepts authentication requests from a Service Provider
- Authenticates the user
- Invokes the SAML 2.0 Credential Mapping provider to generate a SAML assertion
- Wraps the assertion in an authentication response to be sent to the Service Provider.

This service can also create an unsolicited authentication response, which is then sent to the Service Provider to start an Identity Provider initiated web single sign-on session.

SSL hardware accelerator

A peripheral Secure Sockets Layer (SSL) platform that attaches to a Web switch with the express purpose of improving SSL performance for a client. For example, the Alteon SSL Accelerator can be used with WebLogic Server. This accelerator performs a TCP handshake with the client (in this case, WebLogic Server) through a Web switch and performs all the SSL encryption and decryption for the session.

SSL tunneling

Use of an SSL/TLS-protected connection to carry application-protocol traffic, such as HTTP, T3, or IIOP. In this guide, the application protocol is carried over TLS, which protects the transmitted data.

SSPI MBean

Interfaces used by Oracle to generate MBean types for the WebLogic security providers, and from which you generate MBean types for custom security providers. SSPI MBeans may be required (for configuration) or optional (for management). See also custom security provider, MBean type, WebLogic security provider.

subject

A grouping of related information for a single entity, such as a person, as specified by the Java Authentication and Authorization Service (JAAS). The related information includes the Subject's identities, or Principals, as well as its security-related attributes (for example, passwords and cryptographic keys). A subject can contain any number of Principals. Both users and groups can be used as Principals by application servers such as WebLogic Server. In WebLogic security providers (security providers supplied with the WebLogic Server product), the Subject contains a Principal for the user (`WLSUser Principal`) and a Principal for each group of which the user is a member (`WLSGroup` principals). Custom security providers may

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store identities differently. See also authentication, custom security provider, group, JAAS control flag, principal, user.

symmetric key cryptography

A key-based cryptography that uses an encryption algorithm in which the same key is used both to encrypt and decrypt the data. Symmetric key cryptography is also called secret key cryptography. See also asymmetric key cryptography.

target URL

The requested URL that initiates the authentication process in web SSO. See also SAML source site.

token

Artifact generated as part of the authentication process of users or system processes. When using identity assertion, a token is presented to show that the user has been authenticated. Tokens come in many different types, including Kerberos and Security Assertion Markup Language (SAML). See also authentication, Security Assertion Markup Language (SAML), Secure Sockets Layer (SSL), identity assertion, SSL tunneling, Security Assertion Markup Language (SAML), and user.

Trust Manager

An interface that enables you to override validation errors in a peer's digital certificate and continue the SSL handshake. You can also use the interface to discontinue an SSL handshake by performing additional validation on a server's digital certificate chain.

trusted (root) certificate authority

A certificate authority whose public key is explicitly trusted as a trust anchor, commonly through an installed root CA certificate. It may be an organization’s private CA or a public third-party CA. A root certificate is commonly self-signed; trust comes from the decision to trust that CA, not from the self-signature. A peer must validate the presented certificate path to an appropriate trust anchor. See also certificate chain, private key, public key.

two-way SSL authentication

SSL/TLS authentication using certificates from both the client and server. To require mutual certificate authentication in WebLogic Server, configure client certificates as requested and enforced. The requested-but-not-enforced setting allows clients that do not present a certificate. Each peer validates the other peer’s certificate using its configured trust. See also authentication, digital certificate, mutual authentication, Secure Sockets Layer (SSL), trusted (root) certificate authority.

user

An entity that can be authenticated. A user can be a person or a software entity, such as a Java client. Each user is given a unique identity within a security realm. For more efficient

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security management, Oracle recommends adding users to groups. A group is a collection of users who usually have something in common, such as working in the same department in a company. Users can be placed into groups that are associated with security roles, or be directly associated with security roles. See also entity, group, security role, WebLogic resource.

WebLogic component

WebLogic Server implements Jakarta EE component technologies, which include servlets, JSP Pages, and EJBs. To build a WebLogic Server application, you must create and assemble components, using the service APIs when necessary. Components are executed in the WebLogic Server Web container or EJB container. Web components provide the presentation logic for browser-based Jakarta EE applications. EJB components encapsulate business objects and processes. See also WebLogic container.

WebLogic container

To promote fast development and portability, Jakarta EE identifies common services needed by components and implements them in the container that hosts the component. Containers provide the life cycle support and services defined by the Jakarta EE specifications so that the components you build do not have to handle underlying details. A component has only the code necessary to describe the object or process that it models. It has no code to access its execution environment or services such as transaction management, access control, network communications, or persistence mechanisms. These services are provided by the container, which is implemented in WebLogic Server. Additionally, WebLogic containers give applications access to the Jakarta EE application programming interfaces (APIs). WebLogic containers are available for use once the server is started. This component/container abstraction allows developers to work within their fields of expertise. WebLogic Server provides two types of containers: the Web container and the EJB container. See also WebLogic component.

WebLogic Jakarta EE service

WebLogic Server implements Jakarta EE services, which include access to standard network protocols, database systems, and messaging systems. To build a WebLogic Server application, you must create and assemble components, using the service APIs when necessary. Web applications and EJBs are built on Jakarta EE application services, such as JDBC, Java Messaging Service (JMS), and Java Transaction API (JTA). See also WebLogic component.

WebLogic MBeanMaker

Command-line utility that takes an MBean Definition File (MDF) as input and outputs files for an MBean type. See also MBean Definition File (MDF), MBean type.

WebLogic resource

Entities that are accessible from WebLogic Server, such as events, servlets, JDBC connection pools, JMS destinations, JNDI contexts, connections, sockets, files, and enterprise applications and resources, such as databases. See also entity.

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WebLogic Security Framework

Interfaces in the `weblogic.security.service` package that unify security enforcement and present security as a service to other WebLogic Server components. The WebLogic Security Framework invokes the configured security providers to perform security operations on behalf of applications and WebLogic Server components. See also security provider.

WebLogic security provider

Any of the security providers that are supplied by Oracle as part of the WebLogic Server product. These providers were developed using the Security Service Provider Interfaces (SSPIs) for WebLogic Server. See also custom security provider, security provider, Security Service Provider Interfaces (SSPIs).

WebLogic Security Service

The WebLogic Server subsystem that implements the security architecture. This subsystem comprises three major components: the WebLogic Security Framework, the Security Service Provider Interfaces (SSPIs), and the WebLogic security providers.

WebLogic Server domain

A collection of servers, services, interfaces, machines, and associated WebLogic resource managers defined by a single configuration file. See also WebLogic resource.

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