



Integrating WebSphere Portal with your security infrastructure.

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Executive overview

Portals provide personalized access to information, applications, processes and people from a centralized point. You can authenticate users and control access to various kinds of information and applications, based on preset security definitions. Allow public access to less-sensitive information. And guard classified information – such as business-critical enterprise or government data – more carefully.

To accommodate different security requirements, portal servers must integrate with various security infrastructure components – such as authentication, authorization and single sign-on control – so you can choose the combination that best matches your security needs. For example, authentication might be as simple as requiring users to provide a correct user name and password. Or, your customers could use a “smart card” – for example, a bank card with a chip that safely stores a private key and certificate – to provide authentication. The smart card enables Secure Sockets Layer (SSL) or Transport Layer Security (TLS) client authentication to establish an authenticated and safe connection between the client and the portal.

Through a modular architecture, IBM WebSphere® Portal for Multiplatforms, Version 4.1 allows the integration of different authentication proxies, authorization systems and credential vault implementations. WebSphere Portal is designed to work with IBM WebSphere Application Server security¹ and IBM Tivoli® Access Manager, as well as with third-party security products, so that you can build a highly protected system that fits your individual infrastructure.

Introduction

Using WebSphere Portal, Version 4.1, you can establish protected access to portal resources like page groups, pages, portlets and documents. WebSphere Portal offers different ways to perform user authentication and authorization, and it provides support for single sign-on. Figure 1 shows the key components, from left to right, that are invoked when WebSphere Portal handles requests for portal pages. Although some portal pages can be accessed without prior authentication (anonymously), all requests for personal pages or group pages must pass through an authentication component. If a user is authenticated successfully, the incoming request is analyzed and routed to the appropriate component.

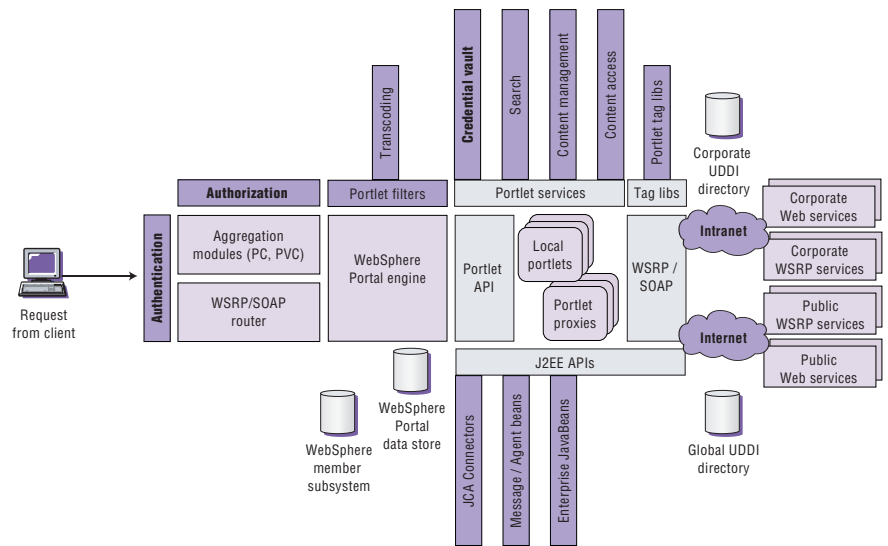


Figure 1. Subsystems of WebSphere Portal, Version 4.1

HTTP requests from user agents seeking a portal page are routed to the portal servlet, which acts as the central access point to all portal pages. Simple Object Access Protocol (SOAP) requests from other portals intended to invoke one of the local portlets are routed to the Web Services for Remote Portal (WSRP) or SOAP router. In either case, authorization is required. The component receiving the request calls the authorization component to determine whether the requested page or the portlet to be invoked can be accessed. To guarantee consistency of access rights, authorization information to most portal resources is maintained in the portal. However, for some resources access control may be externalized to systems such as Tivoli Access Manager or Netegrity SiteMinder.

When a request is routed to the portal servlet and access to a page is authorized, the portal servlet obtains information about the portlets² that are referenced from the page. Next, the portal servlet calls the authorization component to determine the subset that the current user may see, according to current access rights, and then displays the subset. Next, the servlet selects the appropriate aggregation module – based on the user-agent information from the request – and calls that module, passing the information about the page and the portlets to be displayed. The invoked aggregation module renders the page and the portlets in it by calling the referenced portlets. The module uses the portlet application programming interface (API) to communicate additional user profile information and portlet instance data from the WebSphere Portal data store to the portlet.

Portlets are special servlets that – unlike other servlets – are designed to participate in the portal’s event model and exploit the portal infrastructure. As a result, a portlet invoked by the portal can, in turn, invoke any Java™ 2 Platform, Enterprise Edition (J2EE) function such as J2EE Connector Architecture (JCA) Connectors, Enterprise JavaBeans (EJB) components, message beans, and Java Database Connectivity (JDBC) components. A portlet may also call Web services and HTTP uniform resource locators (URLs) in the same way it calls other servlets. It can also invoke portal-specific portlet services and tag libraries designed to access the portal infrastructure from JavaServer Pages (JSP) components. As a special type of portlets, WebSphere Portal offers portlet proxies. These are not functional portlets, but proxies for remote portlets residing on another server that are made available as remote portlet Web services.³ Conversely, WebSphere Portal provides the option to publish local portlets as remote portlet Web services for other portlets to use.

Portlets are often used to integrate back-end applications with portals, providing a Web-based user interface (UI) through the portal. When used this way, having single sign-on capability is important because after logging into the portal, users don’t want to enter an additional password for each application portlet for the respective back-end systems. To enable single sign-on, WebSphere Portal provides a credential vault portlet service. With this service, credentials are available to portlets to forward to back-end systems where users are then transparently authenticated. The credential vault service is backed by a credential vault, which can either be the portal’s built-in vault or a Tivoli Access Manager vault.

Typical portal scenarios

When you build a portal system on WebSphere Portal, you have a variety of possible deployment options – including simple firewall protection and Internet portal-based deployment – that provide different levels of performance, scalability, availability and security.

Simple firewall protection

You can use a simple portal setup if your portal and its clients reside in your intranet, assuming no internal attacks are expected. The portal server, the database server and the user registry are all in the same network, but the portal

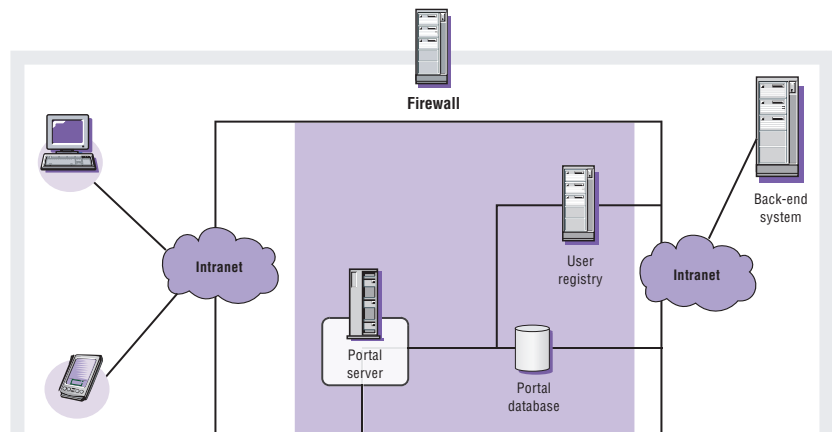


Figure 2. Deployment of a portal within a protected network

will not be visible to the Internet (see Figure 2). The HTTP server and the application server (with the portal server code) are located on the same physical machine. Clients can be connected to the portal server directly because they are in the same network. The portal uses a separate database server to store data. All user information is in a user registry, located in a third and separate machine. And the same network includes any back-end systems the portal applications might access.

Internet portals

When you need your portal to service Internet-based clients, simple firewall protection isn't enough. At least one node of the portal system must be visible from the Internet. Typically, two or more firewalls are used, but there are a number of variations.

The first configuration is appropriate for portals that use WebSphere Application Server security. If the portal directly handles authentication and access control for its resources, the machine running the HTTP server must be visible to the Internet (see Figure 3) because the HTTP server is the first node accessible to external clients. This requires that the HTTP server and the application server with the portal server code be located on different machines. The HTTP server is located in a demilitarized zone (DMZ) behind an outer firewall. And HTTP requests to the HTTP server are the only incoming traffic.

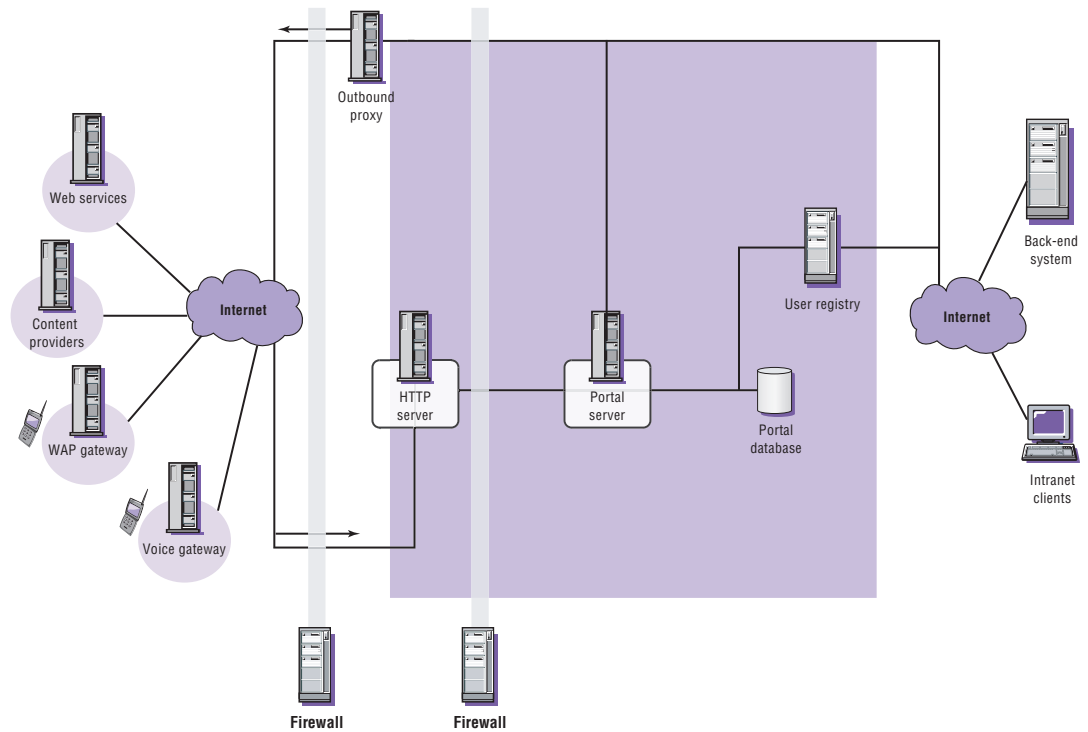


Figure 3. Example of a portal configuration serving to clients in the Internet

A second firewall provides additional protection for the inner network and the back-end systems by only allowing traffic from the HTTP server to the portal server. To penetrate the second firewall, an attacker must successfully seize control of the HTTP server. To allow the portal server to access and aggregate external content, an outbound proxy in the DMZ forwards requests from the intranet and returns the responses from the Internet.

The second configuration option is ideal for portals that use a separate authentication proxy. To authenticate, WebSphere Portal can use its own authentication mechanism or rely on a separate authentication proxy, as shown in Figure 4. A separate authentication component can provide a single central authentication point for one or more portals and other Web resources. The authentication proxy can be implemented as a separate server machine, as a plug-in to the HTTP server or as a plug-in to IBM WebSphere Edge Server.

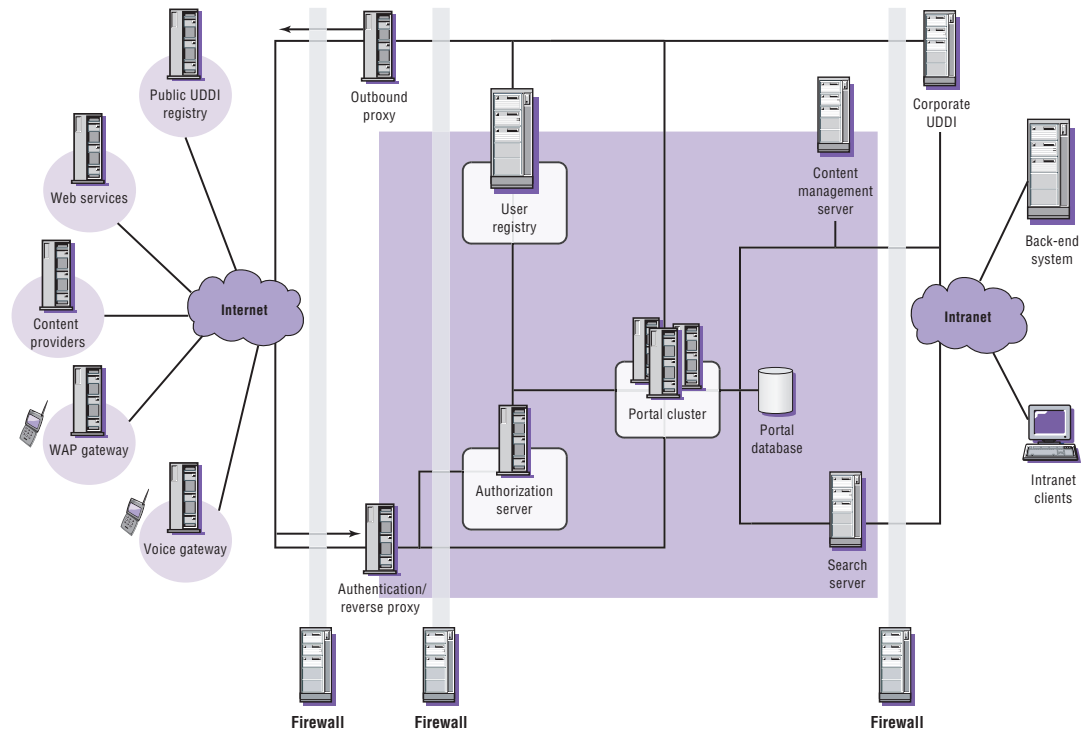


Figure 4. A portal deployment with separate authentication component

In this setup, authentication is performed by a proxy server. The authentication proxy is the only node visible to clients connecting from the Internet. It is protected by an outer firewall that stops simple denial-of-service attacks. The authentication proxy cooperates with its authorization server, which is behind another firewall. This firewall allows inbound requests only from the authentication proxy and inbound responses from the outbound proxy. The outbound proxy forwards requests from the intranet and returns the responses from the Internet. The authorization server accesses the user registry, which is in the same network. The user registry is used by the authorization server, the portal server and by other systems.

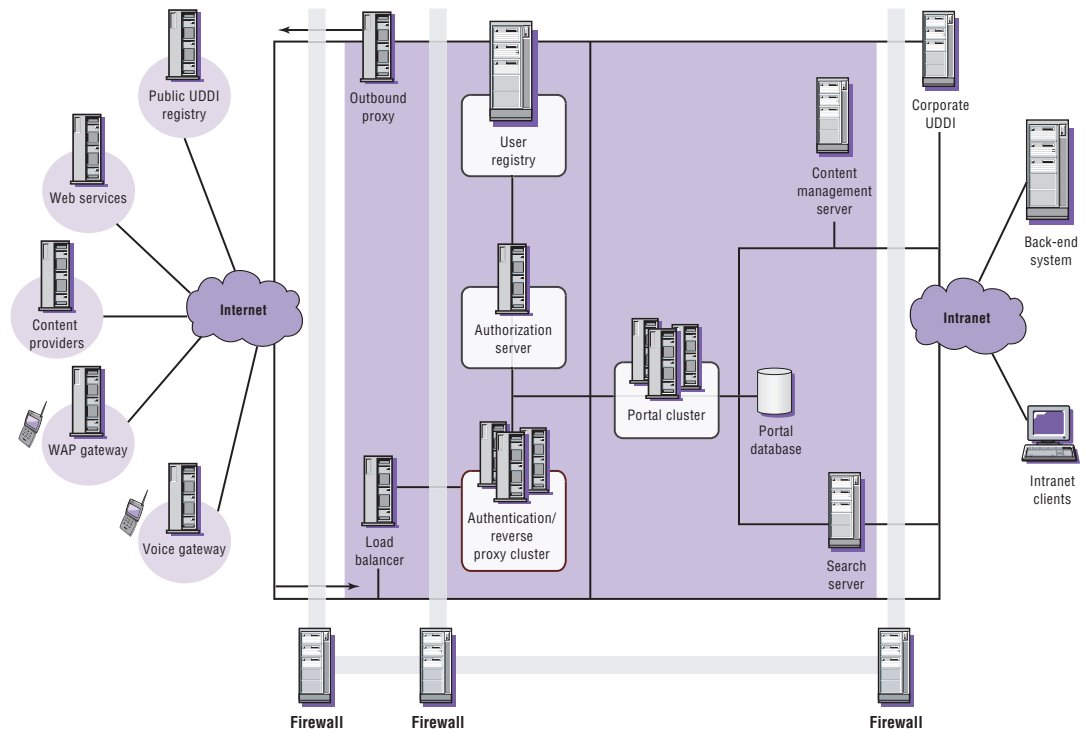


Figure 5. Portal deployment with clusters of portal servers and authentication proxies

The portal server functions execute on several machines in a cluster to provide a higher capacity and fault tolerance. In Figure 5, the cluster includes a load balance machine, several caching proxy machines and several portal server machines.

In the same network as the authorization server, the user registry and the portal server cluster is a portal database, content management server and a search server. An additional firewall separates the network from the intranet, where the back-end systems reside. In this deployment scenario, the portal can use remote portal Web services through the outbound proxy. The portal also offers remote portal Web services to others. Services offered to the Internet are registered with the public Universal Discovery, Description and Integration (UDDI) registry in the Internet, while those offered to your intranet only are registered with your corporate UDDI registry.

Another deployment possibility is based on a portal cluster, which is using a separate, load-balanced and fault-tolerant cluster of authentication proxy server machines (see Figure 5). The network node visible to the clients in the Internet is the load balancer, which dispatches requests between several authentication proxies. This load balancer is located behind the outer firewall and is the only machine in the DMZ – other than the outbound proxy.

The cluster of authentication proxies fed by the first load balancer is behind another firewall, together with the portal server cluster, the user registry, the authorization server, the portal database, the search server and the content management server. A third firewall separates the portal cluster network from the intranet with the back-end systems.

Figure 5 shows a typical network administration setup. The middle firewall has been given a third network adapter to connect the outer DMZ with the network administration system and the intrusion-detection system (IDS). In the same way, the inner firewall connects the inner DMZ with the network administration system and IDS securely with customized filtering.

Available authentication methods

Access control features enable you to positively identify, or authenticate, the person or program requesting access to a secured property, such as to data or to a location. In most cases, the authentication process requires a user identification (user ID) string and a user password to verify the authority of the user. The standard way to provide the user ID and password to the server is through HTTP basic authentication, which uses a Web browser mechanism with a standard login dialog box. Alternatively, using HTTP form-based authentication, the server sends a customized authentication form to the user.

Password-based authentication schemes can only offer limited security, in general, because passwords can be poorly chosen, passed on carelessly, reused between secure and insecure systems, and stolen. Other authentication mechanisms include SSL/TLS client authentication (based on digital signatures and certificates), hardware-based, one-time passwords such as the RSA SecureID token and the use of smart cards. And various biometric mechanisms can be used for authentication, including finger print verification, iris scanning and speaker verification.

WebSphere Portal offers an authentication subsystem that delegates user authentication to underlying mechanisms of IBM WebSphere Application Server. The subsystem provides support for the following authentication setups:

- *Use of native WebSphere Application Server authentication. A custom login form posts the user's authentication data to a servlet that requests WebSphere Application Server security⁴ to validate the user's authentication data. This setup exploits WebSphere Portal integration with WebSphere Application Server and its capability to configure the portal as a secure Web application.*
- *Use of an authentication proxy. WebSphere Application Server provides a trust association interceptor (TAI) interface that allows it to establish cooperation with trusted authentication proxies.*

Authentication through WebSphere Application Server security features

To use WebSphere Application Server security features, the portal is configured as a secure Web application. When WebSphere Application Server receives a request for the application (the portal), its security component requests the authentication credentials from the client. Depending on which authentication method is configured, the security component request will create an HTTP basic authentication request or an HTTP over SSL (HTTPS) client certificate request (which is an HTTP used over a secure connection) to be sent to the Web browser. Or, the client is redirected to an authentication form that prompts the user to provide the credentials for authentication. In the latter case, the form posts the credentials to a WebSphere Portal custom authentication servlet that obtains the posted credentials. The servlet then makes the required calls to WebSphere Application Server security functions to log in the user to the WebSphere Application Server security context. With either HTTP basic authentication or HTTPS client certificate authentication, WebSphere Application Server receives the authentication credentials directly. WebSphere Application Server authenticates users by checking provided credentials against a user registry. The user registry can be a Lightweight Directory Access Protocol (LDAP) directory or a custom user registry.

Authentication through a separate authentication proxy

An external authentication proxy can protect your portal by intercepting all requests targeted to portal destinations. An authentication proxy can be implemented as a proxy server such as WebSEAL in Tivoli Access Manager for e-business. Or it can be implemented as a plug-in to the HTTP server or to WebSphere Edge Server. Examples of HTTP plug-in authentication proxies

include the Web Agent in Netegrity SiteMinder and the authentication plug-in in Entrust GetAccess. WebSEAL Lite from Tivoli is a plug-in to WebSphere Edge Server.⁵ An external authentication component authenticates users by checking the provided credentials against a user registry, which is, in most cases, an LDAP directory.

Trust association interceptors registered with WebSphere Application Server establish a connection between WebSphere Application Server and the authentication component protecting it. TAIs are programs called by WebSphere Application Server to work with external authentication components, as shown in Figure 6. The program relies on external components to process authenticating requests rather than performing authentication directly. WebSphere Application Server defines the interface that a TAI uses to indicate that it can handle a request and that the request has been authenticated. TAIs communicate with the authentication component and make the authentication decisions accessible to WebSphere Application Server through the specified TAI interface.

After a request for a portal destination passes the external authentication component, it is received by WebSphere Application Server and sequentially passed to the registered TAIs until one TAI indicates that it is responsible for authentication and either accepts or rejects the request. When no TAI can handle the incoming request, WebSphere Application Server reverts to its native authentication, as if no TAIs are available. The client is then redirected to the custom login form. However, this only occurs with requests that bypass the external authentication component.

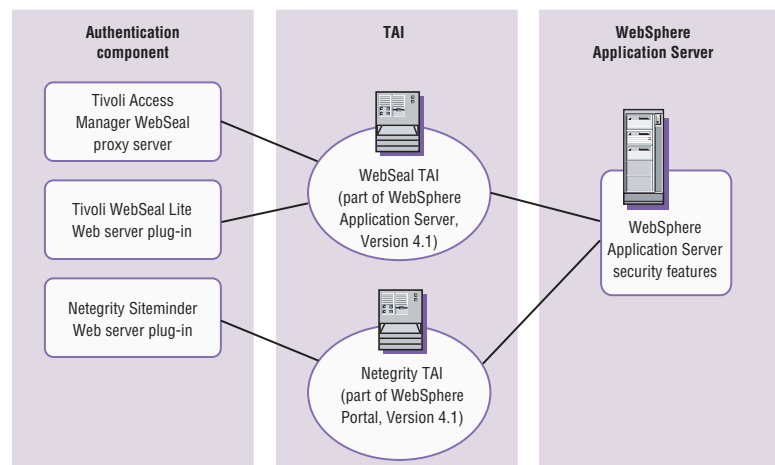


Figure 6. Authentication components and TAIs

Figure 7 shows the detailed flow of control for a request that is passing through an external authentication proxy. The interactions are the same for authentication proxies implemented as separate servers and for proxies implemented as plug-ins for the Web server or WebSphere Edge Server.

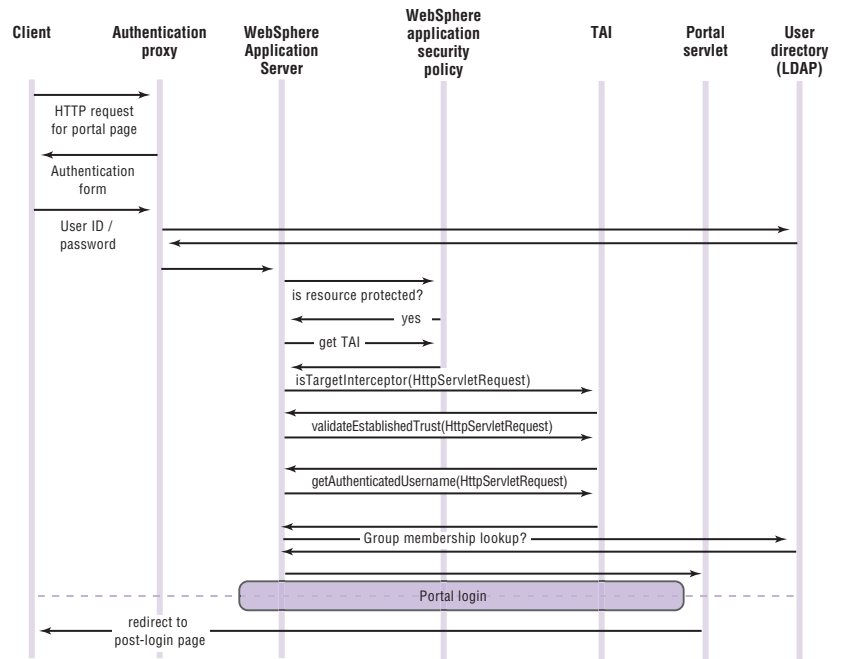


Figure 7. Flow of control for a request passing through an external authentication proxy

Requests in an authenticated session

When authentication is complete, the user is logged in, a portal session is started and a Lightweight Third Party Authentication (LTPA) token, containing the user ID and an expiration date and time, is issued to the client, along with the HTTP session cookie (JSESSIONID)⁶. LTPA is supported by WebSphere components.

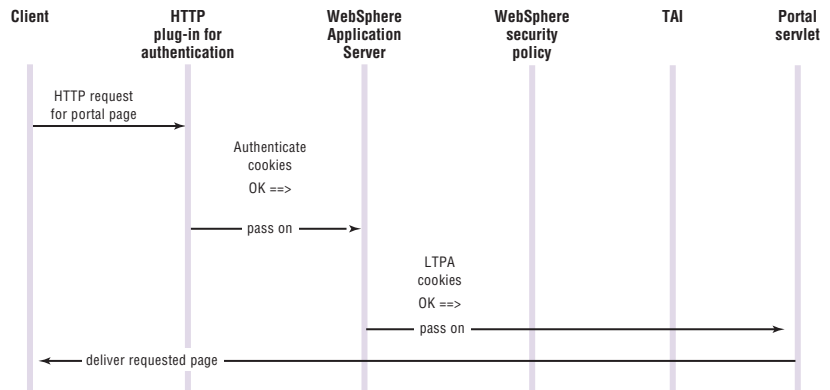


Figure 8. Flow for a request that is already authenticated

As proof of authentication, user information is signed and encrypted into an LTPA token, which can be verified by all servers that are part of the LTPA single sign-on (SSO) domain (see Figure 8).

User registry versatility

A user registry is a repository that holds information about registered users and groups, as well as applications that are validated through the user registry. WebSphere Application Server and WebSphere Portal allow an internal WebSphere Portal database, an LDAP directory or a custom registry to be used as a user registry. WebSphere Portal shares the authentication registry with WebSphere Application Server while having a separate database for user profiles and preferences. Some profile information may also be stored in the same physical store as the authentication registry. For example, an LDAP directory may contain significantly more information about each user than simply a name and password.

In WebSphere Portal, Version 4.1, user information is centralized in the member services component. This component in WebSphere Portal can be configured for different layouts of data in the user registry and its database as shown in Table 1. WebSphere Portal can also work with a read-only user registry so all portal user data that has to be updated is stored in the internal database.

Table 1. Supported authentication registries and corresponding WebSphere Application Server and WebSphere Portal settings

Member service configuration	WebSphere Application Server authentication registry	Description
LDAP and database	LDAP	The authentication registry is a directory server. You can configure which profile information is stored in the LDAP and which is stored in the database.
Database only	Custom user registry provided by WebSphere Portal	WebSphere Portal provides a custom user registry implementation for the internal database. The authentication registry is part of the member subsystem, and profile information is stored in the same database.
Customer-provided registry	Custom user registry provided by customer	The customer supplies a custom user registry. Profile information is held in the portal member subsystem database as well as in the custom registry.

The member services component determines group membership. This information is used by the WebSphere Portal access control and administration functions. The lookup function helps to evaluate nested groups. A configurable option stops group membership lookup at the first level to help prevent a decrease in performance.

Portal session login

After WebSphere Application Server authentication, the portal login is performed (see Figure 9). The user object is populated from the user registry and the user session is resumed from the saved state, if this option is selected. Finally, the Web browser is redirected to the target page, which can be defined as part of the redirection policy.

During the WebSphere Portal login sequence, a Java Authentication and Authorization Services⁷ (JAAS) login is executed. JAAS is a Java API that specifies classes in three different categories: common, authentication and authorization. WebSphere Portal primarily uses the common classes, such as the JAAS subject. The authentication classes – such as LoginContext and LoginModule – are used only with partial functionality, and the authorization classes remain unused. A JAAS login, as defined by the JAAS specification, executes a number of login modules and returns the user's subject as a result of a successful login. The subject is a container for the user's identities (principals) and credentials. Each login module can add principals or credentials to the subject.

If the logout was initiated intentionally by the user and not by session timeout, a WebSphere Application Server logout is performed.⁸ The user's credential token is marked as invalid, and a respective cookie invalidation command is added to the response. The browser is then redirected to render the post-logout target. When using an authentication proxy, WebSphere Portal must be set up to redirect to the authentication proxy's logout page after logout. That way, the authentication proxy is also notified of the logout.

Customization of the portal login and logout process

WebSphere Portal allows you to customize the portal login and logout procedures. The following modifications are possible:

- *Specifying the post-login and the post-logout redirection policy and targets*
- *Adding custom JAAS login modules that are used to authenticate a user and populate the portal's user JAAS subject with principals or credentials*
- *Securing the login interactions and the personalized portal pages through SSL*
- *Extending or replacing the portal login and logout action classes*

Single-sign-on capabilities

You can use WebSphere Portal to integrate enterprise information systems and present them through the portal user interface. You want back-end systems to perform authentication and authorization separately – to maintain current security controls – without repeatedly prompting the user to authenticate. The single-sign-on capability provides a reliable authentication method for one user at a time. It allows, within a single environment – and using a single authentication for the duration of the session – access to other applications, systems and networks.

With WebSphere Portal, there are two SSO realms, one from the client to portal and other Web applications. The other from the portal to back-end applications (See Figure 10). With single sign-on from the client to Web applications and the portal, a client logs in once to one Web application and is then able to access all other Web applications that are part of the same SSO realm without a second authentication challenge. It doesn't matter whether WebSphere Portal is the authenticating Web application or is one of the other, trusting Web applications. Similarly, single sign-on from the portal to back-end applications allows a portal client to log in to the portal once and then access a number of back-end applications through respective portlets without having to authenticate at each of these applications.

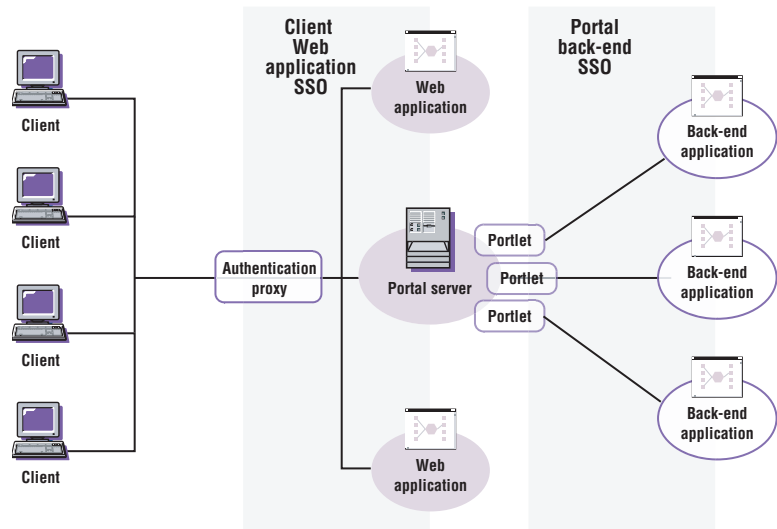


Figure 10. WebSphere Portal SSO realms

Single sign-on from a client to Web applications

Single sign-on from a client to Web applications and the portal can be provided through a variety of mechanisms:

- *LTPA support built into WebSphere Application Server*
- *Authentication proxy single sign-on support (WebSEAL, Netegrity SiteMinder)*
- *Other third-party SSO frameworks or environments, such as Entrust GetAccess*

In function, the various SSO solutions are essentially the same. With successful authentication, the client receives a security token that enables it to prove successful authentication and to pass subsequent requests through without repeating the authentication.

Persistent cookies can be used to achieve the goal of single sign-on. Persistent cookies are stored by the Web browser on the client in a form that has little protection against reading and copying. For greater security, however, WebSphere Portal only uses cookies that are deleted when the Web browser session is terminated – not persistent cookies.

Single sign-on from portal-to-back-end system

WebSphere Portal, Version 4.1 offers a credential vault as a portlet service. This service provides the portal and portlets with a mechanism to map from one user identity – usually a user ID (principal) – to another user identity with a credential, such as a password. With this capability, you don't have to use portlets to store user credentials as part of the user-specific portlet data. In fact, storing credentials in the portlet data is no longer recommended to achieve a single sign-on. You should update portlets that store credentials to make use of the credential vault (see Figure 11).

The credential vault service provides the following parameters:

- *Map the requested credential slot, the user ID and the portlet ID to a resource in the vault. A portlet can only retrieve a credential if a respective mapping rule exists. Each credential slot is associated with a certain vault implementation (the actual store), which allows different credentials to be kept in different physical stores.*
- *Retrieve the user's credential. Some credentials will be stored and managed by the portal that always uses the local default vault store. If a user password is not stored in the portal's local vault, it will be acquired from the respective external vault.*
- *If a credential is not available or the authentication fails, an appropriate exception is thrown. The service passes this exception to the portlet to allow an appropriate error handling. For example, it might ask the user to set the credential through the portlets edit mode.*
- *The credential vault will not allow anyone but the credential owner –not even the portal administrator –to manage or use the credentials, which preserves the trust of the end user. No method to access another user's credentials will be provided.*
- *Administrate the credential vault (vault-management interface). Portal administrators can configure the credential vault services that are not controlled by the user. This includes the management of the vault segments, the administration defined slots and system (shared) credentials. Although an administrator cannot access or change user-defined credential slots and passwords, user-defined slots are deleted if the respective user is deleted.*

Figure 11 illustrates the structure of the WebSphere Portal credential vault. The credential vault is organized as follows:

- *The portal administrator can partition the vault into several vault segments. Vault segments can only be created and configured by portal administrators.*
- *A vault segment contains one or more credential slots. Credential slots are the “drawers” from which portlets retrieve credentials and to which they are stored. Each slot holds one credential, if user-defined, and one credential per user, if defined by the administrator.⁹*
- *A credential slot is linked to a resource in a vault implementation, where the credentials are actually stored. Examples for vault implementations are the WebSphere Portal default database vault or the Tivoli Access Manager repository.*

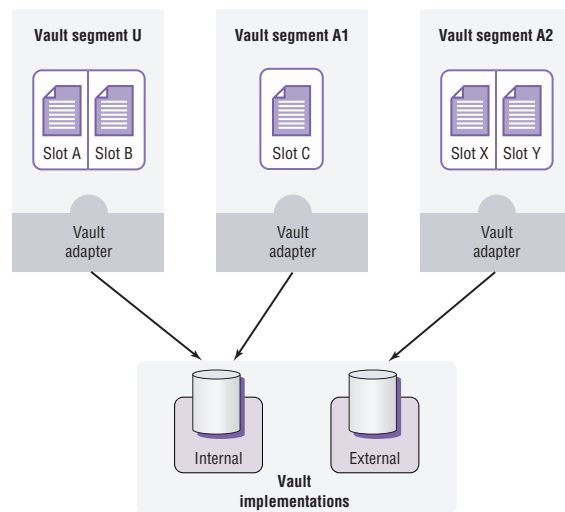


Figure 11. WebSphere Portal, Version 4.1 introduces a credential vault portlet service

For each vault segment, a flag indicates whether it is to be managed by the administrator or by the user. Only administrators can create credential slots in an administrator-managed vault segment. Portlets (acting on behalf of a portal user) are permitted to create credential slots only in user-managed vault segments, but they can set and retrieve credentials in both types of segments.

Therefore, portlets that need a credential to complete their service have two options: to use an existing credential slot that has been defined by the portal administrator in an administrator-managed vault segment or to create a new credential slot in a user-managed vault segment.

The WebSphere Portal credential vault service distinguishes between three types of credential slots:

- *A system credential slot stores system credentials. Credentials are shared among all users and portlets.*
- *A shared credential slot stores user credentials that are shared among the user's portlets. Credentials are user-specific but the same for all portlets of a user.*
- *A portlet private slot stores user credentials that are not shared among portlets. Credentials are user-specific and specific to an individual portlet instance.*

The credential vault service returns credentials in the form of credential objects. WebSphere Portal differentiates between passive and active credential objects.

Passive credential objects are a container for a credential's sensitive information, such as the user ID and password. Portlets that use passive credentials must extract the information out of the credential. With passive credentials the portlets are responsible for the communication (authentication) with the back-end system, shown in Example 1.

Passive credential object use (pseudo code)

```
// Retrieve the credential object from the credential vault
UserPasswordPassiveCredential credential = (UserPasswordPassiveCredential)
service.getCredential(slotId, "UserPasswordPassive", null, porletRequest);

// Extract the actual secret out of the credential object
UserPasswordCredentialSecret secret = credential.getUserSecret([...]);

// Portlet connects to back-end system and authenticates using the user's secret...

// Portlet uses the connection to communicate with the backend application...

// Portlet takes care of logging at the back-end...
```

Example 1. How a portlet uses a passive credential that carries a user ID and password

An active credential object hides the user ID and password from the portlet, making it an ideal method to preserve portal security. Active credentials allow portlets to trigger authentication to remote servers using standard mechanisms – such as HTTP basic authentication, HTTP form-based authentication or POP3 authentication. To access server-side credentials, active credentials allow the use of hardware tokens that never expose their sensitive information. Such hardware tokens¹⁰ only allow the use of credentials inside the hardware with the supported authentication algorithms.

Example 2 illustrates how a portlet uses an active credential. In this case, it's an active credential for HTTP form-based authentication, shown in Figure 12.

Active credential object use (pseudo code)

```
// 1. Retrieve the credential object from the credential vault  
HttpFormBasedAuthCredential credential = (HttpFormBasedAuthCredential)  
service.getCredential(slotId, "HttpFormBasedAuth", config, request);  
  
// 2. Log into the backend system credential.login();  
  
// 3. Get an authenticated connection to use  
URLConnection connection = credential.getAuthenticatedConnection();  
  
// 4. Portlet uses the connection to communicate with the backend application...  
  
// 5. Log out of backend system credential.logout();
```

Example 2. How a portlet uses an active credential

All credential types that are available within the portal are registered in a credential type registry. WebSphere Portal, Version 4.1 provides a small set of credential types out of the box, but additional credential objects can easily be registered.

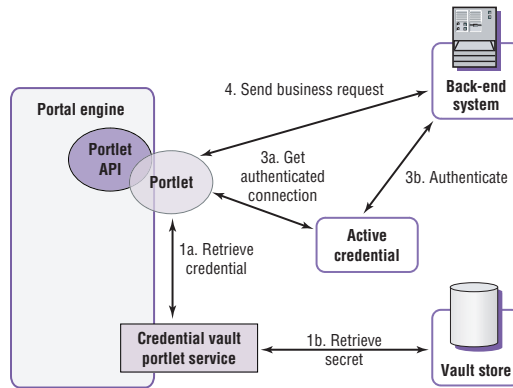


Figure 12. A portlet using an active credential object for back-end single sign-on

Included passive credential objects:

- *SimplePassive*. Stores credentials as “serializable” Java objects.
- *UserPasswordPassive*. Stores credentials as user ID-password pairs.
- *JaasSubjectPassive*. Stores credentials as `javax.security.auth.Subject` objects. It is used to provide portlets with the JAAS subject that the portal established for the user.

Included active credential objects:

- *HttpBasicAuth*. Stores user ID and password and provides support for HTTP basic authentication.
- *HttpFormBasedAuth*. Stores user ID and password and provides support for HTTP form-based authentication.
- *JavaMail*. Stores user ID-password pairs and leverages the authentication functionality of the `javax.mail` API.
- *LTPA token*. Supports authentication at a back-end system that is within the same WebSphere Application Server SSO domain as the portal.
- *SiteMinderToken*. Supports accessing back-end systems that are in the same SiteMinder SSO domain as the portal. It is typically used when a SiteMinder authentication proxy protects the portal and other resources.
- *WebSEALToken*. Supports accessing back-end systems that are in the same WebSEAL SSO domain as the portal. It is typically used when a WebSEAL authentication proxy protects the portal and other resources.

For security reasons, credential objects do not implement `java.io.Serializable` and can therefore only be stored in the portlet session as a transient value. The credential classes store the actual credential secret as private attributes. If they were serialized into the WebSphere Application Server session table, the credential could, potentially, be read by anyone who has access to this database.

Client-to-portal communication security

SSL and TLS protocols¹¹ leverage different cryptographic algorithms to implement security—for example, authentication with certificates, session key exchange algorithms, encryption and integrity check. They are commonly used to help provide privacy and reliability between communicating applications such as Web clients and Web servers. SSL and TLS provide connection security with three basic properties:

- *Confidentiality. Encryption is used after an initial handshake to define a private key. Symmetric cryptography such as Data Encryption Standard (DES) or RC4 is used for data encryption.*
- *Authentication. User identity can be authenticated using public key cryptography such as RSA or DSS.*
- *Integrity. Message transport includes a message integrity check using a keyed message authentication code (MAC). Secure hash functions such as SHA and MD5 are used for MAC computations.*

IP Security Protocol (IPSec) technology can be used as an alternative to SSL, but only for direct connections between two systems, and it can't be tunneled through servers or firewalls. Although the operating systems of most clients support IPSec today, only a few are preconfigured. Using IPSec between clients and a server complex can prove difficult to maintain.

When you need to protect the communication between servers, however, you have a choice between SSL and IPSec. SSL offers a slightly higher degree of security. An attacker not only has to compromise a system, gain access to the SSL keys and use SSL for communication. IPSec, by contrast, is easier to set up because current operating systems have built-in support. Also, it may perform faster if the operating system uses available cryptographic hardware. WebSphere Portal can be configured to support SSL¹² so that it can generate respective URLs if needed, and the protocol as well as the port can be specified.

Using TLS, you need to decide where to terminate the client's SSL connection and what communication to protect. It's necessary not only to protect the communication across unprotected networks (such as the Internet), but also communication within corporate networks. You can't underestimate the possibility of human error or internal attack.

Figure 13 shows how TSL can be implemented in the simplest deployment scenario (see Figure 2). With no systems or firewalls between the client and portal server, one connection has to be secured with SSL.

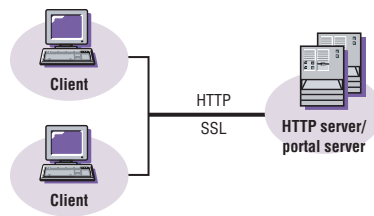


Figure 13. Communication security for portal installations within a protected network

In the second deployment scenario (see Figure 3), the HTTP server is separated from the portal server with firewalls between client, HTTP server and portal server. Again, SSL must be used for the client connection. The first firewall is configured to allow this kind of data to pass through. One connection from the HTTP server to the firewall and one connection from the firewall to the portal server use IPSec. IPSec is preferred to SSL because it easier to configure. It can be used in the described deployment because both servers are part of the same administrative domain.

When an LDAP directory is added (see Figure 14), communication between the application server and LDAP server can be protected because the LDAP queries and responses might contain confidential data. The WebSphere Application Server security component can be configured to use LDAP over SSL (LDAPS).

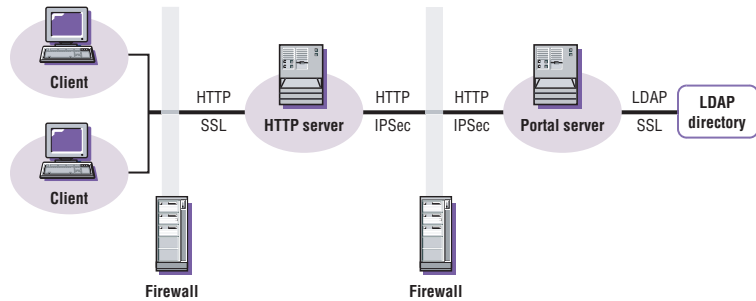


Figure 14. Communication security for a straightforward Internet portal installation

The third deployment scenario (see Figure 4) places a reverse proxy for authentication in the DMZ and adds a cluster of portal servers – fed by a load balancer – behind another firewall. A possible TLS implementation could use SSL from the client to reverse proxy, and IPSec for the remaining path through the DMZ. If the security threat in the intranet was small, the remaining connections would be implemented as plain HTTP, as shown in Figure 15.

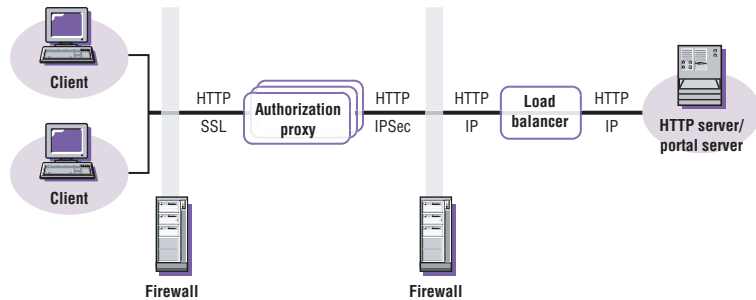


Figure 15. Communication security for a portal cluster in a trusted intranet

In a fully clustered portal setup with full TLS, the client’s SSL connection is terminated at the first load balancer. IPSec is used for the communication between all the remaining components thereafter. Both the reverse proxy and the application server communicate with the LDAP server, and data confidentiality is protected by IPSec, as shown in Figure 16.

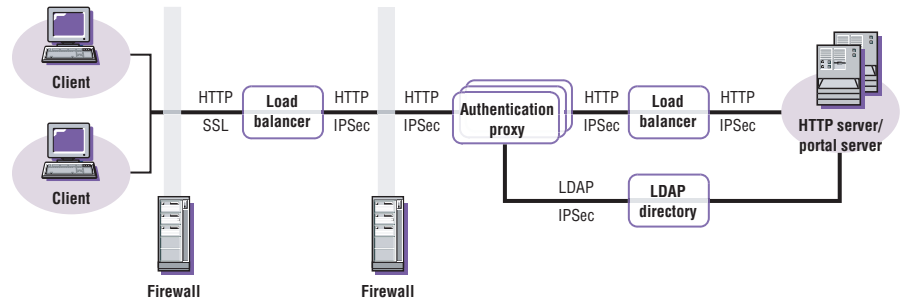


Figure 16. Communication security implementation in a fully clustered portal setup

Restricting protection to sensitive communication only

Using SSL consumes a considerable amount of computing power. The most expensive SSL operation is the initial handshake, but the symmetric encryption of the bulk data produces additional load. Therefore, it is recommended that you keep SSL protection at the necessary minimum. WebSphere Portal allows you to switch between SSL and non-SSL connections during a session. It's possible to set up the portal so that SSL is used only for the user login operation. Once a user is logged in, it is the portlet's responsibility to turn SSL on or off. The final decision whether a portal should protect none, all or only parts of its communication with SSL should be based on the sensitivity of the data.

Using client certificates

The SSL and the TLS protocol specify the authentication of communication partners through the use of X.509 certificates. If the client is using a certificate to authenticate to the server, this type of authentication through the client certificate is more convenient than typing a password. And it avoids the known security drawbacks of passwords. In addition, if the client certificate is stored on a smart card, this form of authentication can establish particularly strong trust.

Enforced certificate-based client authentication is a configuration option with WebSphere Application Server that must be selected during configuration if an authentication proxy such as Tivoli Access Manager WebSEAL is used. WebSEAL offers additional control, called step-up authentication. You can configure it to require and automatically prompt for different forms and strengths of authentication for different targets.

Secure back-end connections

Some portlets are designed to access back-end applications that house critical enterprise data. WebSphere Portal can help keep your data private in two ways:

1. *Selected portlets can use SSL connections to exchange data with a corresponding back-end application. Depending on the back-end application, an SSL handshake with client authentication may be required.*
2. *The portal and the back-end applications can establish a virtual private network (VPN) using IPSec.*

WebSphere Portal offers a content access portlet service that enables portlets to establish and use an SSL connection. It is designed to facilitate assigning the portal a collection of client certificates that portlets can use to self-authenticate to back-end applications. This collection may be different from what the application server uses to authenticate directly. The portal certificates are only available to the portal and its portlets. Other Web applications that are installed on the same application server node cannot use them.

The content access service offers extensive SSL functionality:

- *If an HTTPS protocol handler has been configured, any component (particularly portlets) can initiate an HTTPS connection with `URLConnection`, `HttpURLConnection` or `HttpsURLConnection`. The `SSLContext` and `SSLSocketFactory` will be created and assigned to the connection object on the fly. The portlets can either request a markup or an input stream, and no other communication with the content access service is necessary.*
- *If an HTTPS proxy has been configured, any HTTPS URL requested from content access service will go through that proxy, unless it is explicitly listed on the content access service exclusion list. Ports other than 443 can be configured.*
- *An SSL key store, a collection of keys that can be used to verify the portal's identity to remote systems, can be configured. The key store will be used for all direct HTTPS requests initiated by content access service but not for the SSL handshake between an HTTPS proxy and the back-end application.*
- *An SSL trust store, a collection of trusted certificates that remote systems may present to the portal to self-authenticate, can be configured. The trust store will be used for all direct HTTPS requests initiated by the content access service but not for the SSL handshake between an HTTPS proxy and the back-end application.*
- *If an HTTPS URL returns an HTTP redirect and the maximum number of redirects has not been exceeded, the content access service will follow the redirect using the HTTPS protocol and the HTTPS proxy, if indicated.*

Using IPSec for back-end connections is an alternative to using SSL. IPSec operates efficiently on the network layer and is easy to configure in most current operating systems.

Controlling access to portal resources

WebSphere Portal provides fine-grained access control for your resources including portlets and Web pages. Access control is flexible enough to allow highly complex protection scenarios. The access control function is encapsulated in a separate component and is called whenever you need to access, display, modify or manage portal resources. The portal core code allows portal users to view pages and the portlets on a page only when the required permissions have been assigned.

You can manage the rules for access control and policies using a WebSphere Portal access control portlet—a built-in graphical user interface (see Figure 17). Displaying and modifying access control rules are operations that also have to be restricted by access control. Only users with at least the permission to view the access control portlet can use it. The access control portlet verifies whether the current user has the right to modify a given access control rule, including the ability to change between external and internal control. For each user, the access control portlet displays only those access control rules for which the user has the proper permissions. Users must have the permission to delegate for the object of the rule, as well as the permission to delegate for the subject or for a group containing the subject as member.

Figure 17 shows how you can use the access control portlet to view and modify access control permissions. The portlet shows the permissions for accessing places, which are defined for the group of all authenticated users. The right set of columns labeled “Minimum” is controlled by radio buttons and refers to the permissions set for this group explicitly. The middle set of columns labeled “Active” refers to the permissions that result from the combination of implicitly

inherited and explicitly assigned permissions. The outbound arrows in the far right column can be clicked to transfer the access control to an external access control system, such as Tivoli Access Manager. You can use Tivoli Access Manager if you need to protect and administer WebSphere Portal resources and other resources through one central access control component.

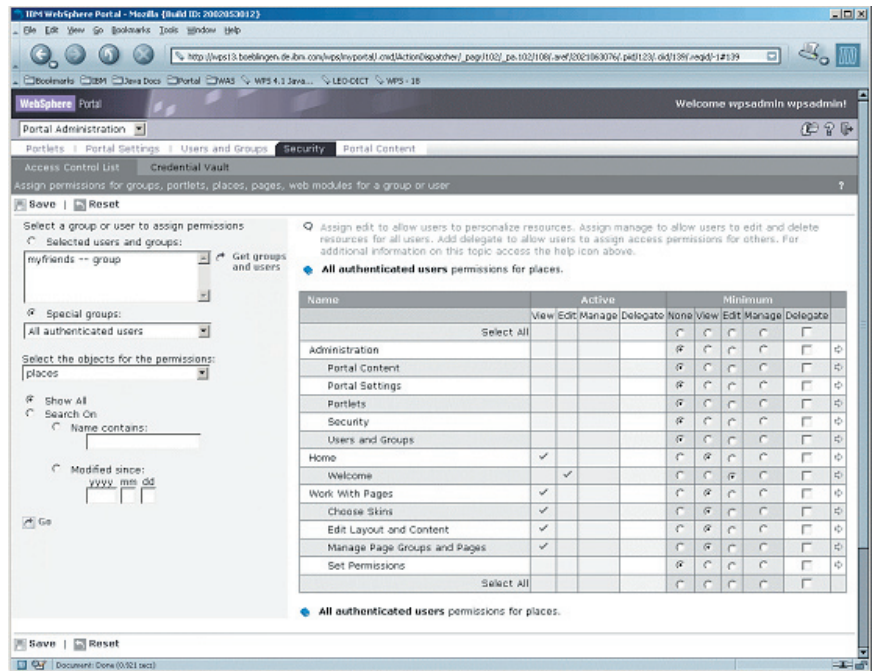


Figure 17. Example of using the access control portlet

Employing an external access control system

The access control system of WebSphere Portal can be configured to allow external access control systems handle portal resources. Available external systems like Tivoli Access Manager, Netegrity SiteMinder and Entrust GetAccess offer centralized authentication, authorization and administration.

WebSphere Portal allows you to delegate the access control for any individual resource or group of resources to external access control system (see Figure 18). During the portal operation numerous calls are sent to the access control system. Some of these are carefully optimized to retrieve a set of results with a single invocation and database lookup. This internal optimization is not practical for access control requests that are forwarded to an external access control system. Instead, you can allow critical resources to be controlled externally while the millions of less-critical resources – like private user pages and public news pages – can be controlled more efficiently inside the portal. This approach is implemented in WebSphere Portal with another performance optimization that extends the internal caching of results to the results from external access control decisions.

As shown in Figure 18, access requests (1) to the WebSphere Portal internal access control are delegated (2) to an external system. All permissions for the specified object are controlled by the same access control service, either internally or externally.

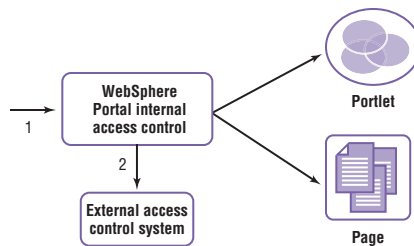


Figure 18. Selected access control decisions are delegated to an external system

Understanding and working with access control rules

Portal access control rules are stated in the format: <subject><permission><object>. The subjects of the rules can be either an individual user or a group of users: for example, MillerJ or Dept-3269. And groups can be nested.

The permission types give the subject (individual or group) specific permissions:

- *View.* View a resource in its predefined configuration.
- *Edit.* Change the configuration of a resource. Permission to edit implies the permission to view.

- *Manage. Install and remove a resource. This permission also implies permissions edit and view. For some resources, like portlets and pages, WebSphere Portal makes a distinction between two levels of modifiable settings. Settings that affect all users of a portlet can only be changed with the permission to manage that portlet. Settings that affect only the current user of a portlet can only be changed with the permission to edit that portlet.*
- *Copy. Copy a resource, including its configuration. The new instance can be configured independently from the old instance. The creator of the copied instance automatically gets permissions manage and delegate. Copy permission does not imply permission to create.*
- *Create. Create instances of a specific resource type. The creator of a resource instance automatically gets permission to manage and delegate. Permission to create is not required to be able to copy resources if you have the permission to copy.*
- *Delegate. Delegate some or all owned permissions to another subject. You need this permission to change access control on an object or resource. To delegate a permission on a specific resource, the delegating subject must have the specific permission (copy permission, for example) to be delegated. The delegating subject also has to have the delegate permission for the specific resource and to the intended recipient of the resource.*

The objects controlled by the portal access control can be of the following types: PORTLET, PAGE, PLACE, CREDENTIAL, PORTAL, RESOURCE_COLLECTION, PORTLET_APPLICATION, ANONYMOUS_USER, USER (authenticated user) and USER-GROUP.

Examples of access control rules:

User:MILLERJ Edit Portlet:World Cup Results

Group:Dept-3269 View Page:3269 Team News

The portal doesn't define any hard-coded group names like "administrators." An administrator with the authorization to create and change all permissions is a user or group that has the permission manage for the special resource "Portal." Using the permission to delegate, it's possible to establish a hierarchy of administrators to whom the specific permissions for individual resources and user groups have been delegated. For example, it is possible to establish country administrators who can control the permissions to all specific resources for their country and who can, in turn, forward part of the permissions to city administrators in their country.

Maintaining portal security

Your portlet developers are charged with keeping sensitive data safe. And they can't afford to allow potentially vulnerable areas of your portal system to be left unprotected. Even with built-in portal server security features, there are risks. The portal engine can't, by itself, protect against malicious portlets. Your administrators are responsible for installing only trusted portlets.

Some portlets require secure connections. You need to guarantee the data that portlets send is kept confidential. If the portal is enabled to serve pages through SSL, portlets can initiate an SSL connection (with a start transaction link). However, for each request, the portlet has to check whether the connection is still secure. This verification can be done with the `request.isSecure()` method. If a request does not come over a secure connection, the portlet must not write confidential data to the output stream.

Some portlets accept data from any user and pass those data on to a different user. If the portlet does not take special precautions to guard against malicious input, the receiving user's application (their Web browser) might process that data with unfavorable results. This is known as a "cross-site-scripting attack" because inputted malicious source is usually executed as scripting language by the receiving user. In order to prevent such attacks, the portal engine filters all input and converts the less-than (<) and greater-than (>) characters to the respective HTML escape sequences.

A similar problem can arise when a portlet aggregates markup language code from a third-party server – for example, with a clipping portlet. Unfortunately, the portal engine isn't able to filter markup commands accurately and can't offer protection. That means your portlet developers have to make sure that potentially malicious markup is filtered out of the aggregated data.

Summary

WebSphere Portal offers state-of-the-art protection through industry-standard security protocols and cryptographic algorithms. Single sign-on capability at the portal front-end and for back-end applications provides a superior user experience. The portal server can be flexibly integrated with existing corporate user directories and with products for authentication, authorization and administration. In addition to password-based authentication, stronger methods like X.509 certificates or one-time passwords (with WebSEAL) are supported. Secure communication can be used wherever the transmitted information is sensitive.

For more information

To learn more about IBM WebSphere Portal, Version 4.1 visit **ibm.com/websphere/portal**.



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- ¹ For more information, read the IBM WebSphere Application Server, Version 4.0 security overview.
- ² For more information, read "WebSphere Portal Server, Version 4.1 and Portlets," available at ibm.com/websphere/portal.
- ³ Read the white paper, "WebSphere Portal Server, Version 4.1 and Web services," available at ibm.com/websphere/portal.
- ⁴ For more information, read the IBM Redbooks®, "IBM WebSphere Application Server, Version 4.0 Advanced Edition Security" (SG24-6520-00).
- ⁵ Plugging into WebSphere Edge Server offers scalability advantages.
- ⁶ For devices that cannot manage cookies (like WAP phones), proxy gateways are used to handle cookies.
- ⁷ For JAAS documentation and specifications, visit www.jaas.sun.com/products/jaas/.
- ⁸ HTTP basic authentication has a known disadvantage: The browser always sends user ID and password with every request to the same target. Because there is no standardized mechanism through which the browser will be notified of the user's logout, the browser will continue to implicitly log in the user as soon as the same target is accessed again.
- ⁹ WebSphere Portal, Version 4.1 installs with one preconfigured, user-managed vault segment and does not allow defining any additional user-managed segments. Administrator-managed vault segments can be created without any limitation.
- ¹⁰ IBM has a cryptographic coprocessor (IBM 4758PCI) to store the private key and execute the cryptographic functions. This module is designed to meet the FIPS PUB 140-1 level 4 specification. The card keeps the server's private keys securely (any data tampering will be recognizable) and executes encryption algorithms. The private keys do not leave the card.
- ¹¹ While TLS is the standard implementation, SSL is still more widely distributed. In this document, when SSL is used, TLS is implied.
- ¹² Read "SSL/TLS in WebSphere: Usage, Configuration, and Performance," available at www7b.software.ibm.com/wsdd/library/summaries/300257.html.