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Preface

What is Covered in this Book
This book is a guide to administering and programming secure applications in Orbix, covering both secure CORBA applications.

The Orbix security framework provides the underlying security infrastructure for performing authentication and authorization.

Who Should Read this Book
This guide is intended for the following audience:

• Security administrators.
• CORBA C++ developers.
• CORBA Java developers.

A prior knowledge of CORBA is assumed.

Organization of this guide
This guide is divided into the following parts:

Part I “Introducing Security”
This part describes how TLS provides security, and how Orbix works.

Part II “Orbix Security Framework Administration”
This part describes how to administer the Orbix Security Framework.

Part III “SSL/TLS Administration”
This part explains how to configure and manage Orbix in detail.

Part IV “CSIv2 Administration”
This part explains how to configure and manage CSIv2 in detail.
Part V  “CORBA Security Programming”
This part explains how to program the SSL/TLS and CSIv2 APIs in your security-aware CORBA applications.

Appendices
The appendices list further technical details.

Related Documentation
The CORBA Programmer’s Guide and CORBA Programmer’s Reference provide details about developing Orbix applications in C++ and Java.

The complete set of documentation for Orbix is available online at:
http://www.iona.com/support/docs/orbix/6.3/index.xml

The latest updates to the Orbix documentation can be found at http://www.iona.com/support/docs/index.xml.
Additional Resources for Information
The Orbix knowledge base (http://www.iona.com/support/kb/index.jspa) contains helpful articles, written by Orbix experts, about Orbix and other products.


Typographical Conventions
This book uses the following typographical conventions:

**Constant width**
Constant width (courier font) in normal text represents portions of code and literal names of items such as classes, functions, variables, and data structures. For example, text might refer to the CORBA::Object class.

Constant width paragraphs represent code examples or information a system displays on the screen. For example:

```c
#include <stdio.h>
```

**Italic**
Italic words in normal text represent emphasis and new terms.

Italic words or characters in code and commands represent variable values you must supply, such as arguments to commands or path names for your particular system. For example:

```
% cd /users/your_name
```

**Note:** Some command examples may use angle brackets to represent variable values you must supply. This is an older convention that is replaced with italic words or characters.
Keying Conventions
This book uses the following keying conventions:

No prompt          When a command’s format is the same for multiple platforms, a prompt is not used.

%                   A percent sign represents the UNIX command shell prompt for a command that does not require root privileges.

#                   A number sign represents the UNIX command shell prompt for a command that requires root privileges.

>                   The notation > represents the DOS, Windows NT, Windows 95, or Windows 98 command prompt.

...                  Horizontal or vertical ellipses in format and syntax descriptions indicate that material has been eliminated to simplify a discussion.

[]                  Brackets enclose optional items in format and syntax descriptions.

{}                  Braces enclose a list from which you must choose an item in format and syntax descriptions.

|                   A vertical bar separates items in a list of choices enclosed in {} (braces) in format and syntax descriptions.
Part I
Introducing Security

This part contains the following chapters:

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Getting Started with Security

This chapter focuses on getting some security demonstrations up and running quickly. The details and background of the various security features are not discussed at this stage.

In this chapter

This chapter discusses the following topics:

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Creating a Secure Domain

Overview

This section describes how to create a secure configuration domain, `secure`, which is required for the security demonstrations. This domain deploys a minimal set of Orbix services.

**WARNING:** The secure domain created using this procedure is *not* fully secure, because the X.509 certificates used in this domain are insecure demonstration certificates. This secure domain *must* be properly customized before deploying in a production environment.

Prerequisites

Before creating a secure domain, the following prerequisites must be satisfied:

- Your license allows you to use the security features of Orbix.
- Some basic system variables are set up (in particular, the `IT_PRODUCT_DIR`, `IT_LICENSE_FILE`, and `PATH` variables).

For more details, please consult the *Installation Guide*.

Licensing

The location of the license file, `licenses.txt`, is specified by the `IT_LICENSE_FILE` system variable. If this system variable is not already set in your environment, you can set it now.

Steps

To create a secure configuration domain, `secure`, perform the following steps:

1. Run `itconfigure`.
2. Choose the domain type.
3. Specify service startup options.
4. Specify security settings.
5. Specify fault tolerance settings.
6. Select services.
7. Confirm choices.
8. Finish configuration.
To begin creating a new configuration domain, enter `itconfigure` at a command prompt. An **Orbix Configuration Welcome** dialog box appears, as shown in **Figure 1**.

Select **Create a new domain** and click **OK**.

**Figure 1:** *The Orbix Configuration Welcome Dialog Box*
Choose the domain type

A **Domain Type** window appears, as shown in Figure 2.

In the **Configuration Domain Name** text field, type `secure`. Under **Configuration Domain Type**, click the **Select Services** radiobutton.

Click **Next>** to continue.

**Figure 2: The Domain Type Window**
Specify service startup options

A Service Startup window appears, as shown in Figure 3. You can leave the settings in this Window at their defaults. Click Next> to continue.

Figure 3: The Service Startup Window
Specify security settings

A Security window appears, as shown in Figure 4.

Under Transports, click the Secure Communication (TLS/HTTPS) radiobutton. Under Security Features, select the IONA Security Service option and the Enable Access Control for Core Services option.

Click Next> to continue.

Figure 4: The Security Window
Specify fault tolerance settings

A Fault Tolerance window appears, as shown in Figure 5. You can leave the settings in this Window at their defaults. Click Next> to continue.

Figure 5: The Fault Tolerance Window
A **Select Services** window appears, as shown in Figure 6.

In the Select Services window, select the following services and components for inclusion in the configuration domain: **Location**, **Node daemon**, **Management**, **CORBA Interface Repository**, **CORBA Naming**, **IONA Security**, and **demos**.

Click **Next** to continue.

**Figure 6**: *The Select Services Window*
Confirm choices

You now have the opportunity to review the configuration settings in the Confirm Choices window, Figure 7. If necessary, you can use the <Back button to make corrections.

Click Next> to create the secure configuration domain and progress to the next window.

Figure 7: The Confirm Choices Window
Finish configuration

The `itconfigure` utility now creates and deploys the secure configuration domain, writing files into the `OrbixInstallDir/etc/bin`, `OrbixInstallDir/etc/domain`, `OrbixInstallDir/etc/log`, and `OrbixInstallDir/var` directories.

If the configuration domain is created successfully, you should see a Summary window with a message similar to that shown in Figure 8. Click Finish to quit the `itconfigure` utility.

**Figure 8: Configuration Summary**
Running a Secure CORBA Demonstration

Overview
This section describes how to run the secure CORBA demonstration, which is a three-tier application that illustrates the SSL/TLS, username/password authentication, and identity assertion features.

Prerequisites
Before running this demonstration, you must have created a secure configuration domain—see “Creating a Secure Domain” on page 4.

Demonstration location
The secure CORBA demonstration is located in the following directory:
\texttt{ASPIinstallDir/asp/Version/demos/common/is2}
Where \texttt{ASPIinstallDir} is the directory where Orbix is installed.

Demonstration overview
Figure 9 gives an overview of the secure CORBA demonstration.

\textbf{Figure 9:} \textit{CORBA Secure Demonstration Overview}

Steps
To build and run the secure CORBA demonstration, perform the following steps:
1. Build the demonstration.
2. Start the Orbix services.
3. Run the target server.
4. Run the intermediate server.
5. Run the client.

Build the demonstration
To build the demonstration, open a new command prompt and enter the following commands:

Windows
> `ASPInstallDir\etc\bin\secure_env.bat`
> `cd ASPInstallDir\asp\Version\demos\common\is2`
> `itant`

UNIX
% `ASPInstallDir/etc/bin/secure_env.sh`
% `cd ASPInstallDir/asp/Version/demos/common/is2`
% `itant`

Start the Orbix services
To start the Orbix services, enter the following command at the command prompt:

Windows
> `ASPInstallDir\etc\bin\start_secure_services.bat`

UNIX
% `ASPInstallDir/etc/bin/start_secure_services`

Run the target server
To run the target server, open a new command prompt and enter the following commands:

Windows and J2SE (JDK) 1.3.x
> `ASPInstallDir\etc\bin\secure_env.bat`
> `cd ASPInstallDir\asp\Version\demos\common\is2`
> `java -classpath .\java\classes;\%CLASSPATH\% is2.Server`

Windows and J2SE (JDK) 1.4.x
> `ASPInstallDir\etc\bin\secure_env.bat`
> `cd ASPInstallDir\asp\Version\demos\common\is2`
> `java -Djava.endorsed.dirs="ASPInstallDir\lib\art\\omg\5" -classpath .\java\classes;\%CLASSPATH\% is2.Server`

UNIX and J2SE (JDK) 1.3.x
% `ASPInstallDir/etc/bin/secure_env.sh`
% `cd ASPInstallDir/asp/Version/demos/common/is2`
% java -classpath ./java/classes:$CLASSPATH is2.Server

UNIX and J2SE (JDK) 1.4.x
% . ASPInstallDir/etc/bin/secure_env.sh
% cd ASPInstallDir/asp/Version/demos/common/is2
% java -Djava_endorsed.dirs=ASPInstallDir/lib/art/omg/5 -classpath
  ./java/classes:$CLASSPATH is2.Server

Run the intermediate server
To run the intermediate server, open a new command prompt and enter the following commands:

Windows and J2SE (JDK) 1.3.x
> ASPInstallDir\etc\bin\secure_env.bat
> cd ASPInstallDir\asp\Version\demos\common\is2
> java -classpath .\java\classes;"%CLASSPATH%"
  is2.IntermediateServer

Windows and J2SE (JDK) 1.4.x
> ASPInstallDir\etc\bin\secure_env.bat
> cd ASPInstallDir\asp\Version\demos\common\is2
> java -Djava_endorsed.dirs="ASPInstallDir\lib\art\omg\5"
  -classpath .\java\classes;"%CLASSPATH%" is2.IntermediateServer

UNIX and J2SE (JDK) 1.3.x
% . ASPInstallDir/etc/bin/secure_env.sh
% cd ASPInstallDir/asp/Version/demos/common/is2
% java -classpath ./java/classes:$CLASSPATH is2.IntermediateServer

UNIX and J2SE (JDK) 1.4.x
% . ASPInstallDir/etc/bin/secure_env.sh
% cd ASPInstallDir/asp/Version/demos/common/is2
% java -Djava_endorsed.dirs=ASPInstallDir/lib/art/omg/5 -classpath
  ./java/classes:$CLASSPATH is2.IntermediateServer

Note: The intermediate server must run in the same directory as the target server.

Run the client
To run the client, open a new command prompt and enter the following commands:

Windows and J2SE (JDK) 1.3.x
> ASPInstallDir\etc\bin\secure_env.bat
> cd ASPInstallDir\asp\Version\demos\common\is2
> java -classpath .\java\classes;"%CLASSPATH%" is2.Client -user alice

**Windows and J2SE (JDK) 1.4.x**

> ASPInstallDir\etc\bin\secure_env.bat
> cd ASPInstallDir\asp\Version\demos\common\is2
> java -Djava_endorsed.dirs="ASPInstallDir\lib\art\omg\5"
> -classpath .\java\classes;"%CLASSPATH%" is2.Client -user alice

**UNIX and J2SE (JDK) 1.3.x**

% . ASPInstallDir/etc/bin/secure_env.sh
% cd ASPInstallDir/asp/Version/demos/common/is2
% java -classpath ./java/classes:$CLASSPATH is2.Client -user alice

**UNIX and J2SE (JDK) 1.4.x**

% . ASPInstallDir/etc/bin/secure_env.sh
% cd ASPInstallDir/asp/Version/demos/common/is2
% java -Djava_endorsed.dirs=ASPInstallDir/lib/art/omg/5 -classpath
> ./java/classes:$CLASSPATH is2.Client -user alice

**Note:** The client must run in the same directory as the target and intermediate servers.
Debugging with the openssl Utility

Overview
The **openssl** utility included with Orbix provides two powerful tools for debugging SSL/TLS client and server applications, as follows:

- **openssl s_client**—an SSL/TLS test client, which can be used to test secure Orbix servers. The test client can connect to a secure port, while providing a detailed log of the steps performed during the SSL/TLS handshake.

- **openssl s_server**—an SSL/TLS test server, which can be used to test secure Orbix clients. The test server can simulate a bare bones SSL/TLS server (handshake only). Additionally, by supplying the `-WWW` switch, the test server can also simulate a simple secure Web server.

References
For complete details of the **openssl s_client** and the **openssl s_server** commands, see the following OpenSSL documentation pages:

- [http://www.openssl.org/docs/apps/s_client.html](http://www.openssl.org/docs/apps/s_client.html)
- [http://www.openssl.org/docs/apps/s_server.html](http://www.openssl.org/docs/apps/s_server.html)

Debugging example
Consider the **is2** demonstration discussed in the previous section, “Running a Secure CORBA Demonstration” on page 13. This demonstration consists of a client, an intermediate server and a target server.

To demonstrate SSL debugging, you can use the **openssl** test client to connect directly to the target server.

Debugging steps
The following table shows the steps required to debug a secure server by connecting to that server using the **openssl** test client:

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<th>Action</th>
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<tr>
<td>2</td>
<td>Run the target server.</td>
</tr>
<tr>
<td>3</td>
<td>Obtain the target server’s IP port.</td>
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CHAPTER 1 | Getting Started with Security

**Convert the client certificate to PEM format**

Certificates for Orbix applications are deployed in PKCS#12 format, whereas the `openssl` test client requires the certificate to be in PEM format (a format that is proprietary to OpenSSL). It is, therefore, necessary to convert the client certificate to the PEM format.

For example, given the certificate `admin.p12` (located in the `OrbixInstallDir/asp/Version/etc/tls/x509/certs/demos` directory), you can convert the certificate to PEM format as follows.

1. Run the `openssl pkcs12` command, as follows:
   ```
   openssl pkcs12 -in admin.p12 -out admin.pem
   ```
   When you run this command you are prompted to enter, first of all, the pass phrase for the `admin.p12` file and then to enter a pass phrase for the newly created `admin.pem` file.

2. The `admin.pem` file generated in the previous step contains a CA certificate, an application certificate, and the application certificate’s private key. Before you can use the `admin.pem` file with the `openssl` test client, however, you must remove the CA certificate from the file. That is, the file should contain only the application certificate and its private key.

   For example, after deleting the CA certificate from the `admin.pem` file, the contents of the file should look something like the following:

```
Bag Attributes
   localKeyID: 6A F2 11 9B A4 69 16 3C 3B 08 32 87 A6 7D 7C 91 C1 E1 FF 4A
   friendlyName: Administrator
   subject=/C=US/ST=Massachusetts/O=ABigBank -- no warranty -- demo purposes/OU=Administration/CN=Administrator/emailAddress=admin@bigbank.com
   issuer=/C=US/ST=Massachusetts/L=Boston/O=ABigBank -- no warranty -- demo purposes/OU=Demonstration Section -- no warranty
   --/CN=ABigBank Certificate
   Authority/emailAddress=info@bigbank.com
   ------BEGIN CERTIFICATE-----
   MIIEiTCCA/KgAwIBAgIBATANBgkqhkiG9w0BAQQQFADCB5jELMAkGA1UEBhMCVVMx
   FjAUBgNVBAgTDU1hc3NhY2h1c2VydEBAczAnBgkqhkjha1YggbjJpcG8h
   FjAUBgNVBAMTQ2NyaWNhcm9wcywzNzEwMBcGCCsGAQUFBzAChjoIADBw
   ChMoQQUJpZ0Jhbm9sb3NjL0Jhc3NhY2h1c2VydEBAczAnBgkqhkjha1Y
   ------END CERTIFICATE-----
```

4. Run the test client.
Bag Attributes

  localKeyID: 6A F2 11 9B A4 69 16 3C 3B 08 32 87 A6 7D 7C 91
  C1 E1 FF 4A

  friendlyName: Administrator

Key Attributes: <No Attributes>

-----BEGIN RSA PRIVATE KEY-----
Proc-Type: 4, ENCRYPTED
DEK-Info: DES-EDE3-CBC, AD8F864A0E97FB4E

-----END RSA PRIVATE KEY-----
Run the target server

Run the target server, as described in “Running a Secure CORBA Demonstration” on page 13.

Obtain the target server’s IP port

In this demonstration, the server writes an IOR file, `target_server.ior`, to the `OrbixInstallDir/asp/Version/demos/common/is2` directory as it starts up. You can extract the target server’s IP port from this IOR file using the `iordump` utility.

From a command prompt, use the `iordump` utility to parse the `target_server.ior` file as follows:

```
iordump target_server.ior
```

This dumps the parsed contents of the IOR to the console window. The relevant portion of the output is the `SSL_SEC_TRANS` tagged component, which looks something like the following:

```
Component 1:
  >> +108 [00][00][00][14]     Tag: (20) SSL_SEC_TRANS
  >> +112 [00][00][00][08]     Component length: 8 bytes
  >> +116 [00]                 Component Byte Order: (0) Big Endian
  >> +117 [00] (padding)
  >> +118 [00][7e]             Target supports: Integrity Confidentiality
                             DetectReplay DetectMisordering EstablishTrustInTarget
                             EstablishTrustInClient
  >> +120 [00][5e]             Target requires: Integrity Confidentiality
                             DetectReplay DetectMisordering EstablishTrustInClient
  >> +122 [0b][8b]             SSL port: 2955
```

In this example, the target server’s IP port is 2955.

Run the test client

To run the `openssl` test client, open a command prompt, change directory to the directory containing the `admin.pem` file, and enter the following command:

```
openssl s_client -connect localhost:2955 -ssl3 -cert admin.pem
```
When you enter the command, you are prompted to enter the pass phrase for the admin.pem file.

The **openssl s_client** command switches can be explained as follows:

- **-connect host:port**

  Open a secure connection to the specified host and port.

- **-ssl3**

  This option configures the client to initiate the handshake using SSL v3 (the default is SSL v2). To see which SSL version (or versions) the target server is configured to use, check the value of the `policies:mechanism_policy:protocol_version` variable in the Orbix configuration file. Orbix servers can also be configured to use TLS v1, for which the corresponding **openssl** command switch is **-tls1**.

- **-cert admin.pem**

  Specifies admin.pem as the test client’s own certificate. The PEM file should contain only application certificate and the application certificate’s private key. The PEM file should *not* contain a complete certificate chain. If your server is not configured to require a client certificate, you can omit the **-cert** switch.

**Other command switches**

The **openssl s_client** command supports numerous other command switches, details of which can be found on the OpenSSL document pages (see “References” on page 17). Two of the more interesting switches are **-state** and **-debug**, which log extra details to the command console during the handshake.
## Where do I go from here?

### Overview
To help you get started in the wide-ranging field of security, you might find it helpful to focus on one of the following fundamental tasks:

- I want to customize the sample domain to make it fully secure.
- I want to security-enable a CORBA application.
- I want to write a security-aware CORBA application.
- I want to integrate a third-party enterprise security system.
- I want to replace the default SSL/TLS toolkit.

### I want to customize the sample domain to make it fully secure
The sample configuration domains generated by the `itconfigure` utility are *not* fully secure, because the X.509 certificates used by the Orbix services are insecure demonstration certificates. To perform basic customization of a secure configuration domain, see the following reference:

- “Securing Orbix Services” on page 203.

### I want to security-enable a CORBA application
To security-enable a CORBA application, see the following reference:

- “Securing CORBA Applications” on page 61.

### I want to write a security-aware CORBA application
To write a security-aware CORBA application, see the following references:

- “Programming Policies” on page 455.
- “Authentication” on page 469.
- “Validating Certificates” on page 511.

### I want to integrate a third-party enterprise security system
The Orbix Security Framework provides a facility for integrating with third-party enterprise security systems, such as LDAP, through a pluggable system of security adapters. For details of how this works, see the following reference:

- “Configuring the Orbix Security Service” on page 137.

For details of how to write your own custom adapter, see the following reference:

- “Developing an iSF Adapter” on page 531.
I want to replace the default SSL/TLS toolkit

By default, Orbix uses the SSL/TLS toolkit from Baltimore Technologies. Orbix’s SSL/TLS toolkit replaceability feature enables you to replace the underlying SSL/TLS toolkit used by an Orbix application.

**Note:** The Baltimore toolkit is deprecated from Orbix 6.3 SP4 onwards and will be removed from later releases of Orbix. It is recommended that you migrate C++ applications to the OpenSSL toolkit and that you migrate Java applications to the JSSE toolkit.

For details, see the following chapter:

- “Choosing an SSL/TLS Toolkit” on page 277.
Orbix Security Framework

The Orbix Security Framework provides the common underlying security framework for all types of applications in Orbix, including CORBA and Web services applications. This chapter provides an introduction to the main features of the iSF.

In this chapter

This chapter discusses the following topics:

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Introduction to the iSF

Overview
This section provides a brief overview of and introduction to the Orbix Security Framework, which provides a common security framework for all components of Orbix.

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iSF Features

Overview

The Orbix Security Framework is a scalable, standards-based security framework with the following features:

- Pluggable integration with third-party enterprise security systems.
- Out-of-the-box integration with flat file, or LDAP security systems.
- Centralized management of user accounts.
- Role-Based Access Control.
- Role-to-permission mapping supported by access control lists.
- Unified security platform works across CORBA and Web services.
- Security platform is ART-based.
- Logging.
Example of an iSF System

Overview

Figure 10 shows an example of an iSF system that features a standalone Orbix security service, which can service remote requests for security-related functions.

Figure 10: Example System with a Standalone Orbix Security Service

Orbix security service

The Orbix security service is the central component of the Orbix Security Framework, providing an authentication service, an authorization service and a repository of user information and credentials. When the Orbix security service is deployed in standalone mode, all kinds of application, including CORBA applications and Web services, can call it remotely.
Enterprise security service

The Orbix security service is designed to integrate with a third-party enterprise security service (ESS), which acts as the primary repository for user information and credentials. Integration with an ESS is supported by a variety of iSF adapters. The following adapters are currently supported by iSF:

• LDAP adapter.

The following adapter is provided for use in simple demonstrations (but is not supported in production environments):

• File adapter.

In addition, it is possible to build your own adapters using the iSF Adapter SDK—see “iSF Server Development Kit” on page 34.

Propagating security credentials

The example in Figure 10 on page 28 assumes that a user’s credentials can be propagated from one application to another. There are fundamentally two different layers that can propagate security credentials between processes in an iSF distributed system:

• Transport layer.
• Application layer.

Transport layer

Security at the transport layer enables security information to be exchanged during the security handshake, which happens while the connection is being established. For example, the SSL/TLS standard enables X.509 certificates to be exchanged between a client and a server during a security handshake.

Application layer

Security at the application layer enables security information to be propagated after connection establishment, using a protocol layered above the transport. For example, the CORBA common secure interoperability v2.0 (CSIv2) protocol propagates security information by embedding security data in IIOP messages, which are layered above TCP/IP.

The CSIv2 protocol can be used to propagate any of the following kinds of credential:

• Username/password/domain.
• Username only.
• Single sign-on (SSO) token.
Security Standards

Overview

One of the goals of the iSF is to base the security framework on established security standards, thereby maximizing the ability of iSF to integrate and interoperate with other secure systems. This section lists the security standards currently supported by the iSF.

Standards supported by iSF

The following security standards are supported by iSF:

- HTTP login mechanisms—that is, HTTP basic authentication and HTTP form-based authentication.
- Secure Sockets Layer / Transport Layer Security (SSL/TLS), from the Internet Engineering Task Force, which provides data security for applications that communicate across networks.
- CCITT X.509, which governs the form of security certificates based on public (asymmetric) key systems
- OMG Common Secure Interoperability specification (CSIv2)
- WS-Security, which a proposed standard from Microsoft, IBM, and VeriSign. It defines a standard set of SOAP extensions, or message headers, that can be used to implement integrity and confidentiality in Web services applications.
- Java Authentication and Authorization Service (JAAS)
Orbix Security Service

Overview

The Orbix security service is the central component of the Orbix Security Framework. This section provides an overview of the main Orbix security service features.

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## Orbix Security Service Architecture

### iSF client API
The GSP plug-in accesses the Orbix security service through the iSF client API, which is a private Orbix-proprietary API. This API exposes general security operations, such as authenticating a username and password, retrieving a user’s roles, and so on. Two language versions of the iSF client API are used internally by Orbix:
- C++.
- Java.

### Remote connections to the Orbix security service
Orbix plug-ins can communicate with the Orbix security service through an IIOP/TLS connection.

### Standalone or embedded deployment
The *isf server module* can be packaged in the following different ways:
- Standalone deployment (default)—the iSF server module is packaged as a standalone server process, the *Orbix security service*, that services requests through a CORBA interface (IIOP or IIOP/TLS).
- Embedded deployment—the iSF server module is packaged as a JAR library that can be loaded directly into a Java application. In this case, service requests are made as local calls.

### iSF adapter API
Integration with third-party enterprise security systems is facilitated by the *iSF adapter API* that enables the Orbix security service to delegate security operations to other security systems.

### iSF adapters
Orbix provides several ready-made adapters that are implemented with the iSF adapter API. The following adapters are available:
- LDAP adapter.
- File adapter (demonstration only—not supported in production environments).
Optional iSF components

The Orbix security service includes the following optional components that can be enabled to provide additional security features:

- Single sign-on.

Single sign-on

Single sign-on means that once an application has authenticated a particular user, it is relatively easy for other secure applications to access that user’s security data.

When single sign-on is enabled, the Orbix security service creates an association between an SSO token and a user session. Any application that has the user’s SSO token can then use it to access the user’s session data.
# iSF Server Development Kit

| **Overview** | The iSF server development kit (SDK) enables you to implement custom extensions to the iSF. The iSF SDK is divided into the following parts:  
| | • iSF adapter SDK.  
| | • iSF client SDK. |

| **iSF adapter SDK** | The iSF adapter SDK provides an API implementing custom iSF adapters. Using this API, you can integrate any enterprise security system with the iSF. This API is available in both C++ and Java. |

| **iSF client SDK** | The iSF client SDK provides an API for Orbix to access the iSF server module’s core functionality directly (usually through remote calls).  
| | *This is a private API intended only for internal use by Orbix.* |
Secure Applications

Overview
This section explains how applications from various technology domains are integrated into the Orbix Security Framework.

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# ART Security Plug-Ins

## Overview
To participate in the Orbix Security Framework, applications load one or more of the ART security plug-ins. Because Orbix is built using a common ART platform, an identical set of security plug-ins are used across the different technology domains of CORBA and Web services. This has the advantage of ensuring maximum security compatibility between these different technology domains.

## What is ART?
Orbix’s Adaptive Runtime Technology (ART) is a modular framework for constructing distributed systems, based on a lightweight core and an open-ended set of plug-ins. ART is the underlying technology in Orbix.

## Security plug-ins
An application can load any of the following security plug-ins to enable particular security features and participate in the Orbix Security Framework:

- **IIOP/TLS.**
- **HTTPS.**
- **CSIv2.**
- **GSP.**

## IIOP/TLS
The IIOP/TLS plug-in provides applications with the capability to establish secure connections using IIOP over a TLS transport. Authentication is also performed using X.509 certificates. For example, this plug-in is used by CORBA applications.

## HTTPS
The HTTPS plug-in provides the capability to establish secure connections using HTTP over a TLS transport. Authentication is also performed using X.509 certificates. For example, this plug-in is used by the Web container to enable secure communications with Web clients.

## CSIv2
The Common Secure Interoperability (CSIv2) plug-in provides support for authentication based on a username and password. The CSIv2 plug-in also enables applications to forward usernames or security tokens to other applications over an IIOP or IIOP/TLS connection.
The GSP plug-in provides an authorization capability for the iSF—that is, the capability to restrict access to certain methods, operations, or attributes, based on the configuration values stored in an external *action-role mapping* XML file. The GSP plug-in works in tandem with the Orbix security service to realize a complete system of role-based access control.

**Note:** The GSP plug-in depends on the CSIv2 plug-in. Whenever you include the GSP plug-in, `gsp`, in your ORB plug-ins list, it automatically loads the CSIv2 plug-in, `csi`. 
Secure CORBA Applications

Overview

Figure 11 shows how the security plug-ins in a CORBA application cooperate to provide security for the application.

IIOP/TLS plug-in in CORBA a application

The IIOP/TLS plug-in enables the CORBA application to establish connections secured by SSL/TLS. This layer of security is essential for providing data encryption.

CSlv2 plug-in in a CORBA application

The CSlv2 plug-in provides CORBA applications with the following features:

- The capability to log in with a username and password.
- Screening incoming IIOP invocations by making sure that the username/password combination is correct.
- Transmission of a username/password/domain combination to other applications.
- Transmission of a username or security token to other applications.

GSP plug-in in a CORBA application

The GSP plug-in restricts access to a CORBA server’s operations and attributes, only allowing user’s with certain specified roles to proceed with an invocation.
# Administering the iSF

## Overview

This section provides an overview of the main aspects of configuring and administering the iSF.

## In this section

This section contains the following subsections:

| Overview of iSF Administration | page 40 |
| Secure ASP Services            | page 42 |
## Overview of iSF Administration

### Overview
There are several different aspects of iSF administration to consider, as follows:
- Orbix configuration file.
- iSF properties file.
- Enterprise security service administration.
- Access control lists.

### Orbix configuration file
The Orbix configuration file, `DomainName.cfg` (or, alternatively, the CFR service), is used to configure the security policies for all of the applications and services in a particular location domain. For example, the following kinds of security policy are specified in the Orbix configuration file:
- The list of security plug-ins to be loaded by an application.
- Whether an application accepts both secure and insecure connections, or secure connections only.
- The name of the iSF authorization realm to which an application belongs.
These are just some of the security policies that can be configured—see “Security” on page 553.

### iSF properties file
The iSF properties file is used to configure the core properties of the Orbix security service. This file primarily configures the properties of an iSF adapter that connects to an enterprise security backend. This file also configures the optional single sign-on and authorization manager features.

See “iS2 Configuration” on page 513 for details.

### Enterprise security service administration
Because the Orbix security service is capable of integrating with a third-party enterprise security service, you can continue to use the native third-party administration tools for your chosen enterprise security service. These tools would be used to administer user accounts, including such data as usernames, passwords, user groups, and roles.

### Access control lists
To complete a system of role-based access control, it is necessary to provide individual applications with an access control list (ACL) file that is responsible for mapping user roles to particular permissions.
For example, the ACL associated with a CORBA server could specify that only a specified set of roles are allowed to invoke a particular IDL operation.

There is one type of ACL file used within the iSF, as follows:

- Action-role mapping (proprietary format).
## Secure ASP Services

### Overview

When you create a secure location domain, all of the standard ASP services are secure by default. The default configuration can be used to test sample applications, but is not genuinely secure. Before the ASP services can be used in a real deployment, it is necessary to customize the security configuration.

### Customizing the security configuration

For a real deployment, certain aspects of the security configuration for ASP services would be customized, as follows:

- X.509 certificates associated with ASP services—the sample certificates initially associated with the ASP services must all be replaced, because they are not secure.
- Default security policies—for the ASP services might need to be changed before deployment.
Transport Layer Security

Transport Layer Security provides encryption and authentication mechanisms for your Orbix system.

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What does Orbix Provide?

| Security plug-ins | Orbix provides the core security infrastructure to a distributed system based on Orbix’s Adaptive Runtime Technology (ART). It is implemented as a symmetric set of plug-ins for Orbix (C++ and Java). When the security plug-ins are installed in an application, the communication layers consist of the CORBA standard Internet Inter-ORB Protocol (IIOP), layered above TLS and TCP/IP. |
| Transport Layer Security | Transport Layer Security (TLS) is an IETF Open Standard. It is based on, and is the successor to, Secure Sockets Layer (SSL), long the standard for secure communications. The TLS Protocol provides the most critical security features to help you preserve the privacy and integrity of your system: |
| • Authentication (based on RSA with X.509v3 certificates). |
| • Encryption (based on DES, Triple DES, RC4, IDEA). |
| • Message integrity (based on SHA1, MD5). |
| • A framework that allows new cryptographic algorithms to be incorporated into the TLS specification. |
| CORBA Security Level 2 | Orbix is based on the CORBA Security Level 2 policies and API’s (RTF 1.7). It implements a set of policies from the CORBA specification that enable you to control encryption and authentication at a fine level. |
| Added-value policies and APIs | Orbix also has added-value policies and APIs that provide more control for SSL/TLS applications than provided by CORBA Security. |
| SSL/TLS toolkit replaceability | Orbix has an SSL/TLS toolkit replaceability feature that enables you to replace completely the underlying toolkit that implements SSL/TLS in Orbix. |

Note: The Baltimore toolkit is deprecated from Orbix 6.3 SP4 onwards and will be removed from later releases of Orbix. It is recommended that you migrate C++ applications to the OpenSSL toolkit and that you migrate Java applications to the JSSE toolkit.
There are two basic approaches to using security in your applications:

- **Security-unaware applications**—Modify the Orbix configuration to enable and configure security for your application. This approach to security is completely transparent to the application, requiring no code changes or recompilation.

- **Security-aware applications**—In addition to modifying the Orbix configuration to enable security, you can customize application security using both the standard CORBA security API and the Orbix added-value APIs.
How TLS Provides Security

**Basic TLS security features**

TLS provides the following security for communications across TCP/IP connections:

- **Authentication**: This allows an application to verify the identity of another application with which it communicates.
- **Privacy**: This ensures that data transmitted between applications can not be eavesdropped on or understood by a third party.
- **Integrity**: This allows applications to detect if data was modified during transmission.

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Authentication in TLS

Public key cryptography

TLS uses Rivest Shamir Adleman (RSA) public key cryptography for authentication. In public key cryptography, each application has an associated public key and private key. Data encrypted with the public key can be decrypted only with the private key. Data encrypted with the private key can be decrypted only with the public key.

Public key cryptography allows an application to prove its identity by encoding data with its private key. As no other application has access to this key, the encoded data must derive from the true application. Any application can check the content of the encoded data by decoding it with the application’s public key.

The TLS Handshake Protocol

Consider the example of two applications, a client and a server. The client connects to the server and wishes to send some confidential data. Before sending application data, the client must ensure that it is connected to the required server and not to an impostor.

When the client connects to the server, it confirms the server identity using the TLS handshake protocol. A simplified explanation of how the client executes this handshake in order to authenticate the server is as follows:

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<tr>
<td>1</td>
<td>The client initiates the TLS handshake by sending the initial TLS handshake message to the server.</td>
</tr>
<tr>
<td>2</td>
<td>The server responds by sending its certificate to the client. This certificate verifies the server’s identity and contains the certificate’s public key.</td>
</tr>
<tr>
<td>3</td>
<td>The client extracts the public key from the certificate and encrypts a symmetric encryption algorithm session key with the extracted public key.</td>
</tr>
<tr>
<td>4</td>
<td>The server uses its private key to decrypt the encrypted session key which it will use to encrypt and decrypt application data passing to and from the client. The client will also use the shared session key to encrypt and decrypt messages passing to and from the server.</td>
</tr>
<tr>
<td>Optimized handshake</td>
<td>The TLS protocol permits a special optimized handshake in which a previously established session can be resumed. This has the advantage of not needing expensive private key computations. The TLS handshake also facilitates the negotiation of ciphers to be used in a connection.</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Client authentication</td>
<td>The TLS protocol also allows the server to authenticate the client. Client authentication, which is supported by Orbix, is optional in TLS communications.</td>
</tr>
</tbody>
</table>
Certificates in TLS Authentication

**Purpose of certificates**

A public key is transmitted as part of a certificate. The certificate is used to ensure that the submitted public key is, in fact, the public key that belongs to the submitter. The client checks that the certificate has been digitally signed by a certification authority (CA) that the client explicitly trusts.

**Certification authority**

A CA is a trusted authority that verifies the validity of the combination of entity name and public key in a certificate. You must specify trusted CAs in order to use Orbix.

**X.509 certificate format**

The International Telecommunications Union (ITU) recommendation, X.509, defines a standard format for certificates. TLS authentication uses X.509 certificates to transfer information about an application’s public key.

An X.509 certificate includes the following data:

- The name of the entity identified by the certificate.
- The public key of the entity.
- The name of the certification authority that issued the certificate.

The role of a certificate is to match an entity name to a public key.

**Access to certificates**

According to the TLS protocol, it is unnecessary for applications to have access to all certificates. Generally, each application only needs to access its own certificate and the corresponding issuing certificates. Clients and servers supply their certificates to applications that they want to contact during the TLS handshake. The nature of the TLS handshake is such that there is nothing insecure in receiving the certificate from an as-yet untrusted peer. The certificate will be checked to make sure that it has been digitally signed by a trusted CA and the peer will have to prove its identity during the handshake.
Privacy of TLS Communications

Establishing a symmetric key
Immediately after authentication, the client sends an encoded data value to the server (using the server’s public key). This unique session encoded value is a key to a symmetric cryptographic algorithm. Only the server is able to decode this data (using the corresponding private key).

Symmetric cryptography
A symmetric cryptographic algorithm is an algorithm in which a single key is used to encode and decode data. Once the server has received such a key from the client, all subsequent communications between the applications can be encoded using the agreed symmetric cryptographic algorithm. This feature strengthens TLS security.

Examples of symmetric cryptographic algorithms used to maintain privacy in TLS communications are the Data Encryption Standard (DES) and RC4.
# Integrity of TLS Communications

| Message authentication code | The authentication and privacy features of TLS ensure that applications can exchange confidential data that cannot be understood by an intermediary. However, these features do not protect against the modification of encrypted messages transmitted between applications. To detect if an application has received data modified by an intermediary, TLS adds a message authentication code (MAC) to each message. This code is computed by applying a function to the message content and the secret key used in the symmetric cryptographic algorithm. |
| Guaranteeing message integrity | An intermediary cannot compute the MAC for a message without knowing the secret key used to encrypt it. If the message is corrupted or modified during transmission, the message content will not match the MAC. TLS automatically detects this error and rejects corrupted messages. |
Obtaining Credentials from X.509 Certificates

Obtaining own credentials

This section discusses how an application’s own credentials are initially obtained from an X.509 certificate. An application’s own credentials are the credentials that the application normally uses to identify itself to other applications.

Comparison of PKCS#12 and PKCS#11

Two mechanisms for obtaining own credentials are described in this section:

- PKCS#12—credentials obtained from a PKCS#12 file.
- PKCS#11—credentials obtained from a smart card. Orbix uses the PKCS#11 interface to communicate with the smart card.

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Obtaining Certificate Credentials from a File

Creating credentials using the principal sponsor

The simplest way for a client to obtain certificate credentials is to configure an SSL/TLS principal sponsor for the client application. This principal sponsor can be initialized by editing the Orbix configuration—see “Specifying an Application’s Own Certificate” on page 371.

Creating credentials from a PKCS#12 file

Figure 12 illustrates how the principal sponsor creates credentials from a PKCS#12 file.

Figure 12: Creating Credentials for a Client Application Using PKCS#12

![Diagram of creating credentials for a client application using PKCS#12](image-url)
Steps for creating credentials

The principal sponsor automates the steps to create credentials, as follows:

1. The principal sponsor reads the client configuration file to discover which authentication method to use.

2. If the authentication method is PKCS#12, the principal sponsor obtains the pass phrase to decrypt the client’s certificate chain and private key. The pass phrase is obtained either by running a login utility that prompts the user for the pass phrase, or by reading the client configuration file—see “Providing a Certificate Pass Phrase” on page 376.

3. The principal sponsor requests the principal authenticator to generate credentials for the client by invoking the authenticate() operation, passing the following data as parameters:
   - Pass phrase,
   - PKCS#12 file name.

4. The principal authenticator loads the PKCS#12 file to obtain the client identity. The PKCS#12 file contains an encrypted X.509 certificate chain and an encrypted private key.

5. If the authentication step is successful, the principal authenticator creates an own credentials object, of SecurityLevel2::Credentials type. The own credentials object is cached in memory along with its private key.
Obtaining Credentials from X.509 Certificates

How PKCS#12 credentials are used in an SSL/TLS handshake

Figure 13 illustrates how PKCS#12 credentials are used during an SSL/TLS handshake, showing only the portion of the handshake where the server verifies the client’s identity.

Figure 13: Using PKCS#12 Credentials to Authenticate a Client to a Server

PKCS#12 handshake steps

During an SSL/TLS handshake, the client authenticates itself to the server as follows:

1. At a certain point during the SSL/TLS handshake, the client sends an X.509 certificate chain (which has been cached in an own credentials object) to the server.
2. The server sends a challenge message, encrypted using the client’s public key.
3. The client uses the private key (cached in memory) to decrypt the challenge message.
4. Having successfully answered the server challenge, the client proceeds to the next stage of the handshake (not shown).
Obtaining Certificate Credentials from a Smart Card

Creating credentials using the PKCS#11 interface

Figure 14 illustrates how the SSL/TLS principal sponsor creates certificate credentials using the PKCS#11 interface—see “Specifying an Application’s Own Certificate” on page 371.

**Figure 14: Creating Credentials for a Client Application Using PKCS#11**

![Diagram showing the process of obtaining certificate credentials from a smart card.](image)
Steps for creating credentials

The principal sponsor automates the steps to create credentials, as follows:

1. The principal sponsor reads the client configuration file to discover which authentication method to use.

2. If the authentication method is PKCS#11, the principal sponsor obtains the smart card’s PIN to gain access to the smart card. The PIN is obtained either by running a login utility that prompts the user for the PIN, or by reading the client configuration file—see “Providing a Smart Card PIN” on page 380.

3. The principal sponsor requests the principal authenticator to generate credentials for the client by invoking the authenticate() operation, passing the following data:
   - Provider name,
   - Slot number,
   - PIN or pass phrase.

4. The principal authenticator communicates with the smart card using the PKCS#11 interface to obtain the client identity. The principal authenticator uploads only the X.509 certificate chain. The private key is left on the smart card.

5. If the authentication step is successful, the principal authenticator creates an own credentials object, of SecurityLevel2::Credentials type. The own credentials object is cached in memory but its private key is not stored in memory.
How PKCS#11 credentials are used in an SSL/TLS handshake

Figure 15 illustrates how PKCS#11 credentials are used during an SSL/TLS handshake, showing only the portion of the handshake where the server verifies the client’s identity.

**Figure 15: Using PKCS#11 Credentials to Authenticate a Client to a Server**

PKCS#11 handshake steps

During an SSL/TLS handshake, the client authenticates itself to the server as follows:

1. At a certain point during the SSL/TLS handshake, the client sends an X.509 certificate chain (which has been cached in an own credentials object) to the server.
2. The server sends a challenge message, encrypted using the client’s public key.
3. The client delegates the challenge message to the smart card, using the PKCS#11 interface. The smart card uses the appropriate private key to decrypt the challenge message. Because the smart card has a built-in processor, it is able to perform the private key calculations in place. The private key never leaves the smart card.
4. Having successfully answered the server challenge, the client proceeds to the next stage of the handshake (not shown).

**Note:** At no point during the handshake is the smart card’s private key loaded into memory.
Securing CORBA Applications

This chapter describes how to enable security in the context of the Orbix Security Framework for CORBA applications and services.

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Overview of CORBA Security

Overview

There are two main components of security for CORBA applications: IIOP over SSL/TLS (IIOP/TLS), which provides secure communication between client and server; and the iSF, which is concerned with higher-level security features such as authentication and authorization.

The following combinations are recommended:

- IIOP/TLS only—for a pure SSL/TLS security solution.
- IIOP/TLS and iSF—for a highly scalable security solution, based on username/password client authentication.

CORBA applications and iSF

Figure 16 shows the main features of a secure CORBA application in the context of the iSF.

Figure 16: A Secure CORBA Application within the iSF
<table>
<thead>
<tr>
<th>Security plug-ins</th>
<th>Within the iSF, a CORBA application becomes fully secure by loading the following plug-ins:</th>
</tr>
</thead>
</table>
|                   | • IIOP/TLS plug-in  
|                   | • CSIv2 plug-in  
|                   | • GSP plug-in  |

**IIOP/TLS plug-in**

The IIOP/TLS plug-in, `iiop_tls`, enables a CORBA application to transmit and receive IIOP requests over a secure SSL/TLS connection. This plug-in can be enabled independently of the other two plug-ins.

See “Securing Communications with SSL/TLS” on page 64 for details on how to enable IIOP/TLS in a CORBA application.

**CSIv2 plug-in**

The CSIv2 plug-in, `csi`, provides a client authentication mechanism for CORBA applications. The authentication mechanism is based on a username and a password. When the CSIv2 plug-in is configured for use with the iSF, the username and password are forwarded to a central Orbix security service to be authenticated. This plug-in is needed to support the iSF.

**GSP plug-in**

The GSP plug-in, `gsp`, provides authorization by checking a user’s roles against the permissions stored in an action-role mapping file. This plug-in is needed to support the iSF.

**Note:** The IIOP/TLS plug-in also provides a client authentication mechanism (based on SSL/TLS and X.509 certificates). The SSL/TLS and CSIv2 authentication mechanisms are independent of each other and can be used simultaneously.

**Note:** The GSP plug-in depends on the CSIv2 plug-in. Whenever you include the GSP plug-in, `gsp`, in your ORB plug-ins list, it automatically loads the CSIv2 plug-in, `csi`. 
Securing Communications with SSL/TLS

Overview

This section describes how to configure an application to use SSL/TLS security. In this section, it is assumed that your initial configuration comes from a secure location domain (generated by the `itconfigure` utility with security enabled—see “Creating a Secure Domain” on page 4).

**WARNING:** The default certificates used in the CORBA configuration samples are for demonstration purposes only and are completely insecure. You must generate your own custom certificates for use in your own CORBA applications.

Configuration samples

If a location domain, `DomainName`, is generated with security enabled and demonstration configurations enabled, the domain will include several sample configurations that can be used as templates for configuring SSL/TLS. Within the default domain configuration (either in the `DomainName.cfg` file or in the CFR service), you can find the following sample SSL/TLS configuration scopes:

- `demos.tls.secure_client_with_no_cert`
- `demos.tls.secure_client_with_cert`
- `demos.tls.semi_secure_client_with_cert`
- `demos.tls.semi_secure_client_with_no_cert`
- `demos.tls.secure_server_no_client_auth`
- `demos.tls.secure_server_request_client_auth`
- `demos.tls.semi_secure_server_no_client_auth`
- `demos.tls.semi_secure_server_request_client_auth`
- `demos.tls.semi_secure_server_enforce_client_auth`
- `demos.tls.semi_secure_server_enforce_client_auth`
Secure client terminology

The terminology used to describe the preceding client configuration scopes is explained in Table 1.

<table>
<thead>
<tr>
<th>Scope Name Prefix/Suffix</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>secure_client</td>
<td>The client opens only secure SSL/TLS connections to the server. If the server does not support secure connections, the connection attempt will fail.</td>
</tr>
</tbody>
</table>
| semi_secure_client      | The type of connection opened by the client depends on the disposition of the server:  
  • If the server is insecure (listening only on an insecure IIOP port), an insecure connection is established.  
  • If the server is secure (listening only on a secure IIOP/TLS port), a secure SSL/TLS connection is established.  
  • If the server is semi-secure (listening on both an IIOP port and on an IIOP/TLS port), the type of connection established depends on the client’s binding:client_binding_list.  
    ♦ If, in the client’s binding:client_binding_list, a binding with the IIOP interceptor appears before a binding with the IIOP_TLS interceptor, an insecure connection is established.  
    ♦ Conversely, if a binding with the IIOP_TLS interceptor appears before a binding with the IIOP interceptor, a secure connection is established. |
| with_no_cert            | No X.509 certificate is associated with the client (at least, not through configuration). |
| with_cert               | An X.509 certificate is associated with the client by setting the principal sponsor configuration variables. |
Secure server terminology

The terminology used to describe the preceding server configuration scopes is explained in Table 2.

### Table 2: Terminology Describing Secure Server Sample Configurations

<table>
<thead>
<tr>
<th>Scope Name Prefix/Suffix</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>secure_server</td>
<td>The server accepts only secure SSL/TLS connection attempts. If a remote client does not support secure connections, the connection attempt will fail.</td>
</tr>
<tr>
<td>semi_secure_server</td>
<td>The server accepts both secure and insecure connection attempts by remote clients.</td>
</tr>
<tr>
<td>no_client_auth</td>
<td>The server does not support client authentication over SSL/TLS. That is, during an SSL/TLS handshake, the server will not request the client to send an X.509 certificate.</td>
</tr>
<tr>
<td>request_client_auth</td>
<td>The server allows a connecting client the option of either authenticating itself or not authenticating itself using an X.509 certificate.</td>
</tr>
<tr>
<td>enforce_client_auth</td>
<td>The server requires a connecting client to authenticate itself using an X.509 certificate.</td>
</tr>
</tbody>
</table>

Outline of a sample configuration scope

For example, the `demos.tls.secure_server_no_client_auth` configuration defines a server configuration that is secured by SSL/TLS but does not expect clients to authenticate themselves. This configuration has the following outline:

```plaintext
# Orbix Configuration File
...
# General configuration at root scope.
...
demos {
    ...
tls {
        # Common SSL/TLS configuration settings.
        ...
        secure_server_no_client_auth {
            # Specific server configuration settings.
            ...
        }
    }
};
};
...```
Three significant groups of configuration variables contribute to the secure_server_no_client_auth configuration, as follows:

1. *General configuration at root scope*—these configuration settings are common to all applications, whether secure or insecure.

2. *Common SSL/TLS configuration settings*—specify the basic settings for SSL/TLS security. In particular, the orb_plugins list defined in this scope includes the iiop_tls plug-in.

3. *Specific server configuration settings*—define the settings specific to the secure_server_no_client_auth configuration.

---

**Sample client configuration**

For example, consider a secure SSL/TLS client whose configuration is modelled on the demos.tls.secure_client_with_no_cert configuration. Example 1 shows how to configure such a sample client.

**Example 1: Sample SSL/TLS Client Configuration**

```plaintext
# Orbix Configuration File
...
# General configuration at root scope.
...
my_secure_apps {
    # Common SSL/TLS configuration settings.
    # (copied from 'demos.tls')
    orb_plugins = ["local_log_stream", "iiop_profile", "giop", "iiop_tls"];


    policies:trusted_ca_list_policy = "ASPInstallDir\asp\6.0\etc\tls\x509\trusted_ca_lists\ca_list1.pem";

    policies:mechanism_policy:protocol_version = "SSL_V3";
    policies:mechanism_policy:ciphersuites = ["RSA_WITH_RC4_128_SHA", "RSA_WITH_RC4_128_MD5"];  

    event_log:filters = ["IT_ATLI_TLS=*", "IT_IIOPTLS=*", "IT_TLS=*"];
    ...
my_client {
```
The preceding client configuration can be described as follows:

1. Make sure that the orb_plugins variable in this configuration scope includes the iiop_tls plug-in.

   **Note:** For fully secure applications, you should exclude the iiop plug-in (insecure IIOP) from the ORB plug-ins list. This renders the application incapable of making insecure IIOP connections.

   For semi-secure applications, however, you should include the iiop plug-in before the iiop_tls plug-in in the ORB plug-ins list.

   If you plan to use the full Orbix Security Framework, you should include the gsp plug-in in the ORB plug-ins list as well—see “Securing Two-Tier CORBA Systems with CSI” on page 76.

2. Make sure that the binding:client_binding_list variable includes bindings with the IIOP_TLS interceptor. You can use the value of the binding:client_binding_list shown here.

   If you plan to use the full Orbix Security Framework, you should use the binding:client_binding_list as shown in “Client configuration” on page 77 instead.

3. An SSL/TLS application needs a list of trusted CA certificates, which it uses to determine whether or not to trust certificates received from other SSL/TLS applications. You must, therefore, edit the
policies:trusted_ca_list_policy variable to point at a list of trusted certificate authority (CA) certificates. See “Specifying Trusted CA Certificates” on page 369.

Note: If using Schannel as the underlying SSL/TLS toolkit (Windows only), the policies:trusted_ca_list_policy variable is ignored. Within Schannel, the trusted root CA certificates are obtained from the Windows certificate store.

4. The SSL/TLS mechanism policy specifies the default security protocol version and the available cipher suites—see “Specifying Cipher Suites” on page 349.

5. This line enables console logging for security-related events, which is useful for debugging and testing. Because there is a performance penalty associated with this option, you might want to comment out or delete this line in a production system.

6. The SSL/TLS principal sponsor is a mechanism that can be used to specify an application’s own X.509 certificate. Because this client configuration does not use a certificate, the principal sponsor is disabled by setting principal_sponsor:use_principal_sponsor to false.

7. The following two lines set the required options and the supported options for the client secure invocation policy. In this example, the policy is set as follows:

- Required options—the options shown here ensure that the client can open only secure SSL/TLS connections.
- Supported options—the options shown include all of the association options, except for the EstablishTrustInClient option. The client cannot support EstablishTrustInClient, because it has no X.509 certificate.

Sample server configuration

Generally speaking, it is rarely necessary to configure such a thing as a pure server (that is, a server that never makes any requests of its own). Most real servers are applications that act in both a server role and a client role. Hence, the sample server described here is a hybrid of the following two demonstration configurations:

- demos.tls.secure_server_request_client_auth
Example 2 shows how to configure such a sample server.

**Example 2: Sample SSL/TLS Server Configuration**

```plaintext
# Orbix Configuration File
...
# General configuration at root scope.
...
my_secure_apps {
  # Common SSL/TLS configuration settings.
  # (copied from ‘demos.tls’)
  ...
  my_server {
    # Specific SSL/TLS server configuration settings
    # (from ‘demos.tls.secure_server_request_client_auth’)
    policies:target_secure_invocation_policy:requires = 
      ["Confidentiality"];
    policies:target_secure_invocation_policy:supports = 
      ["EstablishTrustInClient", "Confidentiality", "Integrity", 
        "DetectReplay", "DetectMisordering", 
        "EstablishTrustInTarget"];

    principal_sponsor:use_principal_sponsor = "true";
    principal_sponsor:auth_method_id = "pkcs12_file";
    principal_sponsor:auth_method_data = 
      ["filename=ASPInstallDir\asp\6.0\etc\tls\x509\certs\demos\bank_server.p12"];

    # Specific SSL/TLS client configuration settings
    # (copied from ‘demos.tls.secure_client_with_cert’)
    policies:client_secure_invocation_policy:requires = 
      ["Confidentiality", "EstablishTrustInTarget"];
    policies:client_secure_invocation_policy:supports = 
      ["Confidentiality", "Integrity", "DetectReplay", 
        "DetectMisordering", "EstablishTrustInClient", 
        "EstablishTrustInTarget"];
  }
};
...
Securing Communications with SSL/TLS

The preceding server configuration can be described as follows:

1. You can use the same common SSL/TLS settings here as described in the preceding “Sample client configuration” on page 67.

2. The following two lines set the required options and the supported options for the target secure invocation policy. In this example, the policy is set as follows:
   - Required options—the options shown here ensure that the server accepts only secure SSL/TLS connection attempts.
   - Supported options—all of the target association options are supported.

3. A server must always be associated with an X.509 certificate. Hence, this line enables the SSL/TLS principal sponsor, which specifies a certificate for the application.

4. This line specifies that the X.509 certificate is contained in a PKCS#12 file. For alternative methods, see “Specifying an Application’s Own Certificate” on page 371.

5. Replace the X.509 certificate, by editing the filename option in the principal_sponsor:auth_method_data configuration variable to point at a custom X.509 certificate. The filename value should be initialized with the location of a certificate file in PKCS#12 format—see “Specifying an Application’s Own Certificate” on page 371 for more details.

   **Note:** If using Schannel as the underlying SSL/TLS toolkit (Windows only), the principal_sponsor:auth_method_id value must be security_label instead of pkcs12_file.

6. For details of how to specify the certificate’s pass phrase, see “Providing a Pass Phrase or PIN” on page 375.
6. The following two lines set the required options and the supported options for the client secure invocation policy. In this example, the policy is set as follows:
   ♦ Required options—the options shown here ensure that the application can open only secure SSL/TLS connections to other servers.
   ♦ Supported options—all of the client association options are supported. In particular, the EstablishTrustInClient option is supported when the application is in a client role, because the application has an X.509 certificate.

Mixed security configurations

Most realistic secure server configurations are mixed in the sense that they include both server settings (for the server role), and client settings (for the client role). When combining server and client security settings for an application, you must ensure that the settings are consistent with each other.

For example, consider the case where the server settings are secure and the client settings are insecure. To configure this case, set up the server role as described in “Sample server configuration” on page 69. Then configure the client role by adding (or modifying) the following lines to the my_secure_apps.my_server configuration scope:

```bash
orb_plugins = ["local_log_stream", "iiop_profile", "giop", "iiop", "iiop_tls"]; policies:client_secure_invocation_policy:requires = ["NoProtection"]; policies:client_secure_invocation_policy:supports = ["NoProtection"];```

The first line sets the ORB plug-ins list to make sure that the iiop plug-in (enabling insecure IIOP) is included. The NoProtection association option, which appears in the required and supported client secure invocation policy, effectively disables security for the client role.

Customizing SSL/TLS security policies

You can, optionally, customize the SSL/TLS security policies in various ways. For details, see the following references:

- “Configuring SSL/TLS Secure Associations” on page 333.
- “Configuring SSL/TLS Authentication” on page 361.
Key distribution management

It is possible to configure your CORBA server so that the certificate pass phrase is supplied automatically by the key distribution management (KDM) service. For details, see the following reference:

- “Automatic Activation of Secure Servers” on page 389.
Specifying Fixed Ports for SSL/TLS Connections

**Overview**

Orbix allows you to specify a fixed IP port on which a server listens for SSL/TLS connections. This subsection provides an overview of the programming and configuration requirements for setting IIOP/TLS fixed ports.

**POA policies required for setting fixed ports**

The main prerequisite for configuring fixed ports is that a CORBA developer programs the application to create a POA instance with the following policies:

- **PortableServer::LifespanPolicy**—the value of this POA policy should be set to `PERSISTENT`, indicating that the objects managed by this POA can outlive the server process.
- **IT_CORBA::WellKnownAddressingPolicy**—the value of this POA policy is a string that defines a well-known addressing prefix, `<wka_prefix>`, for host/port configuration variables that an administrator can edit in the Orbix configuration.
- **IT_PortableServer::PersistenceModePolicy**—the value of this POA policy can be set to either of the following values:
  - `DIRECT_PERSISTENCE`, indicating that the POA is configured to receive connection attempts directly from clients. The server listens on the fixed port (well-known address) and exports IORs containing its own host and fixed port.
  - `INDIRECT_PERSISTENCE`, indicating that connection attempts will be redirected to the server by the locator service. The server listens on the fixed port (well-known address), but exports IORs containing the locator’s host and port.

**Programming the required POA policies**

For details of how to program POA policies, see the *CORBA Programmer’s Guide*.

**Fixed port configuration variables**

The following IIOP/TLS configuration variables can be set for a POA that supports the well-known addressing policy with the `<wka_prefix>` prefix:
Specifying Fixed Ports for SSL/TLS Connections

<wka_prefix>:iiop_tls:host = "<host>*;
  Specifies the hostname, <host>, to publish in the IIOP/TLS profile of server-generated IORs.

<wka_prefix>:iiop_tls:port = "<port>*;
  Specifies the fixed IP port, <port>, on which the server listens for incoming IIOP/TLS messages. This port value is also published in the IIOP/TLS profile of generated IORs.

<wka_prefix>:iiop_tls:listen_addr = "<host>*;
  Restricts the IIOP/TLS listening point to listen only on the specified host, <host>. It is generally used on multi-homed hosts to limit incoming connections to a particular network interface.

<wka_prefix>:iiop_tls:addr_list = 
  ["<optional_plus_sign><host>:<port>, ... 
  In the context of server clustering, this configuration variable specifies a list of host and port combinations, <host>:<port>, for the <wka_prefix> persistent POA instance.
  One of the host and port combinations, <host>:<port> (lacking a + prefix), specifies the POA’s own listening point. The other host and port combinations, +<host>:<port> (including a + prefix), specify the listening points for other servers in the cluster.

Note: The *:addr_list variable takes precedence over the other host/port configuration variables (*:host, *:port, and *:listen_addr).
Securing Two-Tier CORBA Systems with CSI

Overview

This section describes how to secure a two-tier CORBA system using the iSF. The client supplies username/password authentication data which is then authenticated on the server side. The following configurations are described in detail:

- Client configuration.
- Target configuration.

Two-tier CORBA system

Figure 17 shows a basic two-tier CORBA system in the iSF, featuring a client and a target server.

Figure 17: Two-Tier CORBA System in the iSF
Scenario description

The scenario shown in Figure 17 can be described as follows:

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
</table>
| 1     | The user enters a username, password, and domain name on the client side (user login).  
**Note:** The domain name can either be an empty string (acts as a wildcard) or must match the value of the `policies:csi:auth_over_transport:server_domain_name` configuration variable set on the server side. |
| 2     | When the client makes a remote invocation on the server, the iSF transmits the username/password/domain authentication data to the target along with the invocation request. |
| 3     | The server authenticates the received username and password by calling out to the external Orbix security service. |
| 4     | If authentication is successful, the Orbix security service returns the user’s realms and roles. |
| 5     | The iSF controls access to the target’s IDL interfaces by consulting an *action-role mapping file* to determine what the user is allowed to do. |

Client configuration

The CORBA client from Example 17 on page 76 can be configured as shown in Example 3.

**Example 3:** *Configuration of a CORBA client in the iSF*

```
# Orbix Configuration File
...
# General configuration at root scope.
...
my_secure_apps {  
  # Common SSL/TLS configuration settings.
  ...
  # Common iSF configuration settings.
  1  
    orb_plugins = ["local_log_stream", "iiop_profile", "giop", "iiop_tls", "ots", "gsp"];
```
The preceding client configuration can be explained as follows:

1. The SSL/TLS configuration variables common to all of your applications can be placed here—see “Securing Communications with SSL/TLS” on page 64 for details of the SSL/TLS configuration.

2. Make sure that the orb_plugins variable in this configuration scope includes both the iiop_tls and the gsp plug-ins in the order shown.

3. Make sure that the binding:client_binding_list variable includes bindings with the CSI interceptor. You can use the value of the binding:client_binding_list shown here.

4. Make sure that the binding:server_binding_list variable includes bindings with both the CSI and GSP interceptors. You can use the value of the binding:server_binding_list shown here.

5. The SSL/TLS configuration variables specific to the CORBA client can be placed here—see “Securing Communications with SSL/TLS” on page 64.
6. This setting enforces strict checking of reply messages from the server, to make sure the server actually supports CSIv2.

7. This configuration setting specifies that the client supports sending username/password authentication data to a server.

8. The next three lines specify that the client uses the CSI principal sponsor to obtain the user’s authentication data. With the configuration as shown, the user would be prompted to enter the username and password when the client application starts up.

For more details on the CSI principal sponsor, see “Providing a Username and Password” on page 428.

Target configuration

The CORBA target server from Figure 17 on page 76 can be configured as shown in Example 4.

Example 4: Configuration of a Second-Tier Target Server in the iSF

```
# Orbix Configuration File
...
# General configuration at root scope.
...
my_secure_apps {
  # Common SSL/TLS configuration settings.
  ...
  # Common iSF configuration settings.
  orb_plugins = [ ..., "iiop_tls", "gsp", ... ];
  binding:client_binding_list = [ ... ];
  binding:server_binding_list = [ ... ];
  ...
  my_two_tier_target {
    # Specific SSL/TLS configuration settings.
    ...
    # Specific iSF configuration settings.
    policies:csi:auth_over_transport:target_supports =
      ["EstablishTrustInClient"]; 
    policies:csi:auth_over_transport:target_requires =
      ["EstablishTrustInClient"]; 
    policies:csi:auth_over_transport:server_domain_name =
      "DEFAULT";
    plugins:gsp:authorization_realm = "AuthzRealm";
    plugins:gsp:action_role_mapping_file = "ActionRoleURL";
  }
```
Example 4:  Configuration of a Second-Tier Target Server in the iSF

```plaintext
# iSF client configuration settings.
policies:csi:auth_over_transport:client_supports = *EstablishTrustInClient*];

principal_sponsor:csi:use_principal_sponsor = "true";
principal_sponsor:csi:auth_method_id = "GSSUPMech";
principal_sponsor:csi:auth_method_data = [];
};
```

The preceding target server configuration can be explained as follows:

1. The SSL/TLS configuration variables specific to the CORBA target server can be placed here—see “Securing Communications with SSL/TLS” on page 64.

2. This configuration setting specifies that the target server supports receiving username/password authentication data from the client.

3. This configuration setting specifies that the target server requires the client to send username/password authentication data.

4. The `server_domain_name` configuration variable sets the server’s CSIv2 authentication domain name. The domain name embedded in a received CSIv2 credential must match the value of the `server_domain_name` variable on the server side or could be an empty string (acts as a wildcard).

5. This configuration setting specifies the iSF authorization realm, `AuthzRealm`, to which this server belongs. For more details about iSF authorization realms, see “iSF Authorization Realms” on page 171.

6. The `action_role_mapping` configuration variable specifies the location of an action-role mapping that controls access to the IDL interfaces implemented by the server. The file location is specified in an URL format, for example: file:///security_admin/action_role_mapping.xml (UNIX) or file:///c:/security_admin/action_role_mapping.xml (Windows).

For more details about the action-role mapping file, see “CORBA Action-Role Mapping ACL” on page 188.
7. You should also set iSF client configuration variables in the server configuration scope, because a secure server application usually behaves as a secure client of the core CORBA services. For example, almost all CORBA servers need to contact both the locator service and the CORBA naming service.

<table>
<thead>
<tr>
<th>Related administration tasks</th>
<th>After securing your CORBA applications with iSF, you might need to perform related administration tasks, for example:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• See “Managing Users, Roles and Domains” on page 167.</td>
</tr>
<tr>
<td></td>
<td>• See “CORBA Action-Role Mapping ACL” on page 188.</td>
</tr>
</tbody>
</table>
Securing Three-Tier CORBA Systems with CSI

Overview

This section describes how to secure a three-tier CORBA system using the iSF. In this scenario there is a client, an intermediate server, and a target server. The intermediate server is configured to propagate the client identity when it invokes on the target server in the third tier. The following configurations are described in detail:

- **Intermediate configuration.**
- **Target configuration.**

Three-tier CORBA system

Figure 18 shows a basic three-tier CORBA system in the iSF, featuring a client, an intermediate server and a target server.

Figure 18: *Three-Tier CORBA System in the iSF*
**Scenario description**

The second stage of the scenario shown in Figure 18 (intermediate server invokes an operation on the target server) can be described as follows:

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The intermediate server sets its own identity by extracting the user identity from the received username/password credentials. Hence, the intermediate server assumes the same identity as the client.</td>
</tr>
<tr>
<td>2</td>
<td>When the intermediate server makes a remote invocation on the target server, the iSF also transmits the user identity data to the target.</td>
</tr>
<tr>
<td>3</td>
<td>The target server then obtains the user’s realms and roles.</td>
</tr>
<tr>
<td>4</td>
<td>The iSF controls access to the target’s IDL interfaces by consulting an <em>action-role mapping file</em> to determine what the user is allowed to do.</td>
</tr>
</tbody>
</table>

**Client configuration**

The client configuration for the three-tier scenario is identical to that of the two-tier scenario, as shown in “Client configuration” on page 77.

**Intermediate configuration**

The CORBA intermediate server from Figure 18 on page 82 can be configured as shown in Example 5.

**Example 5: Configuration of a Second-Tier Intermediate Server in the iSF**

```bash
# Orbix Configuration File
...
# General configuration at root scope.
...
my_secure_apps {
    # Common SSL/TLS configuration settings.
    ...
    # Common iSF configuration settings.
    orb_plugins = [ ..., "iiop_tls", "gsp", ... ];
    binding:client_binding_list = [ ... ];
    binding:server_binding_list = [ ... ];
    ...
    my_three_tier_intermediate {
        # Specific SSL/TLS configuration settings.
        ...
```
Example 5: Configuration of a Second-Tier Intermediate Server in the iSF

```
# Specific iSF configuration settings.
plugins:csi:allow_csi_reply_without_service_context = "false";
policies:csi:attribute_service:client_supports = ["IdentityAssertion"];
policies:csi:auth_over_transport:target_supports = ["EstablishTrustInClient"];
policies:csi:auth_over_transport:targetRequires = ["EstablishTrustInClient"];
policies:csi:auth_over_transport:server_domain_name = "DEFAULT";
plugins:gsp:authorization_realm = "AuthzRealm";
plugins:gsp:action_role_mapping_file = "ActionRoleURL";

# iSF client configuration settings.
policies:csi:auth_over_transport:client_supports = ["EstablishTrustInClient"];
principal_sponsor:csi:use_principal_sponsor = "true";
principal_sponsor:csi:auth_method_id = "GSSUPMech";
principal_sponsor:csi:auth_method_data = [];
};
``` 

The preceding intermediate server configuration can be explained as follows:

1. The SSL/TLS configuration variables specific to the CORBA intermediate server can be placed here—see “Securing Communications with SSL/TLS” on page 64.

2. This setting enforces strict checking of reply messages from the target, to make sure the target actually supports CSIv2.

3. This configuration setting specifies that the intermediate server is capable of propagating the identity it receives from a client. In other words, the server is able to assume the identity of the client when invoking operations on third-tier servers.

4. This configuration setting specifies that the intermediate server supports receiving username/password authentication data from the client.

5. This configuration setting specifies that the intermediate server requires the client to send username/password authentication data.
6. The `server_domain_name` configuration variable sets the server’s CSIv2 authentication domain name. The domain name embedded in a received CSIv2 credential must match the value of the `server_domain_name` variable on the server side or could be an empty string (acts as a wildcard).

7. This configuration setting specifies the iSF authorization realm, `AuthzRealm`, to which this server belongs. For more details about iSF authorization realms, see “iSF Authorization Realms” on page 171.

8. This configuration setting specifies the location of an action-role mapping that controls access to the IDL interfaces implemented by the server. The file location is specified in an URL format, for example:
   file:///security_admin/action_role_mapping.xml (UNIX) or
   file:///c:/security_admin/action_role_mapping.xml (Windows).
   For more details about the action-role mapping file, see “CORBA Action-Role Mapping ACL” on page 188.

9. You should also set iSF client configuration variables in the intermediate server configuration scope, because a secure server application usually behaves as a secure client of the core CORBA services. For example, almost all CORBA servers need to contact both the locator service and the CORBA naming service.

Target configuration

The CORBA target server from Figure 18 on page 82 can be configured as shown in Example 6.

**Example 6: Configuration of a Third-Tier Target Server in the iSF**

```plaintext
# Orbix Configuration File
...
# General configuration at root scope.
...
my_secure_apps {
    # Common SSL/TLS configuration settings.
    ...
    # Common iSF configuration settings.
    orb_plugins = [ ..., "iiop_tls", "gsp", ... ];
    binding:client_binding_list = [ ... ];
    binding:server_binding_list = [ ... ];
    ...
The preceding target server configuration can be explained as follows:

1. The SSL/TLS configuration variables specific to the CORBA target server can be placed here—see “Securing Communications with SSL/TLS” on page 64.

2. It is recommended that the target server require its clients to authenticate themselves using an X.509 certificate. For example, the intermediate server (acting as a client of the target) would then be required to send an X.509 certificate to the target during the SSL/TLS handshake. You can specify this option by including the `EstablishTrustInClient` association option in the target secure invocation policy, as shown here (thereby overriding the policy value set in the outer configuration scope).

**Example 6: Configuration of a Third-Tier Target Server in the iSF**

```plaintext
my_three_tier_target {
    # Specific SSL/TLS configuration settings.
    ...  
1    policies:iiop_tls:target_secure_invocation_policy:requires = ["Confidentiality", "DetectMisordering", "DetectReplay", "Integrity", "EstablishTrustInClient"];
2    policies:iiop_tls:certificate_constraints_policy = [ConstraintString1, ConstraintString2, ...];

    # Specific iSF configuration settings.
3    policies:csi:attribute_service:target_supports = ["IdentityAssertion"];  
4    plugins:gsp:authorization_realms = "AuthzRealm";
5    plugins:gsp:action_role_mapping_file = "ActionRoleURL";

    # iSF client configuration settings.
6    policies:csi:auth_over_transport:client_supports = ["EstablishTrustInClient"];

    principal_sponsor:csi:use_principal_sponsor = "true";
    principal_sponsor:csi:auth_method_id = "GSSUPMech";
    principal_sponsor:csi:auth_method_data = [];
};
};
```
3. In addition to the preceding step, it is also advisable to restrict access to the target server by setting a certificate constraints policy, which allows access only to those clients whose X.509 certificates match one of the specified constraints—see “Applying Constraints to Certificates” on page 384.

**Note:** The motivation for limiting access to the target server is that clients of the target server obtain a special type of privilege: propagated identities are granted access to the target server without the target server performing authentication on the propagated identities. Hence, the target server trusts the intermediate server to do the authentication on its behalf.

4. This configuration setting specifies that the target server supports receiving propagated user identities from the client.

5. This configuration setting specifies the iSF authorization realm, AuthzRealm, to which this server belongs. For more details about iSF authorization realms, see “iSF Authorization Realms” on page 171.

6. This configuration setting specifies the location of an action-role mapping that controls access to the IDL interfaces implemented by the server. The file location is specified in an URL format, for example: `file:///security_admin/action_role_mapping.xml`.

   For more details about the action-role mapping file, see “CORBA Action-Role Mapping ACL” on page 188.

7. You should also set iSF client configuration variables in the target server configuration scope, because a secure server application usually behaves as a secure client of the core CORBA services. For example, almost all CORBA servers need to contact both the locator service and the CORBA naming service.

---

**Related administration tasks**

After securing your CORBA applications with iSF, you might need to perform related administration tasks, for example:

- See “Managing Users, Roles and Domains” on page 167.
- See “CORBA Action-Role Mapping ACL” on page 188.
X.509 Certificate-Based Authentication

Overview

This section describes how to enable X.509 certificate authentication with the iSF, based on a simple two-tier client/server scenario. In this scenario, the Orbix security service authenticates the client’s certificate and retrieves roles and realms based on the identity of the certificate subject. When iSF certificate-based authentication is enabled, the X.509 certificate is effectively authenticated twice, as follows:

- **SSL/TLS-level authentication**—this authentication step occurs during the SSL/TLS handshake and is governed by Orbix configuration settings and programmable SSL/TLS policies.
- **iSF-level authentication and authorization**—this authentication step occurs after the SSL/TLS handshake and is performed by the Orbix security service working in tandem with the gsp plug-in.

Certificate-based authentication scenario

Figure 19 shows an example of a two-tier system, where authentication of the client’s X.509 certificate is integrated with iSF.

Figure 19: Overview of iSF Certificate-Based Authentication
The scenario shown in Figure 19 can be described as follows:

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
</table>
| 1     | When the client opens a connection to the server, the client sends its X.509 certificate as part of the SSL/TLS handshake. The server then performs SSL/TLS-level authentication, checking the certificate as follows:  
  - The certificate is checked against the server’s trusted CA list to ensure that it is signed by a trusted certification authority.  
  - If a certificate constraints policy is set, the certificate is checked to make sure it satisfies the specified constraints.  
  - If a certificate validator policy is set (by programming), the certificate is also checked by this policy. |
| 2     | The server then performs iSF-level authentication by calling authenticate() on the Orbix security service, passing the client’s X.509 certificate as the argument. |
| 3     | The Orbix security service authenticates the client’s X.509 certificate by checking it against a cached copy of the certificate. The type of checking performed depends on the particular third-party enterprise security service that is plugged into the Orbix security service. |
| 4     | If authentication is successful, the Orbix security service returns the user’s realms and roles. |
| 5     | The iSF controls access to the target’s IDL interfaces by consulting an action-role mapping file to determine what the user is allowed to do. |
**Client configuration**

Example 7 shows a sample client configuration that you can use for the iSF certificate-based authentication scenario (Figure 19 on page 88).

**Example 7: Client Configuration for iSF Certificate-Based Authentication**

```plaintext
# Orbix Configuration File
corba_cert_auth
{
    orb_plugins = ["local_log_stream", "iiop_profile", "giop", "iiop_tls", "gsp"];

    event_log:filters = ["IT_GSP=*", "IT_CSI=*", "IT_TLS=*", "IT_IIOP_TLS=*", "IT_ATLTI2_TLS=*"];


    client_x509
    {
        policies:iiop_tls:client_secure_invocation_policy:supports = ["Integrity", "Confidentiality", "DetectReplay", "DetectMisordering", "EstablishTrustInTheTarget", "EstablishTrustInClient"];  

        policies:iiop_tls:client_secure_invocation_policy:requires = ["Integrity", "Confidentiality", "DetectReplay", "DetectMisordering"];  

        principal_sponsor:use_principal_sponsor = "true";
        principal_sponsor:auth_method_id = "pkcs12_file";
        principal_sponsor:auth_method_data = ["filename=W:\art\etc\tlsl\certs\demos\bob.p12", "password=bobpass"];
    };
}
```

The preceding client configuration is a typical SSL/TLS configuration. The only noteworthy feature is that the client must have an associated X.509 certificate. Hence, the principal_sponsor settings are initialized with the location of an X.509 certificate (provided in the form of a PKCS#12 file).
For a discussion of these client SSL/TLS settings, see “Sample client configuration” on page 67 and “Deploying Application Certificates” on page 311.

**Target configuration**

Example 8 shows a sample server configuration that you can use for the iSF certificate-based authentication scenario (Figure 19 on page 88).

**Example 8: Server Configuration for iSF Certificate-Based Authentication**

```
# Orbix Configuration File
corba_cert_auth
{
  orb_plugins = ["local_log_stream", "iiop_profile", "giop",
  "iiop_tls", "gsp"];

  event_log:filters = ["IT_GSP=*", "IT_CSI=*", "IT_TLS=*",
  "IT_IIOP_TLS=*", "IT_ATLI2_TLS=*"];

  binding:client_binding_list = ["GIOP+EGMIOP",
  "OTS+POA_Coloc", "POA_Coloc", "OTS+TLS_Coloc+POA_Coloc",
  "TLS_Coloc+POA_Coloc", "GIOP+SHMIOP", "CSI+OTS+GIOP+IIOP",
  "CSI+GIOP+IIOP", "CSI+OTS+GIOP+IIOP_TLS",
  "CSI+GIOP+IIOP_TLS", "GIOP+IIOP", "GIOP+IIOP_TLS"];

  server
  {  
    policies:csi:auth_over_transport:authentication_service
  = "com.iona.corba.security.csi.AuthenticationService";

    principal_sponsor:use_principal_sponsor = "true";
    principal_sponsor:auth_method_id = "pkcs12_file";
    principal_sponsor:auth_method_data = [
"filename=OrbixInstallDir\etc\tls\x509\certs\demos\bank_server.p12",
  "password=bankserverpass"];

    binding:server_binding_list = ["CSI+GSP", "CSI",
  "GSP"];

    initial_references:IS2Authorization:plugin =
  "it_is2_authorization";

    plugins:it_is2_authorization:ClassName =
  "com.iona.corba.security.authorization.IS2AuthorizationPlugIn"
  
```
The preceding server configuration can be explained as follows:

1. As is normal for an SSL/TLS server, you must provide the server with its own certificate. The simplest way to do this is to specify the location of a PKCS#12 file using the principal sponsor.

2. This configuration setting specifies the location of an action-role mapping file, which controls access to the server’s interfaces and operations.

3. The `plugins:gsp:enable_security_service_cert_authentication` variable is the key to enabling iSF certificate-based authentication. By setting this variable to `true`, you cause the server to perform iSF-level certificate authentication.

4. The IIOP/TLS target secure invocation policy must require `EstablishTrustInClient`. Evidently, if the client does not provide a certificate during the SSL/TLS handshake, there will be no certificate available to perform the iSF-level authentication.

Example 8:  
Server Configuration for iSF Certificate-Based Authentication

```yaml
plugins:gsp:action_role_mapping_file =
  "file://W:\art\etc\tls\x509\\..\\..\..\..\art_svcs\etc\actionrolemapping_with_interfaces.xml";

auth_x509
{

  plugins:gsp:enable_security_service_cert_authentication = "true";

  policies:iiop_tls:target_secure_invocation_policy:supports =
    ["Integrity", "Confidentiality", "DetectReplay",
     "DetectMisordering", "EstablishTrustInTarget",
     "EstablishTrustInClient"];

  policies:iiop_tls:target_secure_invocation_policy:requires =
    ["Integrity", "Confidentiality", "DetectReplay",
     "DetectMisordering", "EstablishTrustInClient"];
}
```
When using X.509 certificate-based authentication, it is necessary to add the appropriate user data to your enterprise security system (which is integrated with the Orbix security service through an iSF adapter), as follows:

- File adapter (do not use in deployed systems)—see “Certificate-based authentication for the file adapter” on page 183
- LDAP adapter—see “Certificate-based authentication for the LDAP adapter” on page 184.
Caching of Credentials

Overview

To improve the performance of servers within the Orbix Security Framework, the GSP plug-in implements caching of credentials (that is, the authentication and authorization data received from the Orbix security service).

The GSP credentials cache reduces a server’s response time by reducing the number of remote calls to the Orbix security service. On the first call from a given user, the server calls the Orbix security service and caches the received credentials. On subsequent calls from the same user, the cached credentials are used, thereby avoiding a remote call to the Orbix security service.

Cache time-out

The cache can be configured to time-out credentials, forcing the server to call the Orbix security service again after using cached credentials for a certain period.

Cache size

The cache can also be configured to limit the number of stored credentials.

Configuration variables

The following variables configure the credentials cache in the context of the Orbix Security Framework:

`plugins:gsp:authentication_cache_size`

The maximum number of credentials stored in the authentication cache. If this size is exceeded the oldest credential in the cache is removed.

A value of -1 (the default) means unlimited size. A value of 0 means disable the cache.

`plugins:gsp:authentication_cache_timeout`

The time (in seconds) after which a credential is considered stale. Stale credentials are removed from the cache and the server must re-authenticate with the Orbix security service on the next call from that user. The cache timeout should be configured to be smaller than the timeout set in the `is2.properties` file (by default, that setting is `is2.sso.session.timeout=600`).

A value of -1 (the default) means an infinite time-out. A value of 0 means disable the cache.
CHAPTER 5

Single Sign-On for CORBA Applications

Single sign-on (SSO) is an Orbix security feature which minimizes the exposure of usernames and passwords to snooping. After initially signing on, a client communicates with other applications by passing an SSO token in place of the original username and password.

In this chapter

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SSO and the Login Service

Overview
The SSO feature is implemented by the following elements of Orbix:

- **Login service**—a central service which can authenticate username/password combinations and generate SSO tokens.
- **GSP plug-in**—the generic security plug-in, which is embedded in a client application, is responsible for contacting the login service to obtain an SSO token.

Advantages of SSO
SSO greatly increases the security of an application in the Orbix Security Framework, offering the following advantages:

- Password visibility is restricted to the Login Service.
- Clients use SSO tokens to communicate with servers.
- Clients can be configured to use SSO with no code changes.
- SSO tokens are configured to expire after a specified length of time.
- When an SSO token expires, the CORBA client automatically requests a new token from the login service. No additional user code is required.

Embedded login service
Figure 20 shows an overview of the login service which, by default, is embedded in the same process as the Orbix security service. The client ORB automatically requests an SSO token by sending a username and a password to the login service. If the username and password are successfully authenticated, the login service returns an SSO token.

![Figure 20: Client Requesting an SSO Token from the Login Service](image)
SSO token

The SSO token is a compact key that the Orbix security service uses to access a user’s session details, which are stored in a cache.

SSO token expiry

The Orbix security service is configured to impose the following kinds of timeout on an SSO token:

- **SSO session timeout**—this timeout places an absolute limit on the lifetime of an SSO token. When the timeout is exceeded, the token expires.
- **SSO session idle timeout**—this timeout places a limit on the amount of time that elapses between authentication requests involving the SSO token. If the central Orbix security service receives no authentication requests in this time, the token expires.

For more details, see “Configuring Single Sign-On Properties” on page 163.

Automatic token refresh

In theory, the expiry of SSO tokens could prove a nuisance to client applications, because servers will raise a CORBA::NO_PERMISSION exception whenever an SSO token expires. In practice, however, when SSO is enabled, the GSP plug-in catches the NO_PERMISSION exception on the client side and contacts the login service again to refresh the SSO token automatically. The GSP plug-in then automatically retries the failed operation invocation.

Connection to the login server

It is imperative that a connection to the login service is strongly protected by SSL/TLS, in order to avoid exposing usernames and passwords to snooping. Hence, by default, the client-to-login service connection is protected by strong SSL/TLS security policies and the IIOP/TLS client secure invocation policy requires the following association options:

```
["Integrity", "Confidentiality", "DetectReplay",
 "DetectMisordering", "EstablishTrustInTarget"];
```

This protection remains in force, irrespective of the association options set explicitly by the SSL/TLS client secure invocation policy.

**Note:** The only way to reduce the level of protection on login service connections is to set the plugins:gsp:enforce_secure_comms_to_sso_server variable to false.
Standalone login service

It is possible, in principle, to reconfigure the login service as a standalone server (that is, a standalone process that runs independently of the Orbix security service). Currently, however, the \texttt{itconfigure} utility can only generate domains with an embedded login service.

Please contact Progress Consulting for more details:

\url{http://web.progress.com/consulting/index.html}
Username/Password-Based SSO

Overview

This section describes how to configure a client so that it transmits an SSO token in place of a username and a password (that is, SSO is used in conjunction with the CSI authentication over transport mechanism).

CSI layers

The CSIv2 standard defines two layers for transmitting credentials:

- **CSI authentication over transport (GSSUP authentication)**—this layer is used to transmit username, password, and domain data which can then be authenticated on the server side.
- **CSI identity assertion**—this layer is used to transmit just a username (asserted identity). It is not needed for the scenarios in this section.

GSSUP authentication without SSO

**Figure 21** gives an overview of Generic Security Service Username/Password (GSSUP) based authentication without SSO. In this case, the username, `<username>`, and password, `<password>`, are passed directly to the target server, which then contacts the Orbix security service to authenticate the username/password combination.

**Figure 21: Overview of GSSUP Authentication without SSO**
GSSUP authentication with SSO

Figure 22 gives an overview of username/password-based (GSSUP) authentication when SSO is enabled.

**Figure 22: Overview of GSSUP Authentication with SSO**

Prior to contacting the target server for the first time, the client ORB sends the username, `<username>`, and password, `<password>`, to the login server, getting an SSO token, `<token>` in return. The client ORB then includes a CSIv2 service context in the next request to the target server, sending the special string, `_SSO_TOKEN_`, instead of a username and the SSO token, `<token>`, instead of a password. The target server’s ORB contacts the Orbix security service to authenticate the username/password combination and to obtain the user’s authorization data.

**Note:** The target server is not aware whether the client has used the login service or not. It is the Orbix security service that knows to treat the `_SSO_TOKEN_` username in a special way.
Related configuration variables

The following variables are relevant to username/password-based SSO:

plugins:gsp:enable_gssup_sso

Enables SSO with a username and a password (that is, GSSUP) when set to true.

plugins:gsp:sso_server_certificate_constraints

A special certificate constraints policy that applies only to the SSL/TLS connection between the client and the SSO login server. This policy is used to ensure that sensitive password information is seen only by a specific login server. For details on the syntax of certificate constraints, see “Applying Constraints to Certificates” on page 384.

Client configuration

Example 9 shows a typical configuration for an SSO client that employs GSSUP authentication.

Example 9: Client Configuration for Username/Password-Based SSO

```
# Orbix Configuration File

corba_login_server_test_with_tls
{
  orb_plugins = ["local_log_stream", "iicp_profile", "giop", "iop_tls", "gsp"];

  event_log:filters = ["IT_GSP="", "IT_CSI="", "IT_TLS="", "IT_IOP_TLS="", "IT_ATLI2_TLS=""];


  // plugins:gsp:sso_server_certificate_constraints = [
  //  "C=US,ST=Massachusetts,O=ABigBank*,CN=Orbix2000 IONA Services**
  //  ];

  sso_client_gssup
  {
    principal_sponsor:use_principal_sponsor = "false";
  }
```
The preceding client configuration can be described as follows:

1. The `plugins:gsp:sso_server_certificate_constraints` variable specifies certificate constraints that apply only to the X.509 certificate from the login server. If the login server’s certificate fails to match these constraints, a `CORBA::NO_PERMISSION` exception is thrown on the client side.

2. In this example, the SSL/TLS principal sponsor is not used (the SSL/TLS principal sponsor is used to specify an application’s own X.509 certificate credentials).
3. In this example, the client requires a secure SSL/TLS connection and requires the target server to authenticate itself with an X.509 certificate.

**Note:** Irrespective of the level of security required by the these configuration settings, the SSO client always requires the login server connection to be secure and authenticated by an X.509 certificate. The only way you can reduce the level of security required by the login server connection is by setting the `plugins:gsp:enforce_secure_comms_to_sso_server` variable to `false`.

4. This setting enforces strict checking of reply messages from the server, to make sure the server actually supports CSIv2.

5. The CSI authentication over transport policy must support `EstablishTrustInClient` to enable the sending of usernames and passwords in CSIv2 service contexts.

6. The CSI principal sponsor, which specifies an application’s own CSI credentials, can be enabled as shown here (alternatively, you could specify CSI credentials by programming; see “Creating CSIv2 Credentials” on page 478).

   In a deployed system, it is better to omit the password entry from the `principal_sponsor:csi:auth_method_data` setting. When omitted, the principal sponsor will prompt the user to enter a username and password as the client application starts up. The domain must be set to match the value of the `policies:csi:auth_over_transport:server_domain_name` variable on the server side.

   **Note:** Alternatively, you can specify the domain as an empty string, which would match any domain on the server side.

7. The `plugins:gsp:enable_gssup_sso` variable is set to `true` to enable the GSSUP single sign-on behavior.
Example 10 shows a typical configuration for a target server that accepts connections from clients that authenticate themselves using GSSUP.

**Example 10: Target Configuration for Username/Password-Based SSO**

```
# Orbix Configuration File
cobra_login_server_test_with_tls
{
  orb_plugins = ["local_log_stream", "iiop_profile", "giop", "iiop_tls", "gsp"];

  event_log:filters = ["IT_GSP=*", "IT_CSI=*", "IT_TLS=*", "IT_IIOP_TLS=*", "IT_ATL12_TLS=*"];


  plugins:gsp:sso_server_certificate_constraints = ["C=US,ST=Massachusetts,O=ABigBank*,CN=Orbix2000 IONA Services*"];

  server
  {

    principal_sponsor:use_principal_sponsor = "true";
    principal_sponsor:auth_method_id = "pkcs12_file";
    principal_sponsor:auth_method_data = ["filename=W:\art\etc\tls\x509\certs\demos\bank_server.p12", "password=bankserverpass"];

    binding:server_binding_list = ["CSI+GSP", "CSI", "GSP"];

    initial_references:IS2Authorization:plugin = "it_is2_authorization";

    plugins:it_is2_authorization:ClassName = "com.iona.corba.security.authorization.IS2AuthorizationPlugIn";
  }
```
Example 10: Target Configuration for Username/Password-Based SSO

```plaintext
plugins:gsp:action_role_mapping_file = "file:///W:\art\etc\tls\x509\..\..\..\art_svcs\etc\actionrolemapping_with_interfaces.xml";
plugins:gsp:authorization_realm = "AuthzRealm";
policies:csi:auth_over_transport:server_domain_name = "PCGROUP";

auth_csi
{

    policies:iiop_tls:target_secure_invocation_policy:supports = ["Integrity", "Confidentiality", "DetectReplay", "DetectMisordering", "EstablishTrustInTarget"];
    policies:iiop_tls:target_secure_invocation_policy:requires = ["Integrity", "Confidentiality", "DetectReplay", "DetectMisordering"];

    policies:csi:auth_over_transport:target_requires = ["EstablishTrustInClient"];  
    policies:csi:auth_over_transport:target_supports = ["EstablishTrustInClient"];  
}
};
```

The preceding target configuration can be described as follows:

1. As usual for an SSL/TLS server, the SSL/TLS principal sponsor is used to specify the location of the server’s own X.509 certificate.
2. The `action_role_mapping` configuration variable specifies the location of an action-role mapping that controls access to the IDL interfaces implemented by the server.
3. In this example, the server requires a secure SSL/TLS connection, but does not require the client to authenticate itself with an X.509 certificate.
4. It is essential for the target server to require and support the `EstablishTrustInClient` option for CSI authentication over transport. This ensures that the server receives a username and a password from the client in a CSIv2 service context.
### Related administration tasks

For details of how to configure SSO token timeouts, see “Configuring Single Sign-On Properties” on page 163.
Three Tier Example with Identity Assertion

Overview

This section describes what happens when the two-tier username/password-based SSO example is extended by a third tier, which uses the CSI identity assertion mechanism.

This scenario has the following essential features:

- **Client to second tier**—the CSI authentication over transport mechanism (GSSUP authentication) is enabled and the client is configured to use single sign-on.
- **Second tier to third tier**—the CSI identity assertion mechanism is enabled between these tiers. SAML data (containing details of the client user’s roles and realms) is propagated between these tiers.

Three-tier scenario with piggybacking

Figure 23 shows the outline of a single sign-on scenario where SAML role and realm data is piggybacked between the second and third tiers.

Figure 23: Single Sign-On Scenario with Piggybacking Roles and Realms
### Steps

The operation invocations performed on behalf of the client shown in Figure 23 on page 107 can be described as follows:

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>When single sign-on is enabled, the client calls out to the login service, passing in the client’s GSSUP credentials, u/p/d, in order to obtain a single sign-on token, ( t ).</td>
</tr>
<tr>
<td>2</td>
<td>When the client invokes an operation on the second-tier server, the SSO token, ( t ), is sent as the password in the GSSUP authentication data. The GSSUP username has the reserved value _SSO_TOKEN_. The client SSO token, ( t ), is now accessible through the \texttt{IT_CORBASEC::ExtendedReceivedCredentials} interface.</td>
</tr>
<tr>
<td>3</td>
<td>When the SSO token is received by the middle-tier server, it calls out to the Orbix security service to authenticate the client token and retrieve the SAML authorization data containing the user’s complete role and realm data.</td>
</tr>
</tbody>
</table>
| 4     | If the second tier now invokes an operation on the third tier, the effective credentials for the invocation are constructed as follows:  
  - The client username is used as the asserted identity (to be propagated through the CSI identity assertion mechanism).  
  - The client SSO token, \( t \), from the received credentials is inserted into an Orbix-proprietary service context. |
| 5     | When the request message is sent to the third tier, the asserted identity is sent through the CSI identity layer, and the single sign-on token, \( t \), is sent in an Orbix-proprietary service context, accompanied by the SAML role and realm data. In the third tier, no call-out to the Orbix Security Service is required, because the SAML data includes all of the information needed for an authorization check.  
  **WARNING:** It is essential that an adequate degree of trust is established between the third-tier server and the second-tier server. In this scenario, the third tier is completely dependent on the second tier to perform authentication on its behalf. |
Configuration notes

The most important policy settings for this three-tier scenario with SAML piggybacking are briefly described here.

Client to Second Tier

The client is configured to support CSI authentication over transport and single sign-on with the following configuration settings (the sso_server_certificate_constraints setting would have to be customised to match your login server’s X.509 certificate):

```java
policies:csi:auth_over_transport:client_supports = [*EstablishTrustInClient];
plugins:gsp:enable_gssup_sso = "true";
plugins:gsp:sso_server_certificate_constraints = [*"C=US,ST=Massachusetts,O=ABigBank*,CN=Orbix2000 IONA Services*"];```

The second tier is configured to support CSI authentication over transport from incoming connections with the following settings:

```java
policies:csi:auth_over_transport:target_supports = [*EstablishTrustInClient];
policies:csi:auth_over_transport:target_requires = [*EstablishTrustInClient];
```

Second Tier to Third Tier

The second tier is configured to support CSI identity assertion for outgoing connections with the following configuration settings:

```java
policies:csi:attribute_service:client_supports = [*"IdentityAssertion"];```

The third tier is configured to support CSI identity assertion from incoming connections with the following settings:

```java
policies:csi:attribute_service:target_supports = [*"IdentityAssertion"];```
**X.509 Certificate-Based SSO**

**Overview**

Normally, during certificate-based authentication, a client transmits its X.509 certificate during the SSL/TLS handshake. This certificate is then used for the authentication step with the Orbix security service (see “X.509 Certificate-Based Authentication” on page 88).

In contrast to this, in the SSO case a client transmits an SSO token through the CSI security layer (using CSI authentication over transport), having previously obtained the SSO token by authenticating its own certificate with the login server. The client’s certificate might also be propagated directly to the target, in addition to the SSO token, but this would not be the usual case.

**Certificate-based authentication without SSO**

Figure 24 gives an overview of ordinary certificate-based authentication without SSO. In this case, the client’s X.509 certificate is passed directly to the target server (during the SSL/TLS handshake). The target server then contacts the Orbix security service to authenticate the certificate.

*Figure 24: Overview of Certificate-Based Authentication without SSO*
Certificate-based authentication with SSO

Figure 25 gives an overview of certificate-based authentication when SSO is enabled.

**Figure 25: Overview of Certificate-Based Authentication with SSO**

Prior to contacting the target server for the first time, the client ORB invokes the `login()` operation on the login server. The login server retrieves the client’s X.509 certificate from the SSL/TLS received credentials, authenticates the certificate, and sends back an SSO token, `<token>` in return.

The client then sends a request to the target server, including the special username, `_SSO_TOKEN_`, and the password, `<token>`, in a CSIv2 service context. The target server contacts the Orbix security service to authenticate the username/password combination and to retrieve the user’s authorization data (realms and roles).

**Difference between username/password-based SSO and certificate-based SSO**

The key difference between username/password-based SSO (Figure 22 on page 100) and certificate-based SSO (Figure 25) lies in the communication with the login server. In the username/password-based case, the client sends GSSUP data to be authenticated to the login service; whereas in the certificate-based case, the client sends an X.509 certificate to be authenticated to the login service.

There is no difference in the nature of the communication between the client and the target, however. In both cases, an SSO token is transmitted through the CSI authentication over transport layer.
Related configuration variables

The following variables are relevant to certificate-based SSO:

`plugins:gsp:enable_x509_sso`
Enables certificate-based SSO when set to `true`.

`plugins:gsp:sso_server_certificate_constraints`
A special certificate constraints policy that applies only to the SSL/TLS connection between the client and the SSO login server. For details on the syntax of certificate constraints, see “Applying Constraints to Certificates” on page 384.

Typical scenario

The most likely scenario where you might need certificate-based SSO is where an existing server is configured to require username/password credentials, but you want to connect to the server using clients that have only X.509 certificate credentials. By enabling SSO on the client side, the clients acquire username/password credentials which the target server can then use for the purpose of authentication and authorization.

Client configuration

Example 11 shows a typical configuration for an SSO client that employs certificate-based authentication.

**Example 11: Client Configuration for Certificate-Based Authentication**

```plaintext
# Orbix Configuration File
corba_login_server_test_with_tls
{
  orb_plugins = ["local_log_stream", "iiop_profile", "giop",
  "iiop_tls", "gsp"];

  event_log:filters = ["IT_GSP=*", "IT_CSI=*", "IT_TLS=*",
  "IT_IIOP_TLS=*", "IT_ATLI2_TLS=*"];

  binding:client_binding_list = ["GIOP+EGMIOP",
  "OTS+POA_Coloc", "POA_Coloc", "OTS+TLS_Coloc+POA_Coloc",
  "TLS_Coloc+POA_Coloc", "GIOP+SHMIOP", "CSI+OTS+GIOP+IIOP",
  "CSI+GIOP+IIOP", "CSI+OTS+GIOP+IIOP_TLS",
  "CSI+GIOP+IIOP_TLS", "GIOP+IIOP", "GIOP+IIOP_TLS"];

  plugins:gsp:sso_server_certificate_constraints = ["C=US,ST=Massachusetts,O=ABigBank*,CN=Orbix2000 IONA Services*"];
}
Example 11: Client Configuration for Certificate-Based Authentication

```python
sso_client_x509
{
    policies:iiop_tls:client_secure_invocation_policy:supports = [
        "Integrity", "Confidentiality", "DetectReplay", 
        "DetectMisordering", "EstablishTrustInTarget", 
        "EstablishTrustInClient"];
    policies:iiop_tls:client_secure_invocation_policy:requires = [
        "Integrity", "Confidentiality", "DetectReplay", 
        "DetectMisordering", "EstablishTrustInTarget"];
    plugins:csi:allow_csi_reply_without_service_context = "false";
    principal_sponsor:use_principal_sponsor = "true";
    principal_sponsor:auth_method_id = "pkcs12_file";
    principal_sponsor:auth_method_data = [
        "filename=W:\art\etc\tls\x509\certs\demos\bob.p12",
        "password=bobpass"];
    policies:csi:auth_over_transport:client_supports = [
        "EstablishTrustInClient"];
    plugins:gsp:enable_x509_sso = "true";
};
};
The preceding client configuration can be described as follows:

1. The `plugins:gsp:sso_server_certificate_constraints` variable specifies certificate constraints that apply only to the X.509 certificate from the login server. If the login server’s certificate fails to match these constraints, a `CORBA::NO_PERMISSION` exception is thrown on the client side.

2. In this example, the client requires a secure SSL/TLS connection and requires the target server to authenticate itself with an X.509 certificate. The client also supports the SSL/TLS `EstablishTrustInClient` option.

   **Note:** Irrespective of the level of security required by these configuration settings, the SSO client always requires the login server connection to be secure and authenticated by an X.509 certificate. The only way you can reduce the level of security required by the login server connection is by setting the `plugins:gsp:enforce_secure_comms_to_sso_server` variable to `false`.

3. This setting enforces strict checking of reply messages from the server, to make sure the server actually supports CSIv2.

4. The client must have its own X.509 certificate to authenticate itself to the target. In this example, the SSL/TLS principal sponsor is used to specify the location of a PKCS#12 file containing the client’s certificate.

5. The CSI authentication over transport policy must support `EstablishTrustInClient` to enable the sending of usernames and passwords in CSIv2 service contexts.

6. The `plugins:gsp:enable_x509_sso` variable is set to `true` to enable the X.509 single sign-on behavior.
Target configuration

Example 12 shows the configuration for a target server that requires GSSUP username/password credentials, but can also accept connections from clients that use X.509 certificate-based SSO.

Example 12: Target Configuration for Certificate-Based Authentication

```plaintext
# Orbix Configuration File
corba_login_server_test_with_tls
{
   orb_plugins = ["local_log_stream", "iiop_profile", "giop", "iiop_tls", "gsp"];
   event_log:filters = ["IT_GSP=*", "IT_CSI=*", "IT_TLS=*", "IT_IIOP_TLS=*", "IT_ATLI2_TLS=*"];
   plugins:gsp:sso_server_certificate_constraints = ["C=US,ST=Massachusetts,O=ABigBank*,CN=Orbix2000 IONA Services*"];
   server
   {
      principal_sponsor:use_principal_sponsor = "true";
      principal_sponsor:auth_method_id = "pkcs12_file";
      principal_sponsor:auth_method_data = ["filename=W:\art\etc\tls\x509\certs\demos\bank_server.p12", "password=bankserverpass"];
      binding:server_binding_list = ["CSI+GSP", "CSI", "GSP"];
      initial_references:IS2Authorization:plugin = "it_is2_authorization";
      plugins:it_is2_authorization:ClassName = "com.iona.corba.security.authorization.IS2AuthorizationPlugIn"
   }
}
```
Example 12: Target Configuration for Certificate-Based Authentication

```
plugins:gsp:action_role_mapping_file =
    "file://W:\art\etc\tls\x509\..\..\..\..\art_svcs\etc\actionrole_mapping_with_interfaces.xml";
plugins:gsp:authorization_realm = "AuthRealm";
policies:csi:auth_over_transport:server_domain_name = "PCGROUP";

require_gssup_support_x509_with_sso
{
    policies:iiop_tls:target_secure_invocation_policy:supports =
        ["Integrity", "Confidentiality", "DetectReplay", "DetectMisordering", "EstablishTrustInTarget", "EstablishTrustInClient"];

    policies:iiop_tls:target_secure_invocation_policy:requires =
        ["Integrity", "Confidentiality", "DetectReplay", "DetectMisordering"];

    policies:csi:auth_over_transport:targetRequires =
        ["EstablishTrustInTarget"];
    policies:csi:auth_over_transport:targetSupports =
        ["EstablishTrustInClient"];
}
```

The preceding target configuration can be described as follows:

1. As usual for an SSL/TLS server, the SSL/TLS principal sponsor is used to specify the location of the server’s own X.509 certificate.
2. The `action_role_mapping` configuration variable specifies the location of an action-role mapping that controls access to the IDL interfaces implemented by the server.
3. The server requires a secure SSL/TLS connection, but does not require the client to authenticate itself with an X.509 certificate.
4. Because the target server requires the `EstablishTrustInClient` option for CSI authentication over transport, clients must supply GSSUP username/password credentials. This condition is also satisfied by clients that use X.509 certificate-based SSO, because this results in the generation of GSSUP username/password credentials.
Related administration tasks

For details of how to configure SSO token timeouts, see “Configuring Single Sign-On Properties” on page 163.
# Enabling Re-Authentication at Each Tier

## Overview
This section describes a three-tier SSO scenario where piggybacking of SAML data (containing details of the client user’s roles and realms) is disabled. This forces an SSO token to be re-authenticated at each tier in a multi-tier system, because the servers in each tier need to contact the Orbix security service to obtain the SAML data.

## Advantages of enabling re-authentication
Re-enabling authentication at each tier has the following potential advantages:

- If your distributed application crosses different security domains, it might be necessary to re-authenticate credentials in a new domain.
- Sometimes, if the quantity of SAML data is very large, it might be more efficient for servers to retrieve the SAML data directly from the Orbix security service.

## Disabling SAML piggybacking
There are two configuration variables that control SAML piggybacking.

- `plugins:gsp:assert_authorization_info`
  - If false, SAML data is not sent on outgoing connections. Default is true.

- `plugins:gsp:accept_asserted_authorization_info`
  - If false, SAML data is not read from incoming connections. Default is true.
Three-tier scenario without piggybacking

Figure 26 shows the outline of a single sign-on scenario where the propagation of SAML role and realm data is disabled.

**Figure 26: Single Sign-On Scenario without Piggybacking Roles and Realms**

Steps

The operation invocations performed on behalf of the client shown in Figure 26 on page 119 can be described as follows:

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>When single sign-on is enabled, the client calls out to the login service, passing in the client’s GSSUP credentials, u/p/d, in order to obtain a single sign-on token, t.</td>
</tr>
<tr>
<td>2</td>
<td>When the client invokes an operation on the second-tier server, the SSO token, t, is sent as the password in the GSSUP username/password credentials.</td>
</tr>
<tr>
<td>3</td>
<td>The second tier re-authenticates the client’s SSO token, t, by calling out to the Orbix Security Service. The return value contains the SAML role and realm data for the token.</td>
</tr>
</tbody>
</table>
Chapter 5 | Single Sign-On for CORBA Applications

### Configuration notes

The most important policy settings for this three-tier scenario without SAML piggybacking are briefly described here.

#### Client to Second Tier

The client is configured to support CSI authentication over transport and single sign-on without SAML piggybacking, with the following configuration settings (the `sso_server_certificate_constraints` setting would have to be customised to match your login server’s X.509 certificate):

```plaintext
policies:csi:auth_over_transport:client_supports = ['EstablishTrustInClient'];
plugins:gsp:enable_gssup_sso = "true";
plugins:gsp:sso_server_certificate_constraints = ['C=US,ST=Massachusetts,O=ABigBank*,CN=Orbix2000 IONA Services*'];
plugins:gsp:assert_authorization_info = "false";
```

The second tier is configured to support CSI authentication over transport from incoming connections, but not to accept SAML data, with the following settings:

```plaintext
policies:csi:auth_over_transport:target_supports = ['EstablishTrustInClient'];
policies:csi:auth_over_transport:target_requires = ['EstablishTrustInClient'];
plugins:gsp:accept_asserted_authorization_info = "false";
```

---

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
</table>
| 4     | If the second tier now invokes an operation on the third tier, the *effective credentials* for the invocation are constructed as follows:  
• The client username is used as the asserted identity (to be propagated through the CSI identity assertion mechanism).  
• The client SSO token, $t$, from the received credentials is inserted into an Orbix-proprietary service context. |
| 5     | When the request message is sent to the third tier, only the asserted identity and the single sign-on token, $t$, are included. Propagation of the SAML authorization data is disabled. |
| 6     | The third tier re-authenticates the client’s SSO token, $t$, by calling out to the Orbix Security Service. The return value contains the SAML role and realm data for the token. |
Second Tier to Third Tier

The second tier is configured to support CSI identity assertion for outgoing connections, but not to send SAML data, with the following configuration settings:

```
policies:csi:attribute_service:client_supports =
    ["IdentityAssertion"];
plugins:gsp:assert_authorization_info = "false";
```

The third tier is configured to support CSI identity assertion from incoming connections, but not to accept SAML data, with the following settings:

```
policies:csi:attribute_service:target_supports =
    ["IdentityAssertion"];
plugins:gsp:accept_asserted_authorization_info = "false";
```
Optimising Retrieval of Realm Data

Overview

By default, when the GSP plug-in connects to the security service to authenticate a user’s security credentials, it retrieves all of the realm and role data for that user. For example, if a user has security data for realms, A, B, and C, the authentication step would return realm and role data for each of the three realms, A, B, and C.

In an enterprise system, the amount of realm data associated with each user might become very large. In such systems, it is desirable to optimize the authentication step by returning only the realm data that is needed at a particular point in the system, rather than retrieving all of the realm data at once. Orbix enables you to restrict the amount of realm data returned at the authentication step by enabling a feature known as realm filtering.

Enabling realm filtering

To enable realm filtering, set the following configuration variable to false:

```
plugins:gsp:retrieve_isf_auth_principal_info_for_all_realms
```

By default, the GSP plug-in would retrieve a user’s role and realm data for all realms when contacting the security service. When realm filtering is enabled in an Orbix server, however, the GSP plug-in checks to see whether the following configuration variable is set:

```
plugins:gsp:authorization_realm
```

If the preceding variable is set to a specific realm, the GSP plug-in proceeds to retrieve realm and role data for that realm only.
**Same-realm scenario**

*Figure 27* shows an example of realm filtering applied to a three-tier system, where the intermediate server and the target server both belong to the *same* realm, A. In this case, the realm filtering optimization works effectively, because the target server can re-use the role and realm data (SAML-A data) obtained by the intermediate server.

*Figure 27: Intermediate and Target Belong to Same Realm*

---

**Same-realm stages**

The same-realm scenario shown in *Figure 27* can be described as follows:

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The client calls out to the login service, passing in the client’s GSSUP credentials, u/p/d, in order to obtain a single sign-on token, t.</td>
</tr>
<tr>
<td>2</td>
<td>When the client invokes an operation on the intermediate server, the SSO token, t, is included with the request message (in the CSI authentication layer).</td>
</tr>
</tbody>
</table>
Same-realm configuration

Example 13 shows an outline of the configuration required for the same-realm scenario. The intermediate server is configured to use realm filtering by setting the `plugins:gsp:retrieve_isf_auth_principal_info_for_all_realms` variable to `false`. Both the intermediate and the target are configured to belong to realm A.

**Example 13: Same-Realm Scenario Configuration**

```
# Orbix Configuration File
client {
  ...
};

intermediate_server {
  ...
  plugins:gsp:retrieve_isf_auth_principal_info_for_all_realms = "false";
  plugins:gsp:authorization_realm = "A";
};

target_server {
  ...
  plugins:gsp:authorization_realm = "A";
};
```
**Different-realm scenario**

*Figure 28* shows an example of realm filtering applied to a three-tier system, where the intermediate server and the target server belong to *different* realms, A and B. In this case, realm filtering does not provide an optimization and the target server must be configured to re-authenticate any incoming tokens.

*Figure 28: Intermediate and Target Belong to Different Realms*

---

**Different-realm stages**

The different-realm scenario shown in *Figure 28* can be described as follows:

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The client calls out to the login service, passing in the client’s GSSUP credentials, u/p/d, in order to obtain a single sign-on token, t.</td>
</tr>
<tr>
<td>2</td>
<td>When the client invokes an operation on the intermediate server, the SSO token, t, is included with the request message (in the CSI authentication layer).</td>
</tr>
</tbody>
</table>
Example 14 shows an outline of the configuration required for the different-realm scenario. Both the intermediate server and the target server are configured to use realm filtering by setting the `plugins:gsp:retrieve_isf_auth_principal_info_for_all_realms` variable to `false`. The intermediate and the target belong, however, to different realms: while the intermediate belongs to realm A, the target belongs to realm B. To force the target server to re-authenticate incoming tokens (and thus retrieve the necessary SAML data for realm B), the target server configuration sets `plugins:gsp:accept_asserted_authorization_info` to `false`.

**Example 14: Different-Realm Scenario Configuration**

```
# Orbix Configuration File
client {
    ...
};

intermediate_server {
    ...
    plugins:gsp:retrieve_isf_auth_principal_info_for_all_realms = "false";
    plugins:gsp:authorization Realm = "A";
};
```
Example 14: Different-Realm Scenario Configuration

```yaml
};

target_server {
  ...
  plugins:gsp:retrieve_isf_auth_principal_info_for_all_realms = "false";
  plugins:gsp:authorization.realm = "B";
  plugins:gsp:accept_asserted_authorization_info = "false";
};
```
SSO Sample Configurations

Overview

This section provides SSO sample configurations that show how to configure the client side and the server side in a variety of different ways.

Client SSO configurations

The following client configurations appear in Example 15:

- **sso_client_x509**—configuration for an SSO client that uses X.509 certificate-based SSO credentials to authenticate itself to the server.
- **sso_client_gssup**—configuration for an SSO client that provides username and password (GSSUP)-based SSO credentials to authenticate itself to the server.
- **sso_client_gssup_x509**—configuration for an SSO client that can authenticate itself to a server using *either* username/password-based SSO credentials *or* X.509 certificate-based SSO credentials, depending on the requirements of the server.

Server SSO configurations

The following server configurations appear in Example 15:

- **auth_csi**—configuration for a server that requires the client to provide credentials over CSI. Three client scenarios are supported by this server configuration, as follows:
  - Client with username/password credentials (SSO not enabled).
  - Client with username/password-based SSO credentials.
  - Client with X.509 certificate-based SSO credentials.
- **auth_csi_and_x509**—configuration for a server that requires both X.509 certificate credentials (over SSL/TLS) and username/password credentials (over CSIv2). The following client scenarios are supported by this server configuration:
  - Client with both X.509 certificate credentials and username/password credentials (SSO not enabled).
  - Client with X.509 certificate-based SSO credentials.
  - Client with *both* X.509 certificate credentials and username/password-based SSO credentials.
SSO Sample Configurations

- Client with both X.509 certificate-based SSO credentials and username/password-based SSO credentials (for example, the sso_client_gssup_x509 configuration scope). In this case, the client would store three different kinds of credentials: X.509 certificate credentials, X.509 certificate-based SSO credentials, and username/password-based SSO credentials. Only two of the stored credentials would actually be used when communicating with the server (X.509 certificate credentials over SSL/TLS, and one of the SSO credentials over CSIv2).

SSO configuration examples

Example 15 shows a series of sample configurations suitable for SSO clients and SSO servers, supporting either GSSUP authentication, or X.509 certificate authentication, or both.

Example 15: SSO Client and Server Configuration Examples

```bash
# Orbix Configuration File
corba_login_server_test_with_tls
{
    principal_sponsor:use_principal_sponsor = "false";

    orb_plugins = ["local_log_stream", "iiop_profile", "giop", "iiop_tls", "gsp"];

    event_log:filters = ["IT_GSP=*", "IT_CSI=*", "IT_TLS=*", "IT_IIOPTLS=*", "IT_ATL12_TLS=*"];


    plugins:gsp:sso_server_certificate_constraints = ["C=US,ST=Massachusetts,O=ABigBank*,CN=Orbix2000 IONA Services"];

    sso_client_x509
    {
```
Example 15: SSO Client and Server Configuration Examples

```plaintext
policies:iiop_tls:client_secure_invocation_policy:supports = [
  "Integrity", "Confidentiality", "DetectReplay",
  "DetectMisordering", "EstablishTrustInTarget",
  "EstablishTrustInClient"];

policies:iiop_tls:client_secure_invocation_policy:requires = [
  "Integrity", "Confidentiality", "DetectReplay",
  "DetectMisordering"];

  principal_sponsor:use_principal_sponsor = "true";
  principal_sponsor:auth_method_id = "pkcs12_file";
  principal_sponsor:auth_method_data = [
    "filename=W:\art\etc\tls\x509\certs\demos\bob.p12",
    "password=bobpass"];

  plugins:csi:allow_csi_reply_without_service_context = "false";
  policies:csi:auth_over_transport:client_supports = [
    "EstablishTrustInClient"];

  plugins:gsp:enable_x509_sso = "true";
};

**sso_client_gssup**
{

  policies:iiop_tls:client_secure_invocation_policy:supports = [
    "Integrity", "Confidentiality", "DetectReplay",
    "DetectMisordering", "EstablishTrustInTarget"];

  policies:iiop_tls:client_secure_invocation_policy:requires = [
    "Integrity", "Confidentiality", "DetectReplay",
    "DetectMisordering"];

  plugins:csi:allow_csi_reply_without_service_context = "false";
  policies:csi:auth_over_transport:client_supports = [
    "EstablishTrustInClient"];

  principal_sponsor:csi:use_principal_sponsor = "true";
  principal_sponsor:csi:auth_method_id = "GSSUPMech";
  principal_sponsor:csi:auth_method_data = [
    "username=paulh", "password=password", "domain=PCGROUP"];
```
Example 15: SSO Client and Server Configuration Examples

```plaintext
plugins:gsp:enable_gssup_sso = "true";
};

ssos_client_gssup_x509
{
	policies:iiop_tls:client_secure_invocation_policy:supports =
		["Integrity", "Confidentiality", "DetectReplay",
		"DetectMisordering", "EstablishTrustInTarget",
		"EstablishTrustInClient"];
	policies:iiop_tls:client_secure_invocation_policy:requires =
		["Integrity", "Confidentiality", "DetectReplay",
		"DetectMisordering"];

 principally_sponsor:use_principal_sponsor = "true";
 principally_sponsor:auth_method_id = "pkcs12_file";
 principally_sponsor:auth_method_data =
		["filename=W:\art\etc\tls\x509\certs\demos\bob.p12",
		"password=bobpass"];

 plugins:csi:allow_csi_reply_without_service_context =
	"false";
 principally_sponsor:csi:use_principal_sponsor = "true";
 principally_sponsor:csi:auth_method_id = "GSSUPMech";
 principally_sponsor:csi:auth_method_data =
		["username=paulh", "password=password", "domain=PCGROUP"];

 plugins:gsp:enable_gssup_sso = "true";
 plugins:gsp:enable_x509_sso = "true";
};

tserver
{
		policies:csi:auth_over_transport:authentication_service =
		"com.iona.corba.security.csi.AuthenticationService";

 principally_sponsor:use_principal_sponsor = "true";
 principally_sponsor:auth_method_id = "pkcs12_file";
 principally_sponsor:auth_method_data =
		["filename=W:\art\etc\tls\x509\certs\demos\bank_server.p12",
		"password=bankserverpass"];
```
Example 15: SSO Client and Server Configuration Examples

```
binding:server_binding_list = ["CSI+GSP", "CSI", "GSP"];

initial_references:IS2Authorization:plugin = "it_is2_authorization";

plugins:it_is2_authorization:ClassName = "com.iona.corba.security.authorization.IS2AuthorizationPlugIn"

plugins:gsp:action_role_mapping_file = "file://W:\art\etc\tls\x509\..\..\..\art_svcs\etc\actionrolemapping_with_interfaces.xml"

plugins:gsp:authorization_realm = "AuthzRealm"

policies:csi:auth_over_transport:server_domain_name = "PCGROUP"

auth_csi
{

policies:iiop_tls:target_secure_invocation_policy:supports = ["Integrity", "Confidentiality", "DetectReplay", "DetectMisordering", "EstablishTrustInTarget"];

policies:iiop_tls:target_secure_invocation_policy:requires = ["Integrity", "Confidentiality", "DetectReplay", "DetectMisordering"];

policies:csi:auth_over_transport:targetRequires = ["EstablishTrustInClient"];

policies:csi:auth_over_transport:targetSupports = ["EstablishTrustInClient"];}

auth_csi_and_x509
{

policies:iiop_tls:target_secure_invocation_policy:supports = ["Integrity", "Confidentiality", "DetectReplay", "DetectMisordering", "EstablishTrustInTarget", "EstablishTrustInClient"];
```
Example 15: SSO Client and Server Configuration Examples

```plaintext
class SSOConfiguration {
    policies:iiop_tls.target_secure_invocation_policy:requires = [
        "Integrity", "Confidentiality", "DetectReplay",
        "DetectMisordering", "EstablishTrustInClient"];
    policies:csi.auth_over_transport.target_requires = [
        "EstablishTrustInClient"];
    policies:csi.auth_over_transport.target_supports = [
        "EstablishTrustInClient"];
};
```
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<td>167</td>
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<tr>
<td>Managing Access Control Lists</td>
<td>185</td>
</tr>
<tr>
<td>Securing Orbix Services</td>
<td>203</td>
</tr>
</tbody>
</table>
This chapter describes how to configure the properties of the Orbix security service and, in particular, how to configure a variety of adapters that can integrate the Orbix security service with third-party enterprise security back-ends (for example, LDAP).

In this chapter

This chapter discusses the following topics:

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</tbody>
</table>
Configuring the File Adapter

Overview

The iSF file adapter enables you to store information about users, roles, and realms in a flat file, a security information file. The file adapter is easy to set up and configure, but is appropriate for demonstration purposes only. This section describes how to set up and configure the iSF file adapter.

**WARNING:** The file adapter is provided for demonstration purposes only. Orbix does not support the use of the file adapter in a production environment.

File locations

The following files configure the iSF file adapter:

- **is2.properties** file—the default location of the iSF properties file is as follows:
  
  ```
  ASPInstallDir/etc/domains/DomainName/is2.properties
  ```

  See “iS2 Properties File” on page 515 for details of how to customize the default iSF properties file location.

- Security information file—this file’s location is specified by the
  
  ```
  com.iona.isp.adapter.file.param.filename
  ```

  property in the
  
  `is2.properties` file.

File adapter properties

Example 16 shows the properties to set for a file adapter.

**Example 16: Sample File Adapter Properties**

1. `com.iona.isp.adapters=file`

   `###############################`

   `## Demo File Adapter Properties`  

   `##`  

   `com.iona.isp.adapter.file.class=com.iona.security.is2adapter.file.FileAuthAdapter`  

   `com.iona.isp.adapter.file.param.filename=ASPInstallDir/etc/domains/DomainName/is2_user_password_role_file.txt`
Configuring the File Adapter

Example 16: Sample File Adapter Properties

The necessary properties for a file adapter are described as follows:

1. Set `com.iona.isp.adapters=file` to instruct the Orbix security service to load the file adapter.

2. The `com.iona.isp.adapter.file.class` property specifies the class that implements the iSF file adapter.

3. The `com.iona.isp.adapter.file.param.filename` property specifies the location of the security information file, which contains information about users and roles.

   See “Managing a File Security Domain” on page 181 for details of how to create or modify the security information file.

4. *(Optionally)* You might also want to edit the general Orbix security service properties.

   See “Additional Security Configuration” on page 162 for details.
Configuring the LDAP Adapter

Overview

The Orbix security platform integrates with the Lightweight Directory Access Protocol (LDAP) enterprise security infrastructure by using an LDAP adapter. The LDAP adapter is configured in an is2.properties file. This section discusses the following topics:

- Prerequisites
- File location.
- Minimal LDAP configuration.
- Basic LDAP properties.
- LDAP.param properties.
- LDAP server replicas.
- Logging on to an LDAP server.

Prerequisites

Before configuring the LDAP adapter, you must have an LDAP security system installed and running on your system. LDAP is not a standard part of Orbix, but you can use the Orbix security service’s LDAP adapter with any LDAP v.3 compatible system.

File location

The following file configures the LDAP adapter:

- is2.properties file—the default location of the iSF properties file is as follows:
  
  ASPInstallDir/etc/domains/DomainName/is2.properties

  See “iSF Properties File” on page 515 for details of how to customize the default iSF properties file location.
Configuring the LDAP Adapter

Minimal LDAP configuration

Example 17 shows the minimum set of iSF properties that can be used to configure an LDAP adapter.

Example 17: A Sample LDAP Adapter Configuration File

```
1 com.iona.isp.adapters=LDAP
2 #**************************************************************************
3 ## LDAP Adapter Properties
4 #**************************************************************************
5 com.iona.isp.adapter.LDAP.class=com.iona.security.is2adapterldap.LdapAdapter
6 com.iona.isp.adapter.LDAP.param.host.1=10.81.1.400
7 com.iona.isp.adapter.LDAP.param.host.2=10.81.1.401
8 com.iona.isp.adapter.LDAP.param.port.1=389
9 com.iona.isp.adapter.LDAP.param.UserNameAttr=uid
10 com.iona.isp.adapter.LDAP.param.UserBaseDN=dc=iona,dc=com
11 com.iona.isp.adapter.LDAP.param.UserObjectClass=organizationalPerson
12 com.iona.isp.adapter.LDAP.param.UserSearchScope=SUB
13 com.iona.isp.adapter.LDAP.param.UserRoleDNAttr=nsroledn
14 com.iona.isp.adapter.LDAP.param.RoleNameAttr=cn
15 com.iona.isp.adapter.LDAP.param.GroupNameAttr=cn
16 com.iona.isp.adapter.LDAP.param.GroupObjectClass=groupofuniqueNames
17 com.iona.isp.adapter.LDAP.param.GroupSearchScope=SUB
18 com.iona.isp.adapter.LDAP.param.GroupBaseDN=dc=iona,dc=com
19 com.iona.isp.adapter.LDAP.param.MemberDNAttr=uniqueMember
20 com.iona.isp.adapter.LDAP.param.version=3
```

The necessary properties for an LDAP adapter are described as follows:

1. Set `com.iona.isp.adapters=LDAP` to instruct the Orbix Security Platform to load the LDAP adapter.
2. The `com.iona.isp.adapter.file.class` property specifies the class that implements the LDAP adapter.
3. For each LDAP server replica, you must specify the host and port where the LDAP server can be contacted. In this example, the host and port parameters for the primary LDAP server, `host.1` and `port.1`, are specified.

4. These properties specify how the LDAP adapter finds a user name within the LDAP directory schema. The properties are interpreted as follows:

- **UserNameAttr**: The attribute type whose corresponding value uniquely identifies the user.
- **UserBaseDN**: The base DN of the tree in the LDAP directory that stores user object class instances.
- **UserObjectClass**: The attribute type for the object class that stores users.
- **UserSearchScope**: The user search scope specifies the search depth relative to the user base DN in the LDAP directory tree. Possible values are: `BASE`, `ONE`, or `SUB`.

See “iS2 Properties File” on page 515 for more details.

5. The following properties specify how the adapter extracts a user’s role from the LDAP directory schema:

- **UserRoleDNAttr**: The attribute type that stores a user’s role DN.
- **RoleNameAttr**: The attribute type that the LDAP server uses to store the role name.

6. These properties specify how the LDAP adapter finds a group name within the LDAP directory schema. The properties are interpreted as follows:

- **GroupNameAttr**: The attribute type whose corresponding attribute value gives the name of the user group.
- **GroupBaseDN**: The base DN of the tree in the LDAP directory that stores user groups.
- **GroupObjectClass**: The object class that applies to user group entries in the LDAP directory structure.
- **GroupSearchScope**: The group search scope specifies the search depth relative to the group base DN in the LDAP directory tree. Possible values are: `BASE`, `ONE`, or `SUB`. 
Configuring the LDAP Adapter

See “iS2 Properties File” on page 515 for more details.

7. The LDAP version number can be either 2 or 3, corresponding to LDAP v.2 or LDAP v.3 respectively.

### Basic LDAP properties

The following properties must always be set as part of the LDAP adapter configuration:

```plaintext
com.iona.isp.adapters=LDAP
com.iona.isp.adapter.LDAP.class=com.iona.security.is2adapter.ldap.LdapAdapter
```

In addition to these basic properties, you must also set a number of LDAP parameters, which are prefixed by `com.iona.isp.adapter.LDAP.param`.

### LDAP.param properties

Table 3 shows all of the LDAP adapter properties from the `com.iona.isp.adapter.LDAP.param` scope. Required properties are shown in bold:

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<tr>
<th>LDAP Server Properties</th>
<th>LDAP User/Role Configuration Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>host.&lt;Index&gt;</td>
<td>UserNameAttr</td>
</tr>
<tr>
<td>port.&lt;Index&gt;</td>
<td>UserBaseDN</td>
</tr>
<tr>
<td>SSLEnabled.&lt;Index&gt;</td>
<td>UserObjectClass</td>
</tr>
<tr>
<td>SSLCACertDir.&lt;Index&gt;</td>
<td>UserSearchScope</td>
</tr>
<tr>
<td>SSLClientCertFile.&lt;Index&gt;</td>
<td>UserSearchFilter</td>
</tr>
<tr>
<td>SSLClientCertPassword.&lt;Index&gt;</td>
<td>UserRoleDNAttr</td>
</tr>
<tr>
<td>PrincipalUserDN.&lt;Index&gt;</td>
<td>RoleNameAttr</td>
</tr>
<tr>
<td>PrincipalUserPassword.&lt;Index&gt;</td>
<td>UserCertAttrName</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LDAP Group/Member Configuration Properties</th>
<th>Other LDAP Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>GroupNameAttr</td>
<td>MaxConnectionPoolSize</td>
</tr>
<tr>
<td>GroupObjectClass</td>
<td>version</td>
</tr>
<tr>
<td>GroupSearchScope</td>
<td>UseGroupAsRole</td>
</tr>
<tr>
<td>GroupBaseDN</td>
<td>RetrieveAuthInfo</td>
</tr>
<tr>
<td>MemberDNAttr</td>
<td>CacheSize</td>
</tr>
<tr>
<td>MemberFilter</td>
<td>CacheTimeToLive</td>
</tr>
<tr>
<td>LDAP server replicas</td>
<td>The LDAP adapter is capable of failing over to one or more backup replicas of the LDAP server. Hence, properties such as host.&lt;em&gt;Index&lt;/em&gt; and port.&lt;em&gt;Index&lt;/em&gt; include a replica index as part of the parameter name. For example, host.1 and port.1 refer to the host and port of the primary LDAP server, while host.2 and port.2 would refer to the host and port of an LDAP backup server.</td>
</tr>
<tr>
<td>Logging on to an LDAP server</td>
<td>The following properties can be used to configure login parameters for the LDAP server replica: PrincipalUserDN.&lt;em&gt;Index&lt;/em&gt; PrincipalUserPassword.&lt;em&gt;Index&lt;/em&gt; The properties need only be set if the LDAP server is configured to require username/password authentication.</td>
</tr>
<tr>
<td>Secure connection to an LDAP server</td>
<td>The following properties can be used to configure SSL/TLS security for the connection between the Orbix security service and the LDAP server replica: SSLEnabled.&lt;em&gt;Index&lt;/em&gt; SSLCACertDir.&lt;em&gt;Index&lt;/em&gt; SSLClientCertFile.&lt;em&gt;Index&lt;/em&gt; SSLClientCertPassword.&lt;em&gt;Index&lt;/em&gt; The properties need only be set if the LDAP server requires SSL/TLS mutual authentication.</td>
</tr>
<tr>
<td>iSF properties reference</td>
<td>For more details about the Orbix security service properties, see “iS2 Configuration” on page 513.</td>
</tr>
</tbody>
</table>
Clustering and Federation

Overview

Clustering and federation are two distinct, but related, features of the Orbix security service. Briefly, these features can be described as follows:

- **Clustering**—involves running several instances of the Orbix security service to provide what is effectively a single service. By running multiple security service instances as a cluster, Orbix enables you to support fault tolerance and replication features. Typically, in this case all of the security services in a cluster are integrated with a single authentication database back-end.

- **Federation**—enables SSO tokens to be recognized across multiple security domains. Each security domain is served by a distinct security service instance and each security service is integrated with a different database back-end.

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Federating the Orbix Security Service

Overview
Federation is meant to be used in deployment scenarios where there is more than one instance of an Orbix security service. By configuring the Orbix security service instances as a federation, the security services can talk to each other and access each other’s session caches. Federation frequently becomes necessary when single sign-on (SSO) is used, because an SSO token can be verified only by the security service instance that originally generated it.

Federation is not clustering
Federation is not the same thing as clustering. In a federated system, user data is not replicated across different security service instances and there are no fault tolerance features provided.

Example federation scenario
Consider a simple federation scenario consisting of two security domains, each with their own Orbix security service instances, as follows:

• First LDAP security domain—consists of an Orbix security service (with is2.current.server.id property equal to 1) configured to store user data in an LDAP database. The domain includes any Orbix applications that use this Orbix security service (ID=1) to verify credentials.

  In this domain, a login server is deployed which enables clients to use single sign-on.

• Second LDAP security domain—consists of an Orbix security service (with is2.current.server.id property equal to 2) configured to store user data in an LDAP database. The domain includes any Orbix applications that use this Orbix security service (ID=2) to verify credentials.

The two Orbix security service instances are federated, using the configuration described later in this section. With federation enabled, it is possible for single sign-on clients to make invocations that cross security domain boundaries.
Federation scenario

Figure 29 shows a typical scenario that illustrates how iSF federation might be used in the context of an Orbix system.

Figure 29: An iSF Federation Scenario

First LDAP Security Domain

Second LDAP Security Domain
Federation scenario steps

The federation scenario in Figure 29 can be described as follows:

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>With single sign-on (SSO) enabled, the client calls out to the login service, passing in the client’s GSSUP credentials, u/p/d, in order to obtain an SSO token, t.</td>
</tr>
<tr>
<td>2</td>
<td>The login service delegates authentication to the Orbix security server (ID=1), which retrieves the user’s account data from the LDAP backend.</td>
</tr>
<tr>
<td>3</td>
<td>The client invokes an operation on the Target A, belonging to the first LDAP security domain. The SSO token, t, is included in the message.</td>
</tr>
<tr>
<td>4</td>
<td>Target A passes the SSO token to the Orbix security server (ID=1) to be authenticated. If authentication is successful, the operation is allowed to proceed.</td>
</tr>
<tr>
<td>5</td>
<td>Subsequently, the client invokes an operation on the Target B, belonging to the second LDAP security domain. The SSO token, t, obtained in step 1 is included in the message.</td>
</tr>
<tr>
<td>6</td>
<td>Target B passes the SSO token to the second Orbix security server (ID=2) to be authenticated.</td>
</tr>
<tr>
<td>7</td>
<td>The second Orbix security server examines the SSO token. Because the SSO token is tagged with the first Orbix security server’s ID (ID=1), verification of the token is delegated to the first Orbix security server. The second Orbix security server opens an IIOP/TLS connection to the first Orbix security service to verify the token.</td>
</tr>
</tbody>
</table>
Configuring the is2.properties files

Each instance of the Orbix security service should have its own is2.properties file. Within each is2.properties file, you should set the following:

- `is2.current.server.id`—a unique ID (alphanumeric string) for this Orbix security service instance,
- `is2.cluster.properties.filename`—a shared cluster file.
- `is2.sso.remote.token.cached`—a boolean property enables caching of remote token credentials in a federated system.

With caching enabled, the call from one federated security service to another (step 7 of Figure 29 on page 147) is only necessary to authenticate a token for the first time. For subsequent authentications, the security service (with ID=2) can obtain the token’s security data from its own token cache.

For example, the first Orbix security server instance from Figure 29 on page 147 could be configured as follows:

```
# iS2 Properties File, for Server ID=1
...
############################
## iSF federation related properties
############################
is2.current.server.id=1
is2.cluster.properties.filename=C:/is2_config/cluster.properties
is2.sso.remote.token.cached=true
...
```

And the second Orbix security server instance from Figure 29 on page 147 could be configured as follows:

```
# iS2 Properties File, for Server ID=2
...
############################
## iSF federation related properties
############################
is2.current.server.id=2
is2.cluster.properties.filename=C:/is2_config/cluster.properties
is2.sso.remote.token.cached=true
...
```
Configuring the cluster properties file

All the Orbix security server instances within a federation should share a cluster properties file. For example, the following extract from the `cluster.properties` file shows how to configure the pair of embedded Orbix security servers shown in Figure 29 on page 147.

This assumes that the first security service (ID=1) runs on host `security_ldap1` and IP port 5001; the second security service (ID=2) runs on host `security_ldap2` and IP port 5002. To discover the appropriate host and port settings for the security services, check the `plugins:security:iiop_tls` settings in the relevant configuration scope in the relevant Orbix configuration file for each federated security service.

The `securityInstanceURL.ServerID` variable advertises the location of a security service in the cluster. Normally, the most convenient way to set these values is to use the `corbaloc` URL format.

Sample cluster properties file

If you have generated a secure configuration domain, `DomainName`, on a host, `HostName`, you can then find a sample `cluster.properties` file in the following directory:

```
OrbixInstallDir/etc/domains/DomaingName/security_HostName/
```
Overview

To support high availability of the Orbix security service, Orbix implements the following features:

- **Failover**—the security service is contacted using an IOR that contains the address of *every* security service in a cluster. Hence, if one of the services in the cluster crashes, or otherwise becomes unavailable, an application can automatically try one of the alternative addresses listed in the IOR.

- **Replication**—the data cache associated with single sign-on (SSO) sessions can be replicated to other security services in the cluster. This ensures that SSO session data is not lost if one member of the cluster should become unavailable.

This subsection describes how to configure failover and replication by hand.
Failover scenario

Example 30 shows a scenario for a highly available Orbix security service that consists of a cluster of three security services, each with an embedded login service. The security and login services run on separate hosts, security01, security02, and security03 respectively, and all of the services rely on the same third-party LDAP database to store their user data.

Figure 30: Failover Scenario for a Cluster of Three Security Services

In this scenario, it is assumed that both the client and the target application are configured to perform random load balancing over the security services in the cluster (see “Client Load Balancing” on page 160 for details). Each of the security services in the cluster are configured for failover and replication.
The interaction of the client and target with the security service cluster shown in Example 30 on page 152 can be described as follows:

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Assuming the client is configured to use single sign-on (SSO), it will automatically contact the login service (which is part of the security service) to obtain an SSO token. Because the client is configured to perform random load balancing, it chooses one of the addresses from the IT_Login IOR at random and opens a connection to that login service.</td>
</tr>
<tr>
<td>2</td>
<td>The client invokes an operation on the target, sending the SSO token obtained in the previous step with the request.</td>
</tr>
<tr>
<td>3</td>
<td>The target server checks the SSO token received from the client by sending an invocation to the security service cluster. If the target server already has an existing connection with a service in the cluster, it re-uses that connection. Otherwise, the target randomly picks an address from the list of addresses in the IT_SecurityService IOR.</td>
</tr>
</tbody>
</table>

**Configuring the is2.properties file**

Each instance of the Orbix security service should have its own is2.properties file. Within each is2.properties file, you should set the following:

- `is2.current.server.id`—a unique ID (alphanumeric string) for this Orbix security service instance,
- `is2.cluster.properties.filename`—a shared cluster file.
- `is2.replication.required`—must be set to true.
- `is2.replica.selector.classname`—you must set this variable as shown in the example.
For example, the first Orbix security server instance from Figure 30 on page 152 could be configured as follows:

```
# iS2 Properties File, for Server ID=1
...
# iSF federation related properties
##############################################
is2.current.server.id=1
is2.cluster.properties.filename=C:/is2_config/cluster.properties
is2.replication.required=true
is2.replication.interval=20
is2.replica.selector.classname=com.iona.security.replicate.StaticReplicaSelector
...
```

The second and third Orbix security services from Figure 30 on page 152 should be configured similarly, except that the `is2.current.server.id` property should be set to 2 and 3 respectively.

---

**Configuring the cluster properties file**

For the three-service cluster shown in Figure 30 on page 152, you could configure the `cluster.properties` file as follows:

```
# Advertise the locations of the security services in the cluster.
com.iona.security.common.securityInstanceURL.1=corbaloc:it_iiops:1.2@security01:5001/IT_SecurityService
com.iona.security.common.securityInstanceURL.2=corbaloc:it_iiops:1.2@security02:5002/IT_SecurityService
com.iona.security.common.securityInstanceURL.3=corbaloc:it_iiops:1.2@security03:5003/IT_SecurityService

# Configure replication between security services.
com.iona.security.common.replicaURL.1=corbaloc:it_iiops:1.2@security02:5002/IT_SecurityService,corbaloc:it_iiops:1.2@security03:5003/IT_SecurityService
com.iona.security.common.replicaURL.2=corbaloc:it_iiops:1.2@security03:5003/IT_SecurityService,corbaloc:it_iiops:1.2@security01:5001/IT_SecurityService
com.iona.security.common.replicaURL.3=corbaloc:it_iiops:1.2@security01:5001/IT_SecurityService,corbaloc:it_iiops:1.2@security02:5002/IT_SecurityService
```

There are two groups of settings in this file:

- `securityInstanceURL.ServerID`—advertises the location of a security service in the cluster. Normally, the most convenient way to set these values is to use the `corbaloc` URL format.
• **replicaURL.ServerID**—a list of URLs for the other security services to which this service replicates its data.

For example, the `replicaURL.1` setting lists URLs for the security service with ID=2 and the security service with ID=3. Hence, the first service in the cluster is configured to replicate its data to the second and third services. Normally, each security service should replicate to all of the other services in the cluster.

---

**Example 18** shows the details of the Orbix configuration for the first Orbix security service in the cluster. To configure this security service to support failover, you must ensure that the security service’s IOR contains a list addresses for all of the services in the cluster.

**Example 18: Orbix Security Service Configuration for Failover**

```
# Orbix Configuration File

initial_references:IT_SecurityService:reference =
  "IOR:010000002400000049444c3a696f6e612e636f6d2f49545f53656375726974792f5365727665723a312e3000010000000000000000000920000001010
  20008000006626f6c74616e0000000000220000003a0233310536565
  757269749001249545f53656375726974953657276696365000000400000
  014000000080000001007e005e0078cf00000000008000000010000000415f
  5449010000001e0000000100000001000100010000000100010509010100
  100000000101006000000006000000010000000e00";
initial_references:IT_Login:reference =
  "IOR:010000002300000049444c3a696f6e612e636f6d2f49545f53656375
  726974924c6f67696e3a3312a0000000100000000000000000000000001010
  20008000006626f6c74616e0000000000180000003a0233310536565
  757269749000849545f4c6f67696e040000001400000000800000001007e0
  01e0078cf0000000008000000010000000415f5449010000001c0000000100
  000010010001000000010001059010100100010000000010000000e00"

iona_services {
  ...
  principal_sponsor:use_principal_sponsor = "true";
  principal_sponsor:auth_method_id = "pkcs12_file";
  principal_sponsor:auth_method_data = ["filename=PKCS12File",
"password_file=CertPasswordFile"];

  policies:client_secure_invocation_policy:requires =
    ["Confidentiality", "EstablishTrustInTarget",
    "DetectMisordering", "DetectReplay", "Integrity"];
```
Example 18: Orbix Security Service Configuration for Failover

```plaintext
policies:client_secure_invocation_policy:supports = [
  "Confidentiality", "EstablishTrustInClient",
  "EstablishTrustInTarget", "DetectMisordering",
  "DetectReplay", "Integrity"];

security {
  Hostname {
    ...,
    plugins:security_cluster:iiop_tls:addr_list = [
      "+security01:5001", "+security02:5002", "+security03:5003"];
    plugins:security:iiop_tls:host = "5001";
    plugins:security:iiop_tls:port = "security01";
    policies:iiop_tls:target_secure_invocation_policy:requires = [
      "Integrity", "Confidentiality", "DetectReplay",
      "DetectMisordering", "EstablishTrustInClient"];
    policies:iiop_tls:target_secure_invocation_policy:supports = [
      "Integrity", "Confidentiality", "DetectReplay",
      "DetectMisordering", "EstablishTrustInTarget",
      "EstablishTrustInClient"];
    ...,
  };
}):
```

The preceding Orbix configuration can be explained as follows:

1. The IT_SecurityService initial reference is read by Orbix applications to locate the cluster of Orbix security services. Embedded in this IOR is a list of addresses for all of the security services in the cluster. This IOR is generated by the Orbix security service when it is run in prepare mode.

Note: You can parse the contents of the stringified IOR using the iordump tool.
2. The Orbix security service picks up most of its SSL/TLS security settings from the iona_services scope. In particular, the default configuration of the security service uses the X.509 certificate specified by the principal_sponsor settings in this scope.

3. The plugins:security_cluster:iiop_tls:addr_list variable lists the addresses for all of the security services in the cluster. Each address in the list is preceded by a + sign, which indicates that the service embeds the address in its generated IORs.

   **Note:** The plugins:security_cluster:iiop_tls:addr_list setting also configures the embedded login service.

4. The plugins:security:iiop_tls:host and plugins:security:iiop_tls:port settings specify the address where the security service listens for incoming IIOP/TLS request messages.

---

**Orbix configuration for other services in the cluster**

The configuration for other services in the cluster is similar, except that the plugins:security:iiop_tls:host and plugins:security:iiop_tls:port variables should be changed to the appropriate host and port for each of the replicas.
Example 31 on page 158 shows how replication works in a cluster of three Orbix security services. If replication is enabled (that is, `is2.replication.required` is set to `true` in the `is2.properties` file), a security service pushes its data cache to the other services in the cluster every 30 seconds (default replication interval).

Figure 31: Replication of Data Caches in a Security Service Cluster

Security service replication has the following characteristics:

- The security service pushes the following data to the other services:
  - SSO tokens that have been added since the last replication.
  - Realm and role data for each of the new SSO tokens.
- Note, however, that the security service does not replicate username and password data. Therefore, replication is only relevant to applications that use the SSO feature.
Modifying the replication interval

You can modify the replication interval by setting the `is2.replication.interval` property in the `is.properties` file for the relevant service. If this variable is not set, the default replication interval is 30 seconds.

For example, to configure the security service with ID=1 to replicate data once every 10 seconds, its `is2.properties` file would be configured as follows:

```plaintext
# iS2 Properties File, for Server ID=1
...
###############################################################
## iSF federation related properties
###############################################################
is2.current.server.id=1
is2.cluster.properties.filename=C:\is2_config\cluster.properties
is2.replication.required=true
**is2.replication.interval=10**
is2.replica.selector.classname=com.iona.security.replicate.StaticReplicaSelector
...
```
Client Load Balancing

Overview

When you use a clustered security service, it is important to configure all of the other applications in the system (clients and servers) to perform client load balancing (in this context, client means a client of the Orbix security service and thus includes ordinary Orbix servers as well). This ensures that the client load is evenly spread over all of the security services in the cluster.

Client load balancing is enabled by default.

Configuration for load balancing

Example 19 shows an outline of the configuration for a client of a security service cluster. Such clients must be configured to use random load balancing to ensure that the load is spread evenly over the servers in the cluster. The settings highlighted in bold should be added to the application’s configuration scope.

Example 19: Configuration for Client of a Security Service Cluster

```bash
# Orbix Configuration File
...
load_balanced_app {
    ...
    plugins:gsp:use_client_load_balancing = "true";
    policies:iiop_tls:load_balancing_mechanism = "random";
};
```
Client load balancing mechanism

The client load balancing mechanism is selected by setting the policies:iiop_tls:load_balancing_mechanism variable. Two mechanisms are supported, as follows:

- **random**—choose one of the addresses embedded in the IOR at random (this is the default).

  **Note:** This is the only mechanism suitable for use in a deployed system.

- **sequential**—choose the first address embedded in the IOR, moving on to the next address in the list only if the previous address could not be reached.

  In general, this mechanism is not recommended for deployed systems, because it usually results in all of the client applications connecting to the first cluster member.
Additional Security Configuration

Overview
This section describes how to configure optional features of the Orbix security service, such as single sign-on and the authorization manager. These features can be combined with any iSF adapter type.

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Configuring Single Sign-On Properties

Overview

The Orbix Security Framework provides an optional single sign-on (SSO) feature. If you want to use SSO with your applications, you must configure the Orbix security service as described in this section. SSO offers the following advantages:

- User credentials can easily be propagated between applications in the form of an SSO token.
- Performance is optimized, because the authentication step only needs to be performed once within a distributed system.
- Because the user’s session is tracked centrally by the Orbix security service, it is possible to impose timeouts on the user sessions and these timeouts are effective throughout the distributed system.

SSO tokens

The login service generates an SSO token in response to an authentication operation. The SSO token is a compact key that the Orbix security service uses to access a user’s session details, which are stored in a cache.

SSO properties

Example 20 shows the iSF properties needed for SSO:

Example 20: Single Sign-On Properties

```bash
# isF Properties File
...
#########################################################################
## Single Sign On Session Info
#########################################################################
1 is2.sso.enabled=yes
2 is2.sso.session.timeout=6000
3 is2.sso.session.idle.timeout=300
4 is2.sso.cache.size=10000
```

The SSO properties are described as follows:

1. Setting this property to yes enables single sign-on.
2. The SSO session timeout sets the lifespan of SSO tokens, in units of seconds. Once the specified time interval elapses, the token expires.
3. The SSO session idle timeout sets the maximum length of time for which an SSO session can remain idle, in units of seconds. If the Orbix security service registers no activity against a particular session for this amount of time, the session and its token expire.

4. The size of the SSO cache, in units of number of sessions.

**Related administration tasks**

For details of how to configure CORBA applications to use SSO, see “Single Sign-On for CORBA Applications” on page 95.
## Configuring the Log4J Logging

### Overview

log4j is a third-party toolkit from the Jakarta project, [http://jakarta.apache.org/log4j](http://jakarta.apache.org/log4j), that provides a flexible and efficient system for capturing logging messages from an application. Because the Orbix security service’s logging is based on log4j, it is possible to configure the output of Orbix security service logging using a standard log4j properties file.

### log4j documentation

For complete log4j documentation, see the following Web page:


### Enabling log4j logging

To enable log4j logging, you can specify the location of the log4j properties file in either of the following ways:

- In the system_properties list.
- In the SECURITY_CLASSPATH.

### In the system_properties list

You can specify the location of the log4j properties file by setting the `com.iona.common.log4j.Log4JUtils.filename` property in the `plugins:java_server:system_properties` list in the security service configuration. For example, to use the `/is2_config/log4j.properties` file, modify the security service configuration by extending its system properties list as follows:

```bash
# Orbix Configuration File
# In the security service configuration scope:
plugins:java_server:system_properties = [...,
    "com.iona.common.log4j.Log4JUtils.filename=/is2_config/log4j.properties"];
```

### In the SECURITY_CLASSPATH

You can specify the location of the log4j properties file by adding it to the `SECURITY_CLASSPATH` variable in the Orbix configuration file (the separator between items in the classpath is ; on Windows platforms and : on UNIX platforms).
The following example shows how to configure the log4j properties to perform basic logging. In this example, the lowest level of logging is switched on (DEBUG) and the output is sent to the console screen.

```
# log4j Properties File
log4j.rootCategory=DEBUG, A1

# A1 is set to be a ConsoleAppender.

# A1 uses PatternLayout.
log4j.appender.A1.layout.ConversionPattern=%-4r [%t] %-5p %c %x - %m%n
```
The Orbix security service provides a variety of adapters that enable you to integrate the Orbix Security Framework with third-party enterprise security products. This allows you to manage users and roles using a third-party enterprise security product.

In this chapter

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<td>Managing an LDAP Security Domain</td>
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Introduction to Domains and Realms

Overview
This section introduces the concepts of an iSF security domain and an iSF authorization realm, which are fundamental to the administration of the Orbix Security Framework. Within an iSF security domain, you can create user accounts and within an iSF authorization realm you can assign roles to users.

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### iSF Security Domains

#### Overview
This subsection introduces the concept of an iSF security domain.

#### iSF security domain
An *iSF security domain* is a particular security system, or namespace within a security system, designated to authenticate a user.

Here are some specific examples of iSF security domains:
- LDAP security domain—authentication provided by an LDAP security backend, accessed through the Orbix security service.

#### Domain architecture
*Figure 32* shows the architecture of an iSF security domain. The iSF security domain is identified with an enterprise security service that plugs into the Orbix security service through an iSF adapter. User data needed for authentication, such as username and password, are stored within the enterprise security service. The Orbix security service provides a central access point to enable authentication within the iSF security domain.

*Figure 32: Architecture of an iSF Security Domain*
Creating an iSF security domain

Effectively, you create an iSF security domain by configuring the Orbix security service to link to an enterprise security service through an iSF adapter (such as an LDAP adapter). The enterprise security service is the implementation of the iSF security domain.

Creating a user account

Because user account data is stored in a third-party enterprise security service, you use the standard tools from the third-party enterprise security product to create a user account.

For a simple example, see “Managing a File Security Domain” on page 181.
# iSF Authorization Realms

## Overview

This subsection introduces the concept of an iSF authorization realm and role-based access control, explaining how users, roles, realms, and servers are interrelated.

## iSF authorization realm

An *iSF authorization realm* is a collection of secured resources that share a common interpretation of role names. An authenticated user can have different roles in different realms. When using a resource in realm $R$, only the user's roles in realm $R$ are applied to authorization decisions.

## Role-based access control

The Orbix security framework supports a *role-based access control* (RBAC) authorization scheme. Under RBAC, authorization is a two step process, as follows:

1. **User-to-role mapping**—every user is associated with a set of roles in each realm (for example, *guest*, *administrator*, and so on, in a realm, *Engineering*). A user can belong to many different realms, having a different set of roles in each realm.

   The user-to-role assignments are managed centrally by the Orbix security service, which returns the set of realms and roles assigned to a user when required.

2. **Role-to-permission mapping** (or action-role mapping)—in the RBAC model, permissions are granted to *roles*, rather than directly to users. The role-to-permission mapping is performed locally by a server, using data stored in local access control list (ACL) files. For example, CORBA servers in the iSF use an XML action-role mapping file to control access to IDL interfaces, operation, and attributes.
Servers and realms

From a server’s perspective, an iSF authorization realm is a way of grouping servers with similar authorization requirements. Figure 33 shows two iSF authorization realms, Engineering and Finance, each containing a collection of server applications.

Adding a server to a realm

To add a server to a realm, add or modify the `plugins:gsp:authorization_realm` configuration variable within the server’s configuration scope (either in the `DomainName.cfg` file or in the CFR server).

For example, if your server’s configuration is defined in the `my_server_scope` scope, you can set the iSF authorization realm to `Engineering` as follows:

```
# Orbix configuration file
...
my_server_scope {
    plugins:gsp:authorization_realm = "Engineering";
    ...
};
```
Roles and realms

From the perspective of role-based authorization, an iSF authorization realm acts as a namespace for roles. For example, Figure 34 shows two iSF authorization realms, Engineering and Finance, each associated with a set of roles.

Creating realms and roles

Realms and roles are usually administered from within the enterprise security system that is plugged into the Orbix security service through an adapter. Not every enterprise security system supports realms and roles, however.

For example, in the case of a security file connected to a file adapter (a demonstration adapter provided by Orbix), a realm or role is implicitly created whenever it is listed amongst a user’s realms or roles. See also “Assigning realms and roles to the example users” on page 175.

Assigning realms and roles to users

The assignment of realms and roles to users is administered from within the enterprise security system that is plugged into the Orbix security service. For example, Figure 35 shows how two users, Janet and John, are assigned roles within the Engineering and Finance realms.

- Janet works in the engineering department as a developer, but occasionally logs on to the Finance realm with guest permissions.
• John works as an accountant in finance, but also has guest permissions with the Engineering realm.

Special realms and roles

The following special realms and roles are supported by the Orbix Security Framework:

- IONAGlobalRealm—a special realm that encompasses every iSF authorization realm. Roles defined within the IONAGlobalRealm are valid within every iSF authorization realm.

- UnauthenticatedUserRole—a special role that can be used to specify actions accessible to an unauthenticated user (in an action-role mapping file). An unauthenticated user is a remote user without credentials (that is, where the client is not configured to send GSSUP credentials).

Actions mapped to the UnauthenticatedUserRole role are also accessible to authenticated users.

The UnauthenticatedUserRole can be used only in action-role mapping files.
Example Domain and Realms

Overview
This subsection presents an example of how to set up an iSF security domain using a file domain. Sample iSF authorization realms, roles, and users are created, and the authorization process is explained by example.

File domain
In this example, the iSF security domain is configured to be a file domain. A file domain is a simple file-based security domain that can be used for tests or demonstrations. The user data is then stored in an XML security file. For details of how to configure a file domain, see “Managing a File Security Domain” on page 181.

Example users
The following users are created in the file domain for this example:
• Janet—with username, Janet, and password, JanetPass.
• John—with username, John, and password, JohnPass.
• SuperUser—with username, SuperUser, and password, BigSecret.

Assigning realms and roles to the example users
The following realms and roles are assigned to the users, Janet, John, and SuperUser (where realms and roles are notated in the format RealmA { roleA1, roleA2, ..., roleAn}):
• Janet—is assigned the following realms and roles:
  ♦ Engineering {developer, admin}
  ♦ IONAGlobalRealm {guest}
• John—is assigned the following realms and roles:
  ♦ Finance {accountant}
  ♦ IONAGlobalRealm {guest}
• SuperUser—is assigned the following realm and role:
  ♦ IONAGlobalRealm {admin}
Sample security file for the file domain

Within a file domain, you specify the user authentication data (username and password) as well as the realm/role assignments within the same XML security file. The preceding user data can be specified in a security file as follows:

```xml
<?xml version="1.0" encoding="utf-8" ?>
<ns:securityInfo xmlns:ns="urn:www-xmlbus-com:simple-security">
  <users>
    <user name="Janet" password="JanetPass"
      description="Developer">
      <realm name="Engineering">
        <role name="developer"/>
        <role name="admin"/>
      </realm>
      <realm name="IONAGlobalRealm" description="All realms">
        <role name="guest"/>
      </realm>
    </user>
    <user name="John" password="JohnPass"
      description="Accountant">
      <realm name="Finance">
        <role name="accountant"/>
      </realm>
      <realm name="IONAGlobalRealm" description="All realms">
        <role name="guest"/>
      </realm>
    </user>
    <user name="SuperUser" password="BigSecret"
      description="All powerful user!">
      <realm name="IONAGlobalRealm" description="All realms">
        <role name="admin" description="All actions"/>
      </realm>
    </user>
  </users>
</ns:securityInfo>
```
Sample server configuration

Consider, for example, the CORBA naming service in the Engineering iSF authorization realm. To configure this naming service, edit the variables in the iona_services.naming scope in the DomainName.cfg configuration file. Set the authorization realm to Engineering and specify the location of the action-role mapping file, as follows:

```plaintext
# Orbix configuration file
... 
iona_services {
  ...
  naming {
    plugins:gsp:authorization_realm = "Engineering";
    plugins:is2_authorization:action_role_mapping =
      "file:///security/eng_naming_arm.xml";
  };
... 
};
```

Sample ACL file

The eng_naming_arm.xml action-role mapping file, which specifies permissions for the naming service in the Engineering domain, could be defined as follows:

```xml
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE secure-system SYSTEM
  "actionrolemapping_with_interfaces.dtd">
<secure-system>
  <allow-unlisted-interfaces>true</allow-unlisted-interfaces>
  <action-role-mapping>
    <server-name>iona_services.naming</server-name>
    <interface>
      <name>IDL:omg.org/CosNaming/NamingContext:1.0</name>
      <action-role>
        <action-name>*</action-name>
        <role-name>developer</role-name>
      </action-role>
      <action-role>
        <action-name>resolve</action-name>
        <role-name>guest</role-name>
      </action-role>
    </interface>
  </action-role-mapping>
</secure-system>
```
### Authorization process

When user John attempts to invoke an operation on the CORBA naming service in the Engineering domain, authorization proceeds as follows:

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The naming service contacts the Orbix security service remotely to authenticate John’s username and password.</td>
</tr>
</tbody>
</table>
| 2     | If authentication is successful, the Orbix security service returns the complete list of realms and roles assigned to John. In the current example, the following realms and roles would be returned:  
  - Finance {accountant}  
  - IONAGlobalRealm {guest} |
| 3     | The naming service determines which roles are applicable to John in the current iSF authorization realm. Because the naming service belongs to the Engineering realm, only the guest role from the IONAGlobalRealm is applicable here. |
| 4     | The naming service now checks the `eng_naming_arm.xml` action-role mapping file and finds that only the `resolve` and `list` actions are permitted on the `CosNaming::NamingContext` IDL interface for the guest role.  
  
  On the other hand, if the user, John, attempts to call an operation (or attribute) on any other naming service interface, the call would be permitted, because the `<allow-unlisted-interfaces>` option is true in the action-role mapping file.  
  
  **Note:** The special `<allow-unlisted-interfaces>` tag is a useful shortcut, but you should use it carefully to avoid opening a security hole. |
Domain and Realm Terminology

Overview

The terms *domain* and *realm* appear in several security technology specifications with different (and sometimes contradictory) meanings. This subsection attempts to clarify some of the domain and realm terminology and provides a comparison with the Orbix Security Framework terms.

Comparison of terminology

To clarify the terminology used by different technology specifications (all of which are embraced by the iSF) Table 4 lists the generic iSF terms against their technology-specific equivalents:

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<th>Generic iSF Term</th>
<th>Technology-Specific Equivalents</th>
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<td>J2EE security technology domain</td>
</tr>
<tr>
<td></td>
<td>J2EE security policy domain (1)</td>
</tr>
<tr>
<td></td>
<td>J2EE realm (2)</td>
</tr>
<tr>
<td></td>
<td>JAAS authentication realm</td>
</tr>
<tr>
<td></td>
<td>CSIV2 authentication domain</td>
</tr>
<tr>
<td></td>
<td>HTTP login realm</td>
</tr>
<tr>
<td>iSF authorization realm</td>
<td>J2EE security policy domain (1)</td>
</tr>
<tr>
<td></td>
<td>J2EE realm (2)</td>
</tr>
</tbody>
</table>

1. The term, J2EE security policy domain, appears in both rows because it is a general term that embodies both an authentication domain and an authorization domain.

2. J2EE realm means the same thing as J2EE security policy domain.

J2EE security technology domain

The J2EE specification defines a *J2EE security technology domain* as follows:

The scope over which a single security mechanism is used to enforce a security policy. Multiple security policy domains can exist within a single technology domain.
<table>
<thead>
<tr>
<th>J2EE security policy domain</th>
<th>The J2EE specification defines a <em>J2EE security policy domain</em> as follows: A realm, also called a security policy domain or security domain in the J2EE specification, is a scope over which a common security policy is defined and enforced by the security administrator of the security service.</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2EE realm</td>
<td>A <em>J2EE realm</em> is the same thing as J2EE security policy domain.</td>
</tr>
<tr>
<td>JAAS authentication realm</td>
<td>A Java Authentication and Authorization Service (JAAS) authentication realm is a namespace for JAAS principals.</td>
</tr>
<tr>
<td>CSIv2 authentication domain</td>
<td>A <em>CSIv2 authentication domain</em> is a named domain in which CSIv2 authentication data (for example, username and password) is authenticated.</td>
</tr>
<tr>
<td>HTTP login realm</td>
<td>When a user logs on to a Web client through a standard HTTP login mechanism (for example, HTTP basic authentication or HTTP form-based authentication), the user is prompted for a username, password, and login realm name. The login realm name, along with the user’s username and password, is the sent to the Web server.</td>
</tr>
</tbody>
</table>
Managing a File Security Domain

Overview

The file security domain is active if the Orbix security service has been configured to use the iSF file adapter (see “Configuring the File Adapter” on page 138). The main purpose of the iSF file adapter is to provide a lightweight security domain for demonstration purposes. A realistic deployed system, however, would use one of the other adapters (LDAP or custom) instead.

**WARNING:** The file adapter is provided for demonstration purposes only. Orbix does not support the use of the file adapter in a production environment.

Location of file

The location of the security information file is specified by the com.iona.isp.adapter.file.param.filename property in the Orbix security service’s is2.properties file.

Example

Example 21 is an extract from a sample security information file that shows you how to define users, realms, and roles in a file security domain.

**Example 21:** Sample Security Information File for an iSF File Domain

```xml
<?xml version="1.0" encoding="utf-8" ?>

<ns:securityInfo xmlns:ns="urn:www-xmlbus-com:simple-security">
  <users>
    <user name="IONAAdmin" password="admin"
          description="Default IONA admin user">
      <realm name="IONA" description="All IONA applications"/>
    </user>
    <user name="admin" password="admin" description="Old admin user; will not have the same default privileges as IONAAdmin.">
      <realm name="Corporate">
        <role name="Administrator"/>
      </realm>
    </user>
    <user name="alice" password="dost1234">
      <realm name="Financials" description="Financial Department">
        <role name="Manager" description="Department Manager" />
      </realm>
    </user>
  </users>
</ns:securityInfo>
```
Example 21: Sample Security Information File for an iSF File Domain

```xml
<role name="Clerk"/>
</realm>
</user>
<user name="bob" password="dost1234">
  <realm name="Financials">
    <role name="Clerk"/>
  </realm>
</user>
</users>
</ns:securityInfo>
```

1. The `<ns:securityInfo>` tag can contain a nested `<users>` tag.
2. The `<users>` tag contains a sequence of `<user>` tags.
3. Each `<user>` tag defines a single user. The `<user>` tag’s name and password attributes specify the user’s username and password. Within the scope of the `<user>` tag, you can list the realms and roles with which the user is associated.
4. When a `<realm>` tag appears within the scope of a `<user>` tag, it implicitly defines a realm and specifies that the user belongs to this realm. A `<realm>` must have a `name` and can optionally have a `description` attribute.
5. A realm can optionally be associated with one or more roles by including `<role>` elements within the `<realm>` scope.
Certificate-based authentication for the file adapter

When performing certificate-based authentication, the file adapter compares the certificate to be authenticated with a cached copy of the user’s certificate.

To configure the file adapter to support X.509 certificate-based authentication, perform the following steps:

1. Cache a copy of each user’s certificate, *CertFile.pem*, in a location that is accessible to the file adapter.
2. Make the following type of entry for each user with a certificate:

   **Example 22: File Adapter Entry for Certificate-Based Authentication**
   ```xml
   ...
   <user name="CNfromSubjectDN" certificate="CertFile.pem"
       description="User certificate">
       <realm name="RealmName">
       ...
       </realm>
   </user>
   ...
   ``

   The user’s name, *CNfromSubjectDN*, is derived from the certificate by taking the Common Name (CN) from the subject DN of the X.509 certificate (for DN terminology, see “ASN.1 and Distinguished Names” on page 645). The *certificate* attribute specifies the location of this user’s X.509 certificate, *CertFile.pem*. 
Managing an LDAP Security Domain

Overview

The Lightweight Directory Access Protocol (LDAP) can serve as the basis of a database that stores users, groups, and roles. There are many implementations of LDAP and any of them can be integrated with the Orbix security service by configuring the LDAP adapter.

Please consult documentation from your third-party LDAP implementation for detailed instructions on how to administer users and roles within LDAP.

Configuring the LDAP adapter

A prerequisite for using LDAP within the Orbix Security Framework is that the Orbix security service be configured to use the LDAP adapter.

See “Configuring the LDAP Adapter” on page 140.

Certificate-based authentication for the LDAP adapter

When performing certificate-based authentication, the LDAP adapter compares the certificate to be authenticated with a cached copy of the user’s certificate.

To configure the LDAP adapter to support X.509 certificate-based authentication, perform the following steps:

1. Cache a copy of each user’s certificate, CertFile.pem, in a location that is accessible to the LDAP adapter.

2. The user’s name, CNfromSubjectDN, is derived from the certificate by taking the Common Name (CN) from the subject DN of the X.509 certificate (for DN terminology, see “ASN.1 and Distinguished Names” on page 645).

3. Make (or modify) an entry in your LDAP database with the username, CNfromSubjectDN, and specify the location of the cached certificate.
Managing Access Control Lists

The Orbix Security Framework defines access control lists (ACLs) for mapping roles to resources. The ACLs are specific to particular technology domains, such as CORBA. They can be deployed either together with each secure server or centrally in the Orbix security service.

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CORBA ACLs

Overview

This section discusses the ACL files that control access to IDL operations and attributes in a CORBA server. The ACL files for CORBA servers provide role-based access control with granularity down to the level of IDL operations, and attributes.

In this section

This section contains the following subsections:

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## Overview of CORBA ACL Files

<table>
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<tr>
<th>Action-role mapping file</th>
<th>The action-role mapping file is an XML file that specifies which user roles have permission to perform specific actions on the server (that is, invoking specific IDL operations and attributes).</th>
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<tbody>
<tr>
<td>GSP plug-in</td>
<td>The GSP plug-in is a component of the iSF that provides support for action-role mapping. This plug-in must be loaded in order to use the action-role mapping ACL file (see “Security Configuration” on page 485 for details of how to configure the GSP plug-in).</td>
</tr>
</tbody>
</table>
CORBA Action-Role Mapping ACL

Overview

This subsection explains how to configure the action-role mapping ACL file for CORBA applications. Using an action-role mapping file, you can specify that access to IDL operations and attributes is restricted to specific roles.

File location

In your Orbix configuration file, the `plugins:gsp:action_role_mapping_file` configuration variable specifies the location URL of the action-role mapping file, `action_role_mapping.xml`, for a CORBA server. For example:

```
# Orbix Configuration File
...
my_server_scope {
  plugins:gsp:action_role_mapping_file =
    "file:///security_admin/action_role_mapping.xml";
};
```

Example IDL

For example, consider how to set the operation and attribute permissions for the IDL interface shown in Example 23.

**Example 23: Sample IDL for CORBA ACL Example**

```
// IDL
module Simple
{
  interface SimpleObject
  {
    void call_me();
    attribute string foo;
  }
};
```
Example action-role mapping

Example 24 shows how you might configure an action-role mapping file for the Simple::SimpleObject interface given in the preceding Example 23 on page 188.

Example 24: CORBA Action-Role Mapping Example

```xml
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE secure-system SYSTEM "InstallDir/etc/domains/Domain/actionrolemapping.dtd">
<secure-system>
  <allow-unlisted-interfaces>false</allow-unlisted-interfaces>
  <action-role-mapping>
    <server-name>gsp_basic_test.server</server-name>
    <interface>
      <name>IDL:Simple/SimpleObject:1.0</name>
      <action-role>
        <action-name>call_me</action-name>
        <role-name>corba-developer</role-name>
        <role-name>guest</role-name>
      </action-role>
      <action-role>
        <action-name>_get_foo</action-name>
        <role-name>corba-developer</role-name>
        <role-name>guest</role-name>
      </action-role>
    </interface>
  </action-role-mapping>
</secure-system>
```

The preceding action-role mapping example can be explained as follows:

1. If the directory containing the actionrolemapping.dtd file includes spaces, the spaces should be replaced by %20 in the <!DOCTYPE> tag.

2. The <allow-unlisted-interfaces> tag specifies the default access that applies to interfaces not explicitly listed in the action-role mapping file. The tag contents can have the following values:
   - true—for any interfaces not listed, access is allowed for all roles. If the remote user is unauthenticated (in the sense that no GSSUP credentials are sent by the client), access is also allowed.
- false—for any interfaces not listed, access is denied for all roles. Unauthenticated users are also denied access. This is the default.

3. The `<action-role-mapping>` tag contains all of the permissions that apply to a particular server application.

4. The `<server-name>` tag specifies the ORB name that is used by the server in question. The value of this tag must match the ORB name exactly.

   Note: The ORB name also determines which configuration scopes are read by the server. See the *Administrator’s Guide* for details.

5. The `<interface>` tag contains all of the access permissions for one particular IDL interface.

6. The `<name>` tag identifies the IDL interface using the interface’s OMG repository ID. The repository ID normally consists of the characters `IDL:` followed by the fully scoped name of the interface (using `/` instead of `::` as the scoping character), followed by the characters `:1.0`. Hence, the `Simple::SimpleObject` IDL interface is identified by the `IDL:Simple/SimpleObject:1.0` repository ID.

   Note: The form of the repository ID can also be affected by various `#pragma` directives appearing in the IDL file. A commonly used directive is `#pragma prefix`.

   For example, the `CosNaming::NamingContext` interface in the naming service module, which uses the `omg.org` prefix, has the following repository ID: `IDL:omg.org/CosNaming/NamingContext:1.0`

7. The `call_me` action name corresponds to the `call_me()` operation in the `Simple::SimpleObject` interface. The action name corresponds to the GIOP on-the-wire form of the operation name (usually the same as it appears in IDL).

8. The `_get_foo` action name corresponds to the `foo` attribute accessor. In general, any read/write attribute, `AttributeName`, has the following action names:
   - `_get_AttributeName`—for the attribute accessor, and
   - `_set_AttributeName`—for the attribute modifier.

   In general, the accessor or modifier action names correspond to the GIOP on-the-wire form of the attribute accessor or modifier.
Action-role mapping DTD

The syntax of the action-role mapping file is defined by the action-role mapping DTD. See “Action-Role Mapping DTD” on page 655 for details.
Centralized ACL

Overview

By default, a secure Orbix application is configured to store its ACL file locally. Hence, in a large deployment, ACL files might be scattered over many hosts, which could prove to be a nuisance for administrators.

An alternative approach, as described in this section, is to configure your secure applications to use a centralized ACL repository. This allows you to administer all of the ACL data in one place, making it easier to update and maintain.

In this section

This section contains the following subsections:

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<td>Customizing Access Control Locally</td>
<td>page 201</td>
</tr>
</tbody>
</table>
Local ACL Scenario

Overview

This section briefly describes the behavior of a secure server whose operations are protected by a local ACL file (see, for example, “Target configuration” on page 79 for details of such a configuration).

Local ACL scenario

Figure 36 shows an outline of the local ACL scenario, where the ACL file is stored on the same host as the target server. You configure the server to load the ACL file from the local file system by setting the `plugins:gsp:action_role_mapping_file` variable in the target server’s configuration scope.

Figure 36: Local ACL Scenario

Scenario description

The local ACL scenario shown in Figure 36 can be described as follows:

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The client invokes an operation on the secure target server, requiring an access decision to be made on the server side.</td>
</tr>
<tr>
<td>2</td>
<td>The GSP plug-in calls a function on the internal <code>ClientAccessDecision</code> object to check whether the current user has permission to invoke the current operation.</td>
</tr>
</tbody>
</table>
3 If this is the first access decision required by the target server, the ClientAccessDecision object reads the contents of the local ACL file (as specified by the plugins:gsp:action_role_mapping_file variable) and stores the ACL data in a cache.

For all subsequent access decisions, the ClientAccessDecision object reads the cached ACL data for efficiency.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>If this is the first access decision required by the target server, the ClientAccessDecision object reads the contents of the local ACL file (as specified by the plugins:gsp:action_role_mapping_file variable) and stores the ACL data in a cache. For all subsequent access decisions, the ClientAccessDecision object reads the cached ACL data for efficiency.</td>
</tr>
</tbody>
</table>
Centralized ACL Scenario

Overview
From an administrative point of view, it is often more convenient to gather ACL files onto a central host, rather than leaving them scattered on different hosts. The centralized ACL feature enables you to create such a central repository of ACL files. The ACL files are stored on the same host as the Orbix security service, which serves up ACL data to remote Orbix servers on request.

Centralized ACL scenario
Figure 37 shows an outline of a centralized ACL scenario, where the ACL files are stored on the same host as the Orbix security service.

Figure 37: Centralized ACL scenario
Scenario description

The centralized ACL scenario shown in Figure 37 can be described as follows:

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The client invokes an operation on the secure target server, requiring an access decision to be made on the server side.</td>
</tr>
<tr>
<td>2</td>
<td>The GSP plug-in calls a function on the internal ClientAccessDecision object to check whether the current user has permission to invoke the current operation.</td>
</tr>
<tr>
<td>3</td>
<td>If this is the first access decision required by the target server, the ClientAccessDecision object contacts the Orbix security service to obtain the ACL data. For all subsequent access decisions, the ClientAccessDecision object reads the cached ACL data for efficiency.</td>
</tr>
<tr>
<td>4</td>
<td>When the security service is requested to provide ACL data, it selects the appropriate ACL file from its repository of ACL files. By default, the Orbix security service selects the ACL file whose ORB name (as specified in the &lt;server-name&gt; tag) matches that of the request.</td>
</tr>
<tr>
<td>5</td>
<td>The security service returns the ACL data in the form of an XML string, which is then cached by the ClientAccessDecision object.</td>
</tr>
</tbody>
</table>

Modify the Orbix configuration file

To configure an application (such as the target server shown in Figure 37 on page 195) to use a centralized ACL, you must modify its configuration scope as shown in Example 25. In this example, it is assumed that the application’s ORB name is my_secure_apps.my_two_tier_target.

Example 25: Configuration of a Second-Tier Target Server in the iSF

```
# Orbx Configuration File
...
# General configuration at root scope.
...
my_secure_apps {
  ...
    my_two_tier_target {
      ...
```
Centralized ACL

Example 25: Configuration of a Second-Tier Target Server in the iSF

```java
plugins:gsp:authorization_realm = "AuthzRealm";
plugins:gsp:authorization_policy_store_type = "centralized";
plugins:gsp:authorization_policy_enforcement_point = "local";
};
```

The preceding Orbix configuration can be described as follows:

1. The `plugins:gsp:action_role_mapping_file` setting is ignored when you have centralized ACL enabled. You can either comment out this line, as shown here, or delete it.

2. Setting the `plugins:gsp:authorization_policy_store_type` variable to `centralized` configures the application to retrieve its ACL data from the Orbix security service (which is then stored in a local cache).

3. Setting the `plugins:gsp:authorization_policy_enforcement_point` variable to `local` specifies that the ACL logic is implemented locally (in the target server). Currently, this is the only option that is supported.

Modify the is2.properties file

To configure the Orbix security service to support centralized ACL, you should edit its `is2.properties` (normally located in the `OrbixInstallDir/etc/domains/DomainName` directory) to add or modify the following settings:

```ini
# is2.properties File for the Orbix Security Service
...
com.iona.isp.authz.adapters=file
com.iona.isp.authz.adapter.file.class=com.iona.security.is2AzAdapter.multifile.MultiFileAzAdapter
com.iona.isp.authz.adapter.file.param.filelist=ACLFileListFile;
```

The `ACLFileListFile` is the name of a file (specified in the local file format) which contains a list of the centrally stored ACL files.
Create an ACL file list

The ACL file list file is a list of filenames, each line of which has the following format:

\[
[ACLKey=]ACLFileName
\]

A file name can optionally be preceded by an ACL key and an equals sign, \(ACLKey=\), if you want to select the file by ACL key (see “Selection by ACL key” on page 200). The ACL file, \(ACLFileName\), is specified using an absolute pathname in the local file format.

Note: On Windows, you should replace backslashes by forward slashes in the pathname.

For example, on Windows you could specify a list of ACL files as follows:

U:/orbix_security/etc/acl_files/server_A.xml
U:/orbix_security/etc/acl_files/server_B.xml
U:/orbix_security/etc/acl_files/server_C.xml

Selecting the ACL file

When the Orbix security service responds to a request to provide ACL data, it chooses an ACL file using one of the following selection criteria:

- Selection by ORB name.
- Selection by override value.
- Selection by ACL key.

Selection by ORB name

The default selection criterion is selection by ORB name. The target application includes its ORB name in the request it sends to the security service. The security service then selects the data from the ACL file which includes a <server-name> tag with the specified ORB name.

Note: The security service reads and returns all of the data from the selected ACL file. Even if the ACL file contains multiple <server-name> tags labelled by different ORB names, the data from the enclosing <action-role-mapping> tags with non-matching ORB names are also returned.
For example, if the application’s ORB name is `my_secure_apps.my_two_tier_target`, the security service will select the data from the ACL file containing the following `<server-name>` tag:

```xml
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE secure-system SYSTEM "DTDFileForOrbixACL">  
<secure-system>
    <action-role-mapping>
        <server-name>my_secure_apps.my_two_tier_target</server-name>
    ...
    </action-role-mapping>
    ...
</secure-system>
```

### Selection by override value

Alternatively, you can use *selection by override value* to override the value of the ORB name sent to the Orbix security service. The override value must be set in the Orbix configuration using the `plugins:gsp:acl_policy_data_id` variable.

For example, suppose you want to select ACL data that has the ORB name, `my_secure_apps.my_two_tier_target.alt_acl`. You would specify the override value using the `plugins:gsp:acl_policy_data_id` variable as follows:

```bash
# Orbix Configuration File
...
# Add this line to the application’s configuration scope
plugins:gsp:acl_policy_data_id = "my_secure_apps.my_two_tier_target.alt_acl";
```

The security service would then select the data from the ACL file containing the following `<server-name>` tag:

```xml
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE secure-system SYSTEM "DTDFileForOrbixACL">  
<secure-system>
    <action-role-mapping>
        <server-name>my_secure_apps.my_two_tier_target.alt_acl</server-name>
    ...
    </action-role-mapping>
    ...
</secure-system>
```
Selection by ACL key

A more flexible system of selection is *selection by ACL key*. In this case, the application specifies an ACL key in its Orbix configuration and the security service matches this key to an entry in the ACL file list file.

For example, consider an application that defines an ACL key, `bank_data`, in its configuration scope. You would specify the key using the `plugins:gsp:acl_policy_data_id` variable as follows:

```bash
# Orbix Configuration File
...
# Add this line to the application’s configuration scope
plugins:gsp:acl_policy_data_id = "aclkey:bank_data";
```

The security service then selects the entry from the ACL file list labelled with the `bank_data` key:

```bash
U:/orbix_security/etc/acl_files/server_A.xml
U:/orbix_security/etc/acl_files/server_B.xml
bank_data=U:/orbix_security/etc/acl_files/server_C.xml
```
Customizing Access Control Locally

Overview

Orbix allows you to customize access control locally by implementing a plug-in that overrides the implementation of the `ClientAccessDecision` object. This gives you complete control over the access decision logic in an Orbix application.

Note: Detailed instructions on how to implement a `ClientAccessDecision` plug-in are not provided here. Because this task requires a detailed understanding of Orbix plug-ins, we recommend that you contact Progress Consulting for further assistance.

Custom `ClientAccessDecision` in an Orbix application

Figure 38 shows an outline of an ACL scenario, where the default `ClientAccessDecision` object is replaced by a customized implementation.

Figure 38: Custom `ClientAccessDecision` in an Orbix Application
Replacing the `ClientAccessDecision` object with a customized implementation effectively gives you complete control over the access decision logic in an Orbix application. The system shown in Figure 38 can be adapted to a variety of scenarios, as follows:

- Storing the ACL data locally, but using a customized file format.
- Customizing both the `ClientAccessDecision` object and the `ServerAccessDecision` object to implement a centralized ACL with custom features. In particular, this approach would enable you to store and transmit ACL data in a custom format.
- Retrieving ACL data from a custom server. In this case, you could have a centralized ACL repository that bypasses the Orbix security service.
This chapter describes how to enable security in the context of the Orbix Security Framework for the Orbix services.

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<td>Customizing a Secure Domain</td>
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## Introduction to Securing Services

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<th>In a secure system, all Orbix services should be capable of servicing secure connections. A typical secure system includes an Orbix security service and enables SSL/TLS on all of the Orbix services.</th>
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</thead>
<tbody>
<tr>
<td>Configuring the Orbix services</td>
<td>Before deploying the Orbix services in a live system, you must customize the security configuration, replacing demonstration certificates by custom certificates and so on. The procedure for securing Orbix services is similar to the procedure for securing regular CORBA applications (see “Securing CORBA Applications” on page 61).</td>
</tr>
</tbody>
</table>
| Configuring the Orbix security service | The Orbix security service is a special case because, in addition to setting configuration variables in the Orbix configuration, you also need to perform the following basic administration tasks:  
  - Edit the properties in the is2.properties file—see “Configuring the Orbix Security Service” on page 137.  
  - Change the secure user data (usernames, passwords, and so on) stored in the Orbix security service’s user database—see “Managing Users, Roles and Domains” on page 167. |
| Access control lists for Orbix services | Fine-grained access to the Orbix services is controlled by the access control lists (ACLs) in the Orbix action-role mapping files. Default ACLs are generated automatically when you run itconfigure to create a secure domain. See “Default Access Control Lists” on page 237 for a detailed discussion of the default ACLs for the Orbix services. |
Secure File-Based Domain

File-based domain overview

Figure 39 shows an overview of a secure file-based domain. In this example, the Orbix security service runs on a host, S1, and the other core Orbix services run on a different host, S2.

Figure 39: Overview of a Secure File-Based Domain

Domain.cfg in a file-based domain

In a secure file-based domain, the Orbix configuration file, Domain.cfg, contains all of the configuration data for the CORBA system. In particular, the Domain.cfg file can contain security credentials for your applications and the core Orbix services (for example, certificate locations and password file locations).
When deploying a domain across multiple hosts (as, for example, in Figure 39), it is advisable to customize the `Domain.cfg` file on each host. Each copy of `Domain.cfg` should include security credentials only for the applications running on that particular host.

**WARNING:** Any domain configuration files containing security-related data must be stored securely by the operating system.
Secure CFR Domain

CFR domain overview

Figure 40 shows an overview of a secure CFR domain. In this example, the Orbix security service runs on a host, S1, and the other core Orbix services run on a different host, S2.

Note: Some aspects of secure CFR domains have changed significantly in Orbix 6.3 Service Pack 4. If you are using an earlier version of Orbix, please consult the original documentation for that Orbix version.

Figure 40: Overview of a Secure CFR Domain
Secure CFR domain files

A secure CFR domain can use the following different kinds of domain configuration file:

- insecure-Domain.cfg.
- secure-Domain.cfg.
- cfr-Domain.cfg.

insecure-Domain.cfg

The insecure-Domain.cfg file contains boilerplate configuration and default settings for the boot ORB (see “Boot ORB” on page 210). It is not meant to be used directly in a secure CFR domain, but it can be used in a semi-secure CFR domain. It is included in the secure-Domain.cfg file.

secure-Domain.cfg

In a secure CFR domain, the secure-Domain.cfg file is used by all services and clients, except for the Orbix security service and the CFR, to bootstrap the application’s ORB configuration.

The secure-Domain.cfg file contains all of the settings from insecure-Domain.cfg (that is, it includes insecure-Domain.cfg) and additionally specifies the credentials needed to connect to the CFR and download the application’s configuration data.

**WARNING:** The secure-Domain.cfg file contains sensitive data and therefore it must be stored securely by the operating system.

cfr-Domain.cfg

The cfr-Domain.cfg file is used only by the Orbix security service and the CFR service (see Figure 40 on page 207) and it contains the complete configuration details for these two services. It is necessary to leave the configuration of these two services entirely file-based in order to avoid creating a circular dependency.

In a typical deployment, you need to customize the credentials for the Orbix security service and the CFR service, which are set in cfr-Domain.cfg, because the default settings use demonstration certificates and demonstration credentials. See “Creating a Customized Secure Domain” on page 216 for details.

**WARNING:** The cfr-Domain.cfg file contains sensitive data and therefore it must be stored securely by the operating system.
Environment scripts

When you create a secure or a semi-secure CFR domain, *Domain*, the following pair of scripts are generated (where the suffix is either `.bat` for Windows, or `.sh` for UNIX):

- `secure-`*Domain*_env[.bat|.sh]—enables access to secure services.
- `insecure-`*Domain*_env[.bat|.sh]—enables access to insecure services only.

CFR action-role mapping

Like any of the other Orbix services, in a secure or semi-secure domain the CFR has an associated action-role mapping file. It is usually necessary to customize this action-role mapping in order to define which configuration scopes are accessible to ordinary users and which configuration scopes are reserved for the administrator.

For more details, see “Configuration Repository ACL” on page 238.

How does a service initialize in a secure CFR domain?

In a secure CFR domain, ordinary services (that is, all services apart from the security service and the CFR itself) initialize in two phases, as follows:

- **Boot phase**—during the boot phase, the service reads its boot settings from the configuration file, `secure-`*Domain*.cfg, and uses these settings to instantiate a `boot ORB`. The sole purpose of the boot ORB is to establish a connection to the CFR and to download the relevant configuration settings for the application.

  Configuration settings are downloaded as follows:

  i. The boot ORB uses the credentials from the root scope of the `secure-`*Domain*.cfg file to establish a secure connection to the CFR (these are usually CSI credentials).

  ii. The boot ORB requests the CFR to send the relevant configuration data for the application-level ORB (as determined by the application ORB name).

  iii. The CFR authenticates the credentials received from the boot ORB and checks these credentials against the CFR’s access control list, to see whether this user has permission to download the requested configuration data.

  iv. If the boot ORB’s credentials have the requisite privileges, the CFR returns the application ORB’s configuration data.
• *Application phase*—during the application phase, the service instantiates an application ORB using the configuration data that was downloaded during the boot phase. From this point on, application initialization proceeds as normal.

**Note:** Generally, the application ORB settings are independent of the boot ORB settings. The only exception is when you set `plugins:security:share_credentials_across_orbs` to true.

---

**Boot ORB**

Boot ORBs have the following characteristics:

- Boot ORBs are used only for the purpose of making an initial connection to the CFR and downloading the application ORB’s configuration data.
- The boot ORB reads settings exclusively from the *root scope* of the domain configuration file. Nested scopes appearing in the domain configuration file are *completely ignored*.
- You can decide whether or not to share the boot ORB’s credentials with the application ORB using the boolean variable, `plugins:security:share_credentials_across_orbs`.

---

**Customizing the default domain files**

The default CFR domain file, `secure-Domain.cfg`, is initially configured to use demonstration user accounts and X.509 certificates. *It is therefore essential to customize the security settings before attempting to deploy the CFR domain files in a production system.*

In particular, you must customize the following settings in `secure-Domain.cfg`:

- *Enable SSL/TLS*—if you require SSL/TLS security on the CFR connection, check that the `iiop_tls` plug-in is included in the `orb_plugins` list and make sure that the client secure invocation policy is set as follows:

```plaintext
# Orbix Configuration File
policies:iiop_tls:client_secure_invocation_policy:requires = ["Confidentiality", "EstablishTrustInTarget"];

policies:iiop_tls:client_secure_invocation_policy:supports = ["Confidentiality", "Integrity", "DetectReplay", "DetectMisordering", "EstablishTrustInTarget"];
```
For more details, see “Configuring SSL/TLS Secure Associations” on page 333.

**WARNING:** It can be convenient to disable SSL/TLS security on the CFR connection (for example, it saves you having to deploy a trusted CA list file to every client host). *However, this approach is potentially dangerous*, because it leaves clients vulnerable to a man-in-the-middle attack by an imposter CFR, which could serve up bogus configuration settings to the client and steal client credentials.

- **Configure trusted CA list for SSL/TLS**—if SSL/TLS is enabled, you must specify a trusted CA list. Open `secure-Domain.cfg` in a text editor and edit the value of `ROOT_TRUSTED_CA_LIST_POLICY`, setting its value to the location of the trusted CA list file on the local machine. For example:

  ```
  ROOT_TRUSTED_CA_LIST_POLICY =
  "c:\my_custom_ca_lists\ca_list.pem";
  policies:trusted_ca_list_policy =
  "${ROOT_TRUSTED_CA_LIST_POLICY}";
  ```

  For more details, see “Specifying Trusted CA Certificates” on page 369.

- **Configure CSIv2 credentials**—the CSIv2 (GSSUP) credentials set in the root scope of `secure-Domain.cfg` are used *solely* for the purpose of downloading configuration settings from the CFR service. Hence, it is sufficient to specify credentials with read-only access to the CFR.

  For example, you could define a special user, `bootORB`, and an associated user role, `bootORBRole`, that provide read-only access to the CFR, but do not allow you to access any other services. The advantage of this set-up is that the `bootORB` credentials do not present much of a security risk, so you do not need to take any great precautions to keep the credentials a secret.

  You could configure the CSIv2 credentials as follows:

  ```
  BOOT_ORB_GSSUP_CREDENTIALS = ["username=bootORB",
  "password=bootORBPass", "domain=IONA"];
  principal_sponsor:csi:use_principal_sponsor = "true";
  principal_sponsor:csi:auth_method_id = "GSSUPMech";
  principal_sponsor:csi:auth_method_data =
  "${BOOT_ORB_GSSUP_CREDENTIALS}";
  policies:csi:auth_over_transport:client_supports =
  ["EstablishTrustInClient"];
  ```
Where `BOOT_ORB_GSSUP_CREDENTIALS` is a new substitution variable. You must also remove the other GSSUP credentials, `*_GSSUP_CREDENTIALS`, from the CFR domain file.

---

**Administering the secure CFR**

It is important to understand that, when administering the secure CFR using the `itadmin` utility, login occurs at two different levels, as follows:

- **Boot ORB login**—at this level, you can supply CSIv2 credentials that have read-only access to the CFR. This step downloads the configuration that is used to instantiate the application ORB.

  These login credentials are stored in the `secure-Domain.cfg` file.

- **Application ORB login**—at this level, if you want to make any changes to the CFR contents, you must supply CSIv2 credentials that give you sufficient access to modify the contents of the secure CFR.

  As a result of this two-phase bootstrap process, the `itadmin` utility has two bindings connecting it to the secure CFR (which might actually result in two separate TCP/IP connections being opened to the CFR, depending how each ORB is configured).

---

**CFR administration roles**

In general, when setting up the configuration for the `itadmin` utility, you need to distinguish between two levels of administration:

- **User-level administration**—covers the routine use of the standard Orbix services, except for the CFR. You can grant this level of access with the `IONAUserRole` role.

  For example, ordinary users typically need to be able to create and remove name bindings in the CORBA naming service.

- **Sysadmin-level administration**—covers the more sensitive operations, which includes making any modifications to the CFR. You can grant this level of access with the `IONAServiceRole` role.
User-level administration

To configure the application ORB for user-level administration, Orbix defines the following configuration scopes in the CFR by default:

```plaintext
iona_utilities {
  admin {
    secure {
      # Configure user-level administration
      # in a secure environment.
    }
    insecure {
      # Configure user-level administration
      # in an insecure environment.
    }
  }
}
```

Sysadmin-level administration

By default, there is no scope provided specifically for sysadmin-level administration. You must define a new scope in the CFR for sysadmin tasks. The simplest approach is to configure the CSI principal sponsor to prompt the user for login credentials, so that system administrators can log in using their sysadmin username and password. For example, you could define the `iona_utilities.admin.sysadmin` scope as follows:

```plaintext
iona_utilities {
  admin {
    sysadmin {
      # CSI principal sponsor prompts for password
      principal_sponsor:csi:use_principal_sponsor = "true";
      principal_sponsor:csi:auth_method_id = "GSSUPMech";
      principal_sponsor:csi:auth_method_data = 
        "["username=IONAAdmin",
        "domain=IONA"]";
      policies:csi:auth_over_transport:client_supports = 
        ["EstablishTrustInClient"];,
      
      # Other config, including SSL/TLS settings, etc.
      ...
    }
  }
}
```

In this example, because the `password` setting is omitted from `principal_sponsor:csi:auth_method_data`, the user will be prompted to enter the sysadmin password after starting the `itadmin` utility.
In order to select the correct application ORB configuration scope, it is always necessary to specify the relevant ORB name when you run the `itadmin` utility. For example:

```
itadmin -ORBname iona_utilities.admin.secure
```

In practice, it would be tedious to have to type the ORB name on the command line every time you run `itadmin`. To simplify running the utility, therefore, a new environment variable, `IT_ADMIN_UTILITIES_ORB_NAME`, is introduced in Orbix 6.3 SP4. This environment variable specifies the application-level ORB name used by the `itadmin` utility, making it unnecessary to supply the `-ORBname` switch at the command line.

For example, the environment scripts generated for a secure CFR domain set the `IT_ADMIN_UTILITIES_ORB_NAME` environment variable as follows:

- `secure-Domain_env[.bat|.sh]` sets the application ORB name to `iona_utilities.admin.secure`.
- `insecure-Domain_env[.bat|.sh]` sets the application ORB name to `iona_utilities.admin.insecure`.
Customizing a Secure Domain

Overview

This section describes how to customize the configuration of secure domains generated using the `itconfigure` utility. When generating a domain, the `itconfigure` utility allows you to choose between two different levels of security:

- **Secure**—only secure connections are accepted.
- **Semi-secure**—both secure and insecure connections are accepted.

In the subsections that follow, the differences between a secure domain and a semi-secure domain are described in detail.

The `itconfigure` utility also allows you to choose between a file-based domain and a CFR-based domain. The examples in this section are all based on a file domain. Similar comments apply, though, to the analogous settings in a CFR domain.

**WARNING:** It is essential to customize a secure domain generated by the `itconfigure` utility. The default secure domain created using `itconfigure` is not fully secure, because the X.509 certificates used by the domain are demonstration certificates, which are identical for all installations of Orbix.

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Creating a Customized Secure Domain

Overview

If you follow the default steps for creating a secure domain using `itconfigure`, the standard Orbix services will be configured with default X.509 certificates, which are essentially insecure. This section describes how to create a security domain, such that the default X.509 certificates are replaced by secure custom certificates.

Substitution variables

Within a configuration file, Orbix uses substitution variables to specify the X.509 certificate credentials and the CSI credentials used by the standard Orbix services. Normally, these substitution variables are initialized with certain default values.

Orbix provides a mechanism, however, that allows you to override the default values of the substitution variables. First, you create a `substitutions file`, which contains a list of property settings, and then you provide this file to the `itconfigure` utility in the course of creating a new domain.

Example 26 shows the sample contents of a substitutions file that sets security-related substitution variables.

Example 26: Substitution Variables in Property File Format

```
ROOT_TRUSTED_CA_LIST_POLICY="C:\\orbix6\\custom_certs\\calist.pem"
SERVICES_AUTH_METHOD_DATA=["filename=C:\\orbix6\\custom_certs\\administrator.p12","password_file=C:\\orbix6\\custom_certs\\administrator.pwf"]
UTILITIES_AUTH_METHOD_DATA=["filename=C:\\orbix6\\custom_certs\\utilities.p12","password_file=C:\\orbix6\\custom_certs\\utilities.pwf"]
ADMINISTRATOR_GSSUP_CREDENTIALS=["username=IONAServiceAdmin","domain=IONA"]
ITADMIN_ADMIN_CERT_ROOT_DIR="C:\\orbix6\\custom_certs"
KDM_AUTH_METHOD_DATA=["filename=C:\\orbix6\\custom_certs\\kdmadministrator.p12","password_file=C:\\orbix6\\custom_certs\\kdmadministrator.pwf"]
KDM_CERT_CONSTRAINTS=["C=US,O=ABigBank*,CN=abc*","C=US,O=ABigBank*,CN=xyz*"]
KDMADM_CERT_CONSTRAINTS=["C=US,O=ABigBank*,CN=abc*"]
```
The substitutions file has the format of a Java properties file (it is read by itconfigure, which is a Java-based tool). In particular, there is no semicolon, ;, required at the end of a line and a double backslash, \\, must be used in place of a single backslash, \\, in Windows-style path names (the Java properties file uses backslash as an escape character).

The substitution variables shown in Example 26 on page 216 have the following meaning:

- **ROOT_TRUSTED_CA_LIST_POLICY**—specifies the list of trusted CA certificates for all Orbix services. This substitution variable initializes the policies:trusted_ca_list_policy configuration variable (see “Specifying Trusted CA Certificates” on page 369).

- **SERVICES_AUTH_METHOD_DATA**—specifies the own X.509 certificate for all Orbix services. It is recommended that you avoid putting the certificate’s private key password directly into configuration (that is, set the password_file attribute instead of the password attribute). This substitution variable initializes the principal_sponsor:auth_method_data configuration variable within the configuration scopes that affect standard Orbix services.

- **UTILITIES_AUTH_METHOD_DATA**—specifies the own X.509 certificate for the itadmin command-line utility. This substitution variable initializes the principal_sponsor:auth_method_data configuration variable within the iona_utilities configuration scope.

- **ADMINISTRATOR_GSSUP_CREDENTIALS**—specifies the CSI GSSUP (username and password) credentials for all Orbix services. This substitution variable initializes the principal_sponsor:csi:auth_method_data configuration variable (see “Providing a Username and Password” on page 428).

- **ITADMIN_ADMIN_CERT_ROOT_DIR**—specifies the location of a directory that contains PKCS#12 certificates that can be used by an administrator to log on to the KDM server using the itadmin utility (for details see “Logging In” on page 397). This substitution variable initializes the itadmin_x509_cert_root configuration variable.

- **KDM_AUTH_METHOD_DATA**—currently, not used (the KDM server is colocated with and uses the same X.509 certificate as the location service).
• **KDM_CERT_CONSTRAINTS**—specifies certificate constraints that restrict access to the KDM server, protecting it from unauthorized clients (see “Defining certificate constraints” on page 400).

• **KDM_ADM_CERT_CONSTRAINTS**—specifies certificate constraints that protect the itadmin utility from rogue applications that might attempt to impersonate the KDM server (see “Defining certificate constraints” on page 400).

---

**Creating a secure domain using the itconfigure command line**

If you have a pre-existing deployment descriptor, *DeploymentDescriptor*, for a secure domain, you can apply the substitution variables from a substitutions file, *SubstitutionsFile*, by invoking `itconfigure` from the command line with the `-substitutions` switch, as follows:

```bash
itconfigure -nogui -load DeploymentDescriptor -substitutions SubstitutionsFile
```

For more details about the command-line approach to configuring domains, see the *Deployment Guide*.

---

**Creating a secure domain using the itconfigure GUI**

To create a customized secure domain, perform the following steps:

1. Run `itconfigure`.
2. Select expert mode.
3. Specify domain details.
5. Specify storage locations.
6. Select services.
7. Confirm choices.
8. Finish configuration.

---

**Run itconfigure**

To begin creating a new configuration domain, enter `itconfigure` at a command prompt. An *Orbix Configuration Welcome* dialog box appears, as shown in Figure 41.
Click **Cancel** to skip this dialog.

**Figure 41:** The Orbix Configuration Welcome Dialog Box

---

**Select expert mode**

From the main **Orbix Configuration** window, select **File|New|Expert** to begin creating a domain in expert mode, as shown in **Figure 42**.

**Figure 42:** Selecting **File|New|Expert** from the Main Window
Specify domain details

A **Domain Details** window appears, as shown in Figure 43.

In the **Configuration Domain Name** text field, type `custom-secure`. Set the **Allow Secure Communication** checkbox and unset the **Allow Insecure Communication** checkbox.

**Figure 43: Specifying Domain Details**
Specify a substitutions file

From the **Domain Details** window, click the **Substitutions** button at the bottom of the panel—see Figure 43 on page 220.

A file selection dialog appears, as shown in Figure 44. Select a prepared substitutions file (a properties file containing substitution variables—see “Substitution variables” on page 216) and click **Open**.

**Figure 44: Specifying a Substitutions File**

From the **Domain Details** window, click **Next>** to continue.

Specify storage locations

A **Storage Locations** window appears.

If you want to store the domain configuration files somewhere other than the default locations, you can use the Storage Locations panel to customize the relevant directory locations.

Click **Next>** to continue.
### Select services

A Select Services window appears.

Using the checkboxes on this panel, select the services that you require. Typically, you require at least a **Location** service and a **Node Daemon**. You only need to select the **IONA Security** service, if you want to install it on the current host.

**Note:** For more details about how to deploy a domain across multiple hosts, please consult the Orbix Deployment Guide.

Click **Next>** to continue.

### Confirm choices

A Confirm Choices window appears.

You now have the opportunity to review the configuration settings in the Confirm Choices window. If necessary, you can use the <Back button to make corrections.

Click **Next>** to create the secure configuration domain and progress to the next window.

### Finish configuration

The itconfigure utility now creates and deploys the secure configuration domain, writing files into the `OrbixInstallDir/etc/bin`, `OrbixInstallDir/etc/domain`, `OrbixInstallDir/etc/log`, and `OrbixInstallDir/var` directories (or into custom locations, if you changed the defaults in the Storage Locations window).

Click **Finish** to quit the itconfigure utility.
# Configuring an iSF Adapter for the Security Service

## Overview
By default, a new domain configures the security service to use the *file adapter* to store security data (usernames, passwords, roles and realm data). It is necessary to replace the file adapter with a different iSF adapter, however, because the file adapter is not designed for use in a production environment.

**WARNING:** The file adapter is provided for demonstration purposes only. Orbix does not support the use of the file adapter in a production environment.

## Install an iSF adapter
There are two approaches you can take to installing an iSF adapter in the Orbix security service:

- **Install a standard iSF adapter**—Orbix provides a range of ready-made iSF adapters for the Orbix security service. Currently, the LDAP adapter is the only iSF adapter suitable for a production environment.
  
  For details, see “Configuring the Orbix Security Service” on page 137.

- **Install a custom iSF adapter**—you can implement and install your own custom iSF adapter using a special Java API provided by Orbix.
  
  For details, see “Developing an iSF Adapter” on page 531.

## Configure the third-party enterprise security system
After installing an iSF adapter (which interfaces a third-party enterprise security system into the Orbix security service), you must then prime the third-party enterprise security system with security data (usernames, passwords, roles and realm data).

For more information about the kind of security data that is required for role-based access control, see “Managing Users, Roles and Domains” on page 167.
CHAPTER 9 | Securing Orbix Services

Configuring a Typical Orbix Service

Overview

This section describes how to configure a typical Orbix service—such as naming, trading, events, and so on—running in a domain with an Orbix security service. Details of the Orbix security service configuration are discussed in the next subsection “Configuring the Security Service” on page 233.

To configure a typical Orbix service, there are two groups of configuration settings that are relevant:

- **Configuration settings for the application ORB**—these settings configure the behavior of Orbix at the application level.
- **Configuration settings for the internal ORB**—these settings configure an internal ORB that allows the server process to be monitored by the Orbix management service.

Configuration settings for the application ORB

Example 27 shows the configuration settings for a typical Orbix service (not the security service itself). These settings configure the application ORB—that is, these settings determine the ordinary runtime behavior of the service.

**Example 27: Typical Service Configuration for the Application ORB**

```
# Orbix Configuration File
...
# General configuration at root scope.
1 binding:client_binding_list = ["GIOP+EGMIOP",
   "OTS+TLS_Coloc+POA_Coloc", "TLS_Coloc+POA_Coloc",
   "OTS+POA_Coloc", "POA_Coloc", "GIOP+SHMIOP",
   "CSI+OTS+GIOP+IIOP_TLS", "OTS+GIOP+IIOP_TLS",
   "CSI+GIOP+IIOP_TLS", "GIOP+IIOP_TLS", "CSI+OTS+GIOP+IIOP",
   "OTS+GIOP+IIOP", "CSI+GIOP+IIOP", "GIOP+IIOP"];
2 policies:mechanism_policy:protocol_version = "SSL_V3";
policies:mechanism_policy:ciphersuites =
   ["RSA_WITH_RC4_128_SHA", "RSA_WITH_RC4_128_MD5"];
3 policies:trusted_ca_list_policy =
   "%(ROOT_TRUSTED_CA_LIST_POLICY)";
...
iona_services
{
   # Common SSL/TLS security settings.
```
Example 27: *Typical Service Configuration for the Application ORB*

```plaintext
principal_sponsor:use_principal_sponsor = "true";
principal_sponsor:auth_method_id = "pkcs12_file";
principal_sponsor:auth_method_data = "\%{SERVICES_AUTH_METHOD_DATA}";

policies:target_secureInvocation_policy:requires = ["Confidentiality", "DetectMisordering", "DetectReplay", "Integrity"];
policies:target_secureInvocation_policy:supports = ["Confidentiality", "EstablishTrustInTarget", "EstablishTrustInClient", "DetectMisordering", "DetectReplay", "Integrity"];

policies:client_secureInvocation_policy:requires = ["Confidentiality", "EstablishTrustInTarget", "DetectMisordering", "DetectReplay", "Integrity"];
policies:client_secureInvocation_policy:supports = ["Confidentiality", "EstablishTrustInClient", "EstablishTrustInTarget", "DetectMisordering", "DetectReplay", "Integrity"];

binding:server_binding_list = ["CSI+GSP+OTS", "CSI+GSP", "CSI+OTS", "CSI"];  

Service {
    # Service-specific security configuration.
    ...

    orb_plugins = ["local_log_stream", "iiop_profile", "giop", "iiop_tls", "ots", "gsp"];

    plugins:Service:iiop_tls:port = "0";
    plugins:Service:iiop_tls:host = "ServiceHost";

    # Configuration of CSI and GSP plug-ins.
    policies:csi:auth_over_transport:target_requires = "EstablishTrustInClient";
policies:csi:auth_over_transport:target_supports = "EstablishTrustInClient";
policies:csi:auth_over_transport:server_domain_name = "IONA";
policies:csi:auth_over_transport:client_supports = "EstablishTrustInClient";

    principal_sponsor:csi:use_principal_sponsor = "true";
    principal_sponsor:csi:auth_method_id = "GSSUPMech";
}
```
The preceding service configuration can be explained as follows:

1. Make sure that the `binding:client_binding_list` variable includes bindings with the `IIOP_TLS` and `CSI` interceptors. You can use the value of the `binding:client_binding_list` shown here.

2. The SSL/TLS mechanism policy specifies the default security protocol version and the available cipher suites—see “Specifying Cipher Suites” on page 349.

3. An SSL/TLS application needs a list of trusted CA certificates, which it uses to determine whether or not to trust certificates received from other SSL/TLS applications.

   By default, the `policies:trusted_ca_list_policy` variable is initialized from a substitution variable, `ROOT_TRUSTED_CA_LIST_POLICY`. Alternatively, you can edit the `policies:trusted_ca_list_policy` variable to point at a list of trusted certificate authority (CA) certificates. For example, the following configuration fragment shows how to initialize the `policies:trusted_ca_list_policy` configuration variable explicitly:

```
policies:trusted_ca_list_policy = "/vob/art/etc/tls/x509/trusted_ca_lists/ca_list1.pem";
```
Customizing a Secure Domain

For details, see “Specifying Trusted CA Certificates” on page 369.

**Note:** If using Schannel as the underlying SSL/TLS toolkit (Windows only), the `policies:trusted_ca_list_policy` variable is ignored. Within Schannel, the trusted root CA certificates are obtained from the Windows certificate store.

4. The Orbix services all require an X.509 certificate. Hence, this line enables the SSL/TLS principal sponsor, which specifies a certificate for the application.

5. This line specifies that the X.509 certificate is contained in a PKCS#12 file. For alternative methods, see “Specifying an Application’s Own Certificate” on page 371.

**Note:** If using Schannel as the underlying SSL/TLS toolkit (Windows only), the `principal_sponsor:auth_method_id` value must be `security_label` instead of `pkcs12_file`.

6. By default, the service’s own X.509 certificate is specified by the value of the `SERVICES_AUTH_METHOD_DATA` substitution variable.

   Alternatively, you can edit the `principal_sponsor:auth_method_data` configuration variable directly. For example, the following configuration fragment specifies the service’s own X.509 certificate by setting the `filename` and `password_file` attributes:

   ```
   principal_sponsor:auth_method_data =
   ["filename=/vob/art/etc/tls/x509/certs/services/administrator.p12",
   "password_file=/vob/art/etc/tls/x509/certs/services/administrator.pwf"];
   ```

   The `filename` value should be initialized with the location of a certificate file in PKCS#12 format—see “Specifying an Application’s Own Certificate” on page 371 for more details.

**Note:** If using Schannel as the underlying SSL/TLS toolkit (Windows only), you would set the `label` option instead of the `filename` option in the `principal_sponsor:auth_method_data` configuration variable. The `label` specifies the common name (CN) from the application certificate’s subject DN.
7. The following two lines set the required options and the supported options for the target secure invocation policy. In this example, which is a secure domain, the target policies specify that the application will accept secure connections only.

Alternatively, in a semi-secure domain the target secure invocation policy would be set as follows:

```
policies:target_secure_invocation_policy:requires =
  ["NoProtection"];
policies:target_secure_invocation_policy:supports =
  ["NoProtection", "Confidentiality",
   "EstablishTrustInTarget", "EstablishTrustInClient",
   "DetectMisordering", "DetectReplay", "Integrity"];```

8. The following two lines set the required options and the supported options for the client secure invocation policy. In this example, which is a secure domain, the client policies require the connection to open secure connections only.

Alternatively, in a semi-secure domain the client secure invocation policy would be set as follows:

```
policies:client_secure_invocation_policy:requires =
  ["NoProtection"];
policies:client_secure_invocation_policy:supports =
  ["NoProtection", "Confidentiality",
   "EstablishTrustInTarget", "EstablishTrustInClient",
   "DetectMisordering", "DetectReplay", "Integrity"];```

9. Make sure that the binding:server_binding_list variable includes bindings with the CSI and GSP interceptors. You can use the value of the binding:server_binding_list shown here.

10. Make sure that the orb_plugins variable in this configuration scope includes both the iiop_tls plug-in and the gsp plug-in.

**Note:** For fully secure applications, you should exclude the iiop plug-in (insecure IIOP) from the ORB plug-ins list. This renders the application incapable of making insecure IIOP connections.

For semi-secure applications, however, you should include the iiop plug-in before the iiop_tls plug-in in the ORB plug-ins list.
11. The IIOP/TLS IP port is set to 0 in this example, because the node daemon is responsible for allocating the port dynamically (on demand activation). Services that are not activated on demand (for example, the locator) will be allocated a specific IP port.

12. In this example (secure domain), the CSI policies are set up in such a way that clients are required to provide a username and password to log on to the service.

   Alternatively, in a semi-secure domain the policies:csi:auth_over_transport:target_requires variable is set to an empty string, "", implying that clients are not required to provide a username and password to the service. For example:

   ```
   policies:csi:auth_over_transport:server_domain_name = "IONA";
policies:csi:auth_over_transport:target_supports = "EstablishTrustInClient";
policies:csi:auth_over_transport:target_requires = "";
policies:csi:auth_over_transport:client_supports = "EstablishTrustInClient";
   ```

13. The CSI principal sponsor sets a username, a password and a domain, which the server uses when acting in a client role to connect to other applications. By default, the username, password, and domain for the CSI principal sponsor are initialized from the ADMINISTRATOR_GSSUP_CREDENTIALS substitution variable.

   Alternatively, you can set the username, password, and domain explicitly, as shown in the following configuration fragment:

   ```
   principal_sponsor:csi:auth_method_data = [
   "username=IONAServiceAdmin", "password=service",
   "domain=IONA"
   ];
   ``
password—in this example, the CSI password is provided directly in the configuration file. For alternative ways of specifying the CSI password, see “Providing a Username and Password” on page 428.

domain—has the value IONA. The CSI authentication domain must match the target server’s domain name, as specified by the policies:csi:auth_over_transport:server_domain_name configuration variable, or could be an empty string (acts as a wildcard).

14. The action_role_mapping configuration variable specifies the location of an action-role mapping that controls access to the IDL interfaces implemented by the server. The file location is specified in an URL format, for example: file:///security_admin/action_role_mapping.xml (UNIX) or file:///c:/security_admin/action_role_mapping.xml (Windows).

For more details about the action-role mapping file, see “CORBA Action-Role Mapping ACL” on page 188.

15. This configuration setting specifies the iSF authorization realm, AuthzRealm, to which this server belongs (the default is IONAGlobalRealm). For more details about iSF authorization realms, see “iSF Authorization Realms” on page 171.

Example 28 shows the configuration settings for the internal ORB. These settings enable the management service to monitor the Orbix services. All of the settings for the internal ORB are intended to configure the server end of a connection. The internal ORB does not open any connections to other processes.

Example 28: Typical Service Configuration for the Internal ORB

```bash
# Orbix Configuration File
...
IT_POAInternalORB
{
    principal_sponsor:use_principal_sponsor = "true";
    principal_sponsor:auth_method_id = "pkcs12_file";
    principal_sponsor:auth_method_data = "${SERVICES_AUTH_METHOD_DATA}";
```
Example 28: Typical Service Configuration for the Internal ORB

```plaintext
policies:target_secure_invocation_policy:requires = 
["Confidentiality", "DetectMisordering", "DetectReplay", 
"Integrity"];
policies:target_secure_invocation_policy:supports = 
["Confidentiality", "EstablishTrustInTarget", 
"EstablishTrustInClient", "DetectMisordering", 
"DetectReplay", "Integrity"];
policies:client_secure_invocation_policy:requires = 
["Confidentiality", "EstablishTrustInTarget", 
"DetectMisordering", "DetectReplay", "Integrity"];
policies:client_secure_invocation_policy:supports = 
["Confidentiality", "EstablishTrustInClient", 
"EstablishTrustInTarget", "DetectMisordering", 
"DetectReplay", "Integrity"];

binding:server_binding_list = ["CSI+GSP+OTS", "CSI+GSP", 
"CSI+OTS", "CSI"];
policies:csi:auth_over_transport:target_requires = 
"EstablishTrustInClient";
policies:csi:auth_over_transport:target_supports = 
"EstablishTrustInClient";
policies:csi:auth_over_transport:server_domain_name = 
"IONA";

iona_services
{
  Service
  {
    orb_plugins = ["local_log_stream", "iiop_profile", 
"giop", "iiop_tls", "ots", "gsp"];

    plugins:local_log_stream:filename = 
"/vob/art/var/filedomain-secure-is2-tls/logs/IT_POAInternalORBifr.log";

    plugins:gsp:action_role_mapping_file = 
"file:///vob/art/etc/domains/filedomain-secure-is2-tls/allow_all_authenticated_clients_action_role_mapping.xml";
  }
  ...
};
```
The preceding internal ORB configuration can be explained as follows:

1. The internal ORB’s principal sponsor should be configured with an X.509 certificate suitable for a secure Orbix service.

   **Note:** Instead of using the principal sponsor here, you could set the `plugins:security:share_credentials_across_orbs` configuration variable instead. See “Security Configuration” on page 485.

2. Make sure that the `orb_plugins` variable in this configuration scope includes both the `iiop_tls` plug-in and the `gsp` plug-in.

3. The internal ORB uses the `allow_all_authenticated_clients_action_role_mapping.xml` file for access control. This configuration gives unrestricted access to all authenticated clients.
Configuring the Security Service

Overview

This section describes how to configure the Orbix security service. This service is configured somewhat differently from the others. For example, because the gsp plug-in contacts the security service to perform authentication, the gsp plug-in must be excluded from the security service’s own orb_plugins list in order to avoid a circular dependency.

Configuration settings for application ORB

Example 29 shows the configuration settings for the Orbix security service. These settings configure the application ORB—that is, these settings determine the ordinary runtime behavior of the service.

Example 29: Security Service Configuration for the Application ORB

```plaintext
# Orbix Configuration File
...
1 # General configuration at root scope.
... 2 initial_references:IT_SecurityService:reference = "IOR: ...";
... 3 iona_services {
  4   # Common SSL/TLS security settings.
  ... 5   security
  ... 6   iS2Host {
  ... 7     plugins:security:iiop_tls:port = "53112";
  8     plugins:security:iiop_tls:host = "iS2Host";
  9     orb_plugins = ["local_log_stream", "iiop_profile",
 10        "giop", "iiop_tls"]; 11     policies:iiop_tls:target_secure_invocation_policy:requires = [
 12        "Integrity", "Confidentiality", "DetectReplay",
 13        "DetectMisordering", "EstablishTrustInClient"];
```
The preceding security service configuration can be explained as follows:

1. The security service’s root configuration settings are the same as in Example 27 on page 224.

2. The IT_SecurityService initial reference specifies the IOR that CORBA applications use to talk to the security service.

3. The common configuration settings (in the iona_services scope) are the same as in Example 27 on page 224.
4. The `plugins:security:iiop_tls:port` variable specifies the IP port where the security service listens for secure connections.

   **Note:** If you want to change the security service’s listening port, you would also have to update the IOR in the `initial_references:IT_SecurityService:reference` setting. You could regenerate the IOR by re-running the `itconfigure` utility.

5. This `orb_plugins` setting is required here for technical reasons. Specifically, the Orbix security service is bootstrapped in two stages, as follows:
   v. In the first stage, the generic server (implemented in C++) instantiates an ORB with the `iona_services.security.iS2Host` configuration scope, loading a minimal set of ORB plug-ins (this `orb_plugins` setting).
   vi. In the second stage, the generic server spawns a Java process, which instantiates an ORB with the `iona_services.security.iS2Host.server` configuration scope, loading the full set of ORB plug-ins.

6. The IIOP/TLS target secure invocation policy requires a strong quality of protection for incoming connections.

7. Restricts access to the Orbix security server, allowing only clients that match the specified certificate constraints to open a connection to the security service. For details of how to specify certificate constraints, see “Applying Constraints to Certificates” on page 555.

   **Note:** This configuration variable *must* be set, otherwise the Orbix security server will not start.
8. Make sure that the `orb_plugins` variable in this configuration scope includes the `iiop_tls` plug-in.

**Note:** For fully secure applications, you should *exclude* the `iiop` plug-in (insecure IIOP) and the `http` plug-in (insecure HTTP) from the ORB plug-ins list. This renders the application incapable of making insecure IIOP connections and insecure HTTP connections.

For semi-secure applications, however, you should *include* the `iiop` plug-in before the `iiop_tls` plug-in in the ORB plug-ins list.
Default Access Control Lists

Overview

When you use the `itconfigure` utility to generate a secure domain, `SecureDomain`, a collection of default action-role mapping files are generated in the `etc/domains/SecureDomain` directory. Each of the core Orbix services, `Service`, is associated with an action-role mapping file as follows:

- `Service_action_role_mapping.xml`—for a secure domain.
- `Service_semi_secure_action_role_mapping.xml`—for a semi-secure domain.

Two basic levels of access are defined in these ACLs: `IONAUserRole` for ordinary users; and `IONAServiceRole` for administrators.

**Note:** It is recommended that you check whether the default ACLs provide the level of security you need before deploying the core Orbix services in a real system.

In this section

This section contains the following subsections:

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<td>Locator ACL</td>
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<td>Node Daemon ACL</td>
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<td>Event Log Service ACL</td>
<td>264</td>
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<tr>
<td>Notify Log Service ACL</td>
<td>267</td>
</tr>
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</table>
Configuration Repository ACL

Overview

The configuration repository (CFR) ACL is a special case, because it requires access control of parameter values in the IDL operations. To enable parameter-based access control, the CFR includes a special subsystem, a request to action mapper, which is responsible for parsing the operation parameters. In the CFR, the following kinds of parameter can be subjected to access control:

- Configuration scopes.
- Namespaces.

Note: It is recommended that you check whether the default configuration repository ACL provides the level of security you need before deploying it in a real system.

Configuration scopes

Similarly to a file domain, the CFR uses a configuration scope to group together related configuration settings. Configuration scopes can be nested as shown in the following example:

```
# Orbix Configuration File
demos {
  tls {
    secure_client_with_cert {
      ...
    }
  }
};
```

To reference a nested configuration scope, the period character (.) is used as a delimiter. For example, demos.tls.secure_client_with_cert refers to the innermost configuration scope of the preceding example.
Namespaces

The CFR uses *namespaces* to represent compound variable names. For example, the `principal_sponsor:csi:auth_method_id` variable name is built up as follows:

```
principal_sponsor                 Namespace.
principal_sponsor:csi             Namespace.
principal_sponsor:csi:auth_method_id  Variable name.
```

To represent compound names composed of namespaces, the colon character (:) is used as a delimiter.

IT_CFR module

The `IT_CFR` module defines some of the CFR’s remotely accessible interfaces and operations (the CFR also implements the IDL modules defined in `cfr_replication.idl`). The IDL for the `IT_CFR` module is available in the following file:

```
OrbixInstallDir/asp/Version/idl/orbix_pdk/cfr.idl
```

For example, the `itadmin` utility calls operations from the `IT_CFR` module in order to read from and update the configuration repository. Example 30 shows an overview of the interfaces defined in the `IT_CFR` module.

**Example 30: The IT_CFR Module**

```
// IDL
...
module IT_CFR {
    interface ConfigScope { ... };
    interface Namespace { ... };
    interface ConfigRepository { ... };
    interface Listener { ... };
    interface ListenerRegistration { ... };
};
```

CompoundName type

The `IT_CFR::CompoundName` type is defined as follows:

```
// IDL
module IT_CFR {
    typedef sequence<string> CompoundName;
};
```
The **CompoundName** type represents configuration scopes and namespaces as follows:

- **Configuration scope**—is converted into a CompoundName by recognizing the period character (.) as a delimiter. For example, the `demos.tls.secure_client_with_cert` scope is converted to the following sequence of strings: `demos, tls, secure_client_with_cert`.

- **Namespace**—is converted into a CompoundName by recognizing the colon character (:) as a delimiter. For example, the `principal_sponsor:csi:auth_method_id` variable name is converted to the following sequence of strings: `principal_sponsor, csi, auth_method_id`.

---

**Parameter-based access control**

In order to provide a meaningful level of access control for the CFR, it is necessary to control access at the level of operation parameters; operation-based access control would not be sufficient.

For example, consider the following `destroy_subscope()` operation from the **IT_CFR** module:

```idl
// IDL
module IT_CFR {
    interface ConfigScope {
        ConfigScope destroy_subscope(
            in CompoundName name
        ) raises (CFRException);
    }
};
```

Ordinary users should not have permission to destroy critical configuration scopes such as `iona_services` (which holds the configuration settings for the core Orbix services). But ordinary users do need full access to at least one scope, for example `demos`, in order to configure their own applications. **Parameter-based access control** enables you to control access based on the value of the `name` parameter in the preceding operation.
To control access based on the `destroy_scope()` operation’s `name` parameter, you could use the following fragment in an action-role mapping file:

```xml
<interface>
  <name>IDL:iona.com/IT_CFR/ConfigScope:1.0</name>
  ...
  <action-role>
    <action-name>destroy_subscope</action-name>
    <parameter-control>
      <parameter name="name" value="demos.*"/>
      <role-name>IONAUserRole</role-name>
    </parameter-control>
    ...
    <role-name>IONAServiceRole</role-name>
  </action-role>
</interface>
```

This ensures that ordinary users (represented by `IONAUserRole`) can only destroy the `demos` scope and its subscopes.

### ACL for configuration scope operations

**Example 31**, which is extracted from the default `cfr_action_role_mapping.xml` file, shows how access control is configured for the `IT_CFR::ConfigScope` interface.

**Example 31: ACL for the IT_CFR::ConfigScope Interface**

```xml
<interface>
  <name>IDL:iona.com/IT_CFR/ConfigScope:1.0</name>
  <action-role>
    <action-name>*get*</action-name>
    <role-name>IONAUserRole</role-name>
  </action-role>
  <action-role>
    <action-name>scope_lookup</action-name>
    <role-name>IONAUserRole</role-name>
  </action-role>
  <action-role>
    <action-name>create_subscope</action-name>
    <parameter-control>
      <parameter name="name" value="_it_cfr_root_scope.*"/>
      <role-name>IONAUserRole</role-name>
    </parameter-control>
    ...
    <role-name>IONAServiceRole</role-name>
  </action-role>
</interface>
```
Example 31: ACL for the IT_CFR::ConfigScope Interface

```
<interface>
  <action-role>
    <action-name>create_subscope</action-name>
    <parameter-control>
      <parameter name="name" value="multicast_demo.*"/>
    </parameter-control>
    <role-name>IONAUserRole</role-name>
  </action-role>
  <action-role>
    <action-name>destroy_subscope</action-name>
    <parameter-control>
      <parameter name="name" value="demos.*"/>
    </parameter-control>
    <role-name>IONAUserRole</role-name>
  </action-role>
  <action-role>
    <action-name>*</action-name>
    <role-name>IONAServiceRole</role-name>
  </action-role>
</interface>
```
Locator ACL

Overview
This subsection describes which interfaces and operations are accessible through the default locator ACL. The following alternative ACL files are generated by \texttt{itconfigure} for the locator service:

- \texttt{locator\_action\_role\_mapping.xml} (secure domain).
- \texttt{locator\_semi\_secure\_action\_role\_mapping.xml} (semi-secure domain).

\textbf{Note:} It is recommended that you check whether the default locator ACL provides the level of security you need before deploying it in a real system.

IONAServiceRole
The IONAServiceRole can access all interfaces and operations in both secure and semi-secure domains.

IONAUserRole and UnauthenticatedUserRole
The IONAUserRole can access the locator interfaces and operations shown in Table 5 in both secure and semi-secure domains.

Unauthenticated users (represented by the special UnauthenticatedUserRole in the action-role mapping file) can access the interfaces and operations shown in Table 5 in semi-secure domains only.

\textbf{Table 5:} Locator Interfaces and Operations Accessible to the IONAUserRole and the UnauthenticatedUserRole

<table>
<thead>
<tr>
<th>IDL Interface</th>
<th>IONAUserRole Accessible Operations (Secure and semi-secure)</th>
<th>UnauthenticatedUserRole Accessible Operations (Semi-secure only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT_Location::Locator</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_IMRAdmin::Process</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_IMRAdmin::ProcessRegistry</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_IMRAdmin::Process</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_IMRAdmin::ORBRegistry</td>
<td>All</td>
<td>All</td>
</tr>
</tbody>
</table>
Table 5: Locator Interfaces and Operations Accessible to the IONAUserRole and the UnauthenticatedUserRole

<table>
<thead>
<tr>
<th>IDL Interface</th>
<th>IONAUserRole Accessible Operations (Secure and semi-secure)</th>
<th>UnauthenticatedUserRole Accessible Operations (Semi-secure only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT_IMRAadmin::ORB</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_NamedKey::NamedKeyRegistry</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_POAIMRAadmin::POA</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_POAIMRAadmin::POARegistry</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_LocatorAdmin::ActiveORBRegistry</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_LocatorAdmin::ActiveProcessRegistry</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_POALocatorAdmin::ActivePOARegistry</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_POAIMRAadmin::ActivePOA</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_POAIMRAadmin::POAActiveORB</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_POAIMRAadmin::CachedPOA</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_POAIMRAadmin::POA</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_POAIMRAadmin::POACache</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_NodeDaemon::NodeDaemonRegistry</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_NodeDaemon::NodeDaemon</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>IT_NodeDaemon::DynamicStateRegistry</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>IT_ServerLocation::ServerValidator</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>IT_ServerLocation::EndpointCache</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>IT_LocatorAdmin::ActiveProcess</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>
Node Daemon ACL

Overview
This subsection describes which interfaces and operations are accessible through the default node daemon ACL. The following alternative ACL files are generated by `itconfigure` for the node daemon service:

- `node_daemon_action_role_mapping.xml` (*secure* domain).
- `node_daemon_semi_secure_action_role_mapping.xml` (*semi-secure* domain).

**Note:** It is recommended that you check whether the default node daemon ACL provides the level of security you need before deploying it in a real system.

IONAServiceRole
The IONAServiceRole can access all interfaces and operations in both *secure* and *semi-secure* domains.

IONAUserRole and UnauthenticatedUserRole
The IONAUserRole can access the node daemon interfaces and operations shown in Table 6 in both *secure* and *semi-secure* domains.

Unauthenticated users (represented by the special UnauthenticatedUserRole in the action-role mapping file) can access the interfaces and operations shown in Table 6 in *semi-secure* domains only.

**Table 6:** Node Daemon Interfaces and Operations Accessible to the IONAUserRole and the UnauthenticatedUserRole

<table>
<thead>
<tr>
<th>IDL Interface</th>
<th>IONAUserRole Accessible Operations (Secure and semi-secure)</th>
<th>UnauthenticatedUserRole Accessible Operations (Semi-secure only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT_NodeDaemon::NodeDaemon</td>
<td>shutdown</td>
<td>shutdown</td>
</tr>
<tr>
<td></td>
<td>shutdown_complete</td>
<td>shutdown_complete</td>
</tr>
<tr>
<td></td>
<td>register_process</td>
<td>register_process</td>
</tr>
<tr>
<td>IT_NodeDaemon::ORBStateRegistry</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>IT_NodeDaemon::EndpointRegistry</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>IT_NodeDaemon::ProcessRegistry</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>
### Table 6: Node Daemon Interfaces and Operations Accessible to the IONAUserRole and the UnauthenticatedUserRole

<table>
<thead>
<tr>
<th>IDL Interface</th>
<th>IONAUserRole Accessible Operations (Secure and semi-secure)</th>
<th>UnauthenticatedUserRole Accessible Operations (Semi-secure only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT_NodeDaemon::DynamicStateRegistry</td>
<td>All</td>
<td>All</td>
</tr>
</tbody>
</table>
Naming Service ACL

Overview
This subsection describes which interfaces and operations are accessible through the default naming service ACL. The following alternative ACL files are generated by `itconfigure` for the naming service:

- `naming_action_role_mapping.xml` (secure domain).
- `naming_semi_secure_action_role_mapping.xml` (semi-secure domain).

**Note:** It is recommended that you check whether the default naming ACL provides the level of security you need before deploying it in a real system.

IONAServiceRole
The IONAServiceRole can access all interfaces and operations in both secure and semi-secure domains.

IONAUserRole and UnauthenticatedUserRole
The IONAUserRole can access the naming service interfaces and operations shown in Table 7 in both secure and semi-secure domains.

Unauthenticated users (represented by the special `UnauthenticatedUserRole` in the action-role mapping file) can access the interfaces and operations shown in Table 7 in semi-secure domains only.

**Table 7:** Naming Service Interfaces and Operations Accessible to the IONAUserRole and the UnauthenticatedUserRole

<table>
<thead>
<tr>
<th>IDL Interface</th>
<th>IONAUserRole Accessible Operations (Secure and semi-secure)</th>
<th>UnauthenticatedUserRole Accessible Operations (Semi-secure only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT_Naming::IT_NamingContextExt</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_NamingReplication::IT_MasterNamingAdmin</td>
<td>shutdown</td>
<td>shutdown</td>
</tr>
<tr>
<td>IT_NamingAdmin::NamingAdmin</td>
<td>shutdown</td>
<td>shutdown</td>
</tr>
<tr>
<td>CosNaming::NamingContextExt</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>CosNaming::BindingIterator</td>
<td>All</td>
<td>All</td>
</tr>
</tbody>
</table>
Trader Service ACL

Overview

The default action-role mappings for the trader service are designed to protect the service by differentiating between non-intrusive operations (for example, read operations) and intrusive operations that might threaten the integrity of the service (for example, write operations).

Two different action-role mappings are provided, as follows:

- **Secure domain**—both intrusive and non-intrusive access to the trader service is restricted to authenticated applications only.
- **Semi-secure domain**—non-intrusive access to the trader service is available to both authenticated and unauthenticated applications. Intrusive access is limited to authenticated applications only.

**Note:** It is recommended that you check whether the default trader ACL provides the level of security you need before deploying it in a real system.

Secure domain

In a secure domain, the trader’s action-role mapping file is:

```
/etc/DomainName/trader_action_role_mapping.xml
```

Only authorized applications can add service types and service offers. This ensures that unauthorized peers will not be able to add to the repository references to malicious applications designed to mimic the behavior and appearance of expected service offers.

Applications that need to obtain references to existing service offers must also be authenticated. This prevents unauthorized client applications from looking up services they are not allowed to use.

**Note:** This precaution alone is not sufficient to protect server applications from unauthorized access, because querying the trader service is not the only way to obtain references to server applications. Sensitive applications must incorporate their own security mechanisms, or be protected by the security service as well.

Access to administrative operation that could endanger the integrity of the database if accessed by unauthorized parties is restricted to roles normally used by administrators (that is, IONAServiceRole and IONAAadminRole).
Semi-secure domain

In a semi-secure domain, the trader’s action-role mapping file is:

```
/etc/DomainName/trader_semi_secure_action_role_mapping.xml
```

This mapping relaxes the settings from the secure domain, so that unauthenticated users (using either secure or insecure transports) are allowed to invoke any operations that perform read only queries.

Only authenticated users are allowed to invoke operations that require write access to the Trader’s database. This ensures that no malicious application will be able to export unauthorized service types or offers (for example, server applications that mimic legitimate service offers, but instead collect information passed to them by client applications).

IONAServiceRole

The IONAServiceRole can access all interfaces and operations in both secure and semi-secure domains.

IONAUserRole and UnauthenticatedUserRole

The IONAUserRole can access the trader service interfaces and operations shown in Table 8 in both secure and semi-secure domains.

Unauthenticated users (represented by the special UnauthenticatedUserRole in the action-role mapping file) can access the interfaces and operations shown in Table 8 in semi-secure domains only.

**Table 8: Trader Service Interfaces and Operations Accessible to the IONAUserRole and the UnauthenticatedUserRole**

<table>
<thead>
<tr>
<th>IDL Interface</th>
<th>IONAUserRole Accessible Operations (Secure and semi-secure)</th>
<th>UnauthenticatedUserRole Accessible Operations (Semi-secure only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CosTradingRepos::ServiceTypeRepository</td>
<td>add_type, list_types, describe_type, fully_describe_type</td>
<td>list_types, describe_type, fully_describe_type</td>
</tr>
<tr>
<td>CosTradingDynamic::DynamicPropEval</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_Trading::IT LookupExt</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_TradingAdmin::TradingAdmin</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>CosTrading::Lookup</td>
<td>All</td>
<td>All</td>
</tr>
</tbody>
</table>
Table 8: Trader Service Interfaces and Operations Accessible to the IONAUUserRole and the UnauthenticatedUserRole

<table>
<thead>
<tr>
<th>IDL Interface</th>
<th>IONAUUserRole Accessible Operations (Secure and semi-secure)</th>
<th>UnauthenticatedUserRole Accessible Operations (Semi-secure only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CosTrading::Register</td>
<td>export, withdraw, describe, modify, withdraw_using_constraint</td>
<td>None</td>
</tr>
<tr>
<td>CosTrading::Link</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>CosTrading::Proxy</td>
<td>All</td>
<td>None</td>
</tr>
<tr>
<td>CosTrading::Admin</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>CosTrading::OfferIterator</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>CosTrading::OfferIdIterator</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>
Event Service ACL

Overview

The default action-role mappings for the event service are designed to protect the service by differentiating between non-intrusive operations (for example, read operations) and intrusive operations that might threaten the integrity of the service (for example, write operations).

Two different action-role mappings are provided, as follows:

- **Secure domain**—intrusive access to the event service is restricted to authenticated applications only.
- **Semi-secure domain**—intrusive access to the event service is available to both authenticated and unauthenticated applications.

**Note:** It is recommended that you check whether the default events ACL provides the level of security you need before deploying it in a real system.

Secure domain

In a secure domain, the event service’s action-role mapping file is:

```
/etc/DomainName/event_action_role_mapping.xml
```

Only authenticated applications can connect to the event service for the purpose of sending or receiving events. With this security scheme in place, consumers connected to the service can trust that the events they receive are legitimate (because they are known to originate from authenticated suppliers). Suppliers that send events through the event service can trust that their events reach only legitimate consumers (because consumers are also authenticated).

Semi-secure domain

In a semi-secure domain, the event service’s action-role mapping file is:

```
/etc/DomainName/event_semi_secure_action_role_mapping.xml
```

The security scheme for the semi-secure domain is very permissive, because all applications have full access to the service by default. The scheme could be made more secure by restricting the role of unauthenticated applications to simple listeners (by denying them the privilege of connecting suppliers to event channels).

**WARNING:** The semi-secure scheme should not be used if events can carry security-sensitive information, because the identity of neither the suppliers nor the consumers can be guaranteed.
IONAServiceRole

The IONAServiceRole can access all interfaces and operations in both secure and semi-secure domains.

IONAUserRole and UnauthenticatedUserRole

The IONAUserRole can access the event service interfaces and operations shown in Table 9 in both secure and semi-secure domains.

Unauthenticated users (represented by the special UnauthenticatedUserRole in the action-role mapping file) can access the interfaces and operations shown in Table 9 in semi-secure domains only.

**Table 9: Event Service Interfaces and Operations Accessible to the IONAUserRole and the UnauthenticatedUserRole**

<table>
<thead>
<tr>
<th>IDL Interface</th>
<th>IONAUserRole Accessible Operations (Secure and semi-secure)</th>
<th>UnauthenticatedUserRole Accessible Operations (Semi-secure only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT_EventChannelAdminInternal::EventChannelFactory</td>
<td>_get_name</td>
<td>_get_name</td>
</tr>
<tr>
<td></td>
<td>_get_host</td>
<td>_get_host</td>
</tr>
<tr>
<td></td>
<td>shutdown</td>
<td>shutdown</td>
</tr>
<tr>
<td></td>
<td>create_channel</td>
<td>create_channel</td>
</tr>
<tr>
<td></td>
<td>find_channel</td>
<td>find_channel</td>
</tr>
<tr>
<td></td>
<td>find_channel_by_id</td>
<td>find_channel_by_id</td>
</tr>
<tr>
<td></td>
<td>list_channels</td>
<td>list_channels</td>
</tr>
<tr>
<td></td>
<td>create_typed_channel</td>
<td>create_typed_channel</td>
</tr>
<tr>
<td></td>
<td>find_typed_channel</td>
<td>find_typed_channel</td>
</tr>
<tr>
<td></td>
<td>find_typed_channel_by_id</td>
<td>find_typed_channel_by_id</td>
</tr>
<tr>
<td></td>
<td>list_typed_channels</td>
<td>list_typed_channels</td>
</tr>
<tr>
<td></td>
<td>create</td>
<td>create</td>
</tr>
<tr>
<td></td>
<td>find</td>
<td>find</td>
</tr>
<tr>
<td></td>
<td>findByRef</td>
<td>findByRef</td>
</tr>
<tr>
<td></td>
<td>list</td>
<td>list</td>
</tr>
<tr>
<td></td>
<td>createTyped</td>
<td>createTyped</td>
</tr>
<tr>
<td></td>
<td>findTyped</td>
<td>findTyped</td>
</tr>
<tr>
<td></td>
<td>findByTypedRef</td>
<td>findByTypedRef</td>
</tr>
<tr>
<td></td>
<td>listTyped</td>
<td>listTyped</td>
</tr>
<tr>
<td>CosEventChannelAdmin::EventChannel</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>CosTypedEventChannelAdmin::TypedEventChannel</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>CosEventChannelAdmin::SupplierAdmin</td>
<td>All</td>
<td>All</td>
</tr>
</tbody>
</table>
Table 9: Event Service Interfaces and Operations Accessible to the IONAUserRole and the UnauthenticatedUserRole

<table>
<thead>
<tr>
<th>IDL Interface</th>
<th>IONAUserRole Accessible Operations (Secure and semi-secure)</th>
<th>UnauthenticatedUserRole Accessible Operations (Semi-secure only)</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>CosTypedEventChannelAdmin::TypedSupplierAdmin</code></td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td><code>CosEventChannelAdmin::ConsumerAdmin</code></td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td><code>CosTypedEventChannelAdmin::TypedConsumerAdmin</code></td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td><code>CosEventChannelAdmin::ProxyPushConsumer</code></td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td><code>CosTypedEventChannelAdmin::ProxyPushConsumer</code></td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td><code>CosEventChannelAdmin::ProxyPushSupplier</code></td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td><code>CosEventChannelAdmin::ProxyPullSupplier</code></td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td><code>CosEventChannelAdmin::ProxyPullConsumer</code></td>
<td>All</td>
<td>All</td>
</tr>
</tbody>
</table>
Notification Service ACL

Overview

The default action-role mappings for the notification service are designed to protect the service by differentiating between non-intrusive operations (for example, read operations) and intrusive operations that might threaten the integrity of the service (for example, write operations).

Two different action-role mappings are provided, as follows:

- **Secure domain**—both intrusive and non-intrusive access to the notification service are restricted to authenticated applications only.
- **Semi-secure domain**—non-intrusive access to the notification service is available to both authenticated and unauthenticated applications. Intrusive access is limited to authenticated applications only.

**Note:** It is recommended that you check whether the default notification ACL provides the level of security you need before deploying it in a real system.

Secure domain

In a secure domain, the event service’s action-role mapping file is:

```
/etc/DomainName/notify_action_role_mapping.xml
```

Only authenticated applications can connect to the notification service for the purpose of sending or receiving notifications. With this security scheme in place, consumers connected to the service can trust that the events they receive are legitimate (because they are known to originate from authenticated suppliers). Suppliers that send events through the notification service can trust that their events reach only legitimate consumers (because consumers are also authenticated).

Authenticated applications are allowed to create and apply event filters and mapping filters, as normal.

Authenticated applications are allowed to alter the behavior of the notification service by setting *Quality of Service* properties at any level of the service. The operations that administer the notification service are also protected by access control. Hence, these administration operations can only be called by authenticated applications and utilities.
Semi-secure domain

In a semi-secure domain, the event service’s action-role mapping file is:

`etc/DomainName/notify_semi_secure_action_role_mapping.xml`

The security scheme for the semi-secure domain forces all event suppliers to authenticate with the notification service. However any consumer, even non-authenticated consumers, can connect to the service and receive events.

Under this security model, consumers can trust the notifications they receive to be legitimate (because they are known to originate from authenticated applications only). On the other hand, suppliers do not know whether the events they send will reach authenticated or unauthenticated consumers.

**WARNING:** The semi-secure scheme should not be used if notifications can carry security-sensitive information, because suppliers have no way of knowing the identity of consumers. Also, an insecure transport might be used to carry events to the consumers.

Operations that could potentially compromise the integrity or the functionality of the notification service are restricted to authenticated applications only.

Only authenticated peers are allowed to apply filters to objects other than proxy consumers or suppliers, since filters set at any other level could potentially be used by malicious applications to prevent events from reaching their legitimate targets.

Unauthenticated consumers have the right to decide which events they want to receive: they can still apply filters to their proxy supplier. Similarly, they have read-only access to filters set at the channel administration level (so that they can interpret the filtration logic of the events they receive).

IONAServiceRole

The IONAServiceRole can access all interfaces and operations in both secure and semi-secure domains.
IONAUserRole and UnauthenticatedUserRole

The IONAUserRole can access the notification service interfaces and operations shown in Table 10 in both secure and semi-secure domains.

Unauthenticated users (represented by the special UnauthenticatedUserRole in the action-role mapping file) can access the interfaces and operations shown in Table 10 in semi-secure domains only.

Table 10: Notification Service Interfaces and Operations Accessible to the IONAUserRole and the UnauthenticatedUserRole

<table>
<thead>
<tr>
<th>IDL Interface</th>
<th>IONAUserRole Accessible Operations (Secure and semi-secure)</th>
<th>UnauthenticatedUserRole Accessible Operations (Semi-secure only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT_NotifyFilterInternal::Filter</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_NotifyFilterInternal::MappingFilter</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_NotifyFilterInternal::FilterFactory</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_NotifyComm::GroupNotifyPublish</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>IT_NotifyComm::GroupPushConsumer</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_NotifyComm::GroupStructuredPushConsumer</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_NotifyComm::GroupSequencePushConsumer</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_NotifyChannelAdmin::IT_ProxySupplier</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_NotifyChannelAdmin::NotifyProxySupplier</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_NotifyChannelAdmin::ProxyPushSupplier</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_NotifyChannelAdmin::StructuredProxyPushSupplier</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_NotifyChannelAdmin::SequenceProxyPushSupplier</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_NotifyChannelAdmin::ProxyPullSupplier</td>
<td>All</td>
<td>All</td>
</tr>
</tbody>
</table>
Table 10: Notification Service Interfaces and Operations Accessible to the IONAUserRole and the UnauthenticatedUserRole

<table>
<thead>
<tr>
<th>IDL Interface</th>
<th>IONAUserRole Accessible Operations (Secure and semi-secure)</th>
<th>UnauthenticatedUserRole Accessible Operations (Semi-secure only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT_NotifyChannelAdmin::StructuredProxyPullSupplier</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_NotifyChannelAdmin::SequenceProxyPullSupplier</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_NotifyChannelAdmin::IT_ProxyConsumer</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_NotifyChannelAdmin::NotifyProxyConsumer</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_NotifyChannelAdmin::ProxyPushConsumer</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_NotifyChannelAdmin::StructuredProxyPushConsumer</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_NotifyChannelAdmin::SequenceProxyPushConsumer</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_NotifyChannelAdmin::ProxyPullConsumer</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_NotifyChannelAdmin::StructuredProxyPullConsumer</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_NotifyChannelAdmin::SequenceProxyPullConsumer</td>
<td>All</td>
<td>All</td>
</tr>
</tbody>
</table>
### Table 10: Notification Service Interfaces and Operations Accessible to the IONAUserRole and the UnauthenticatedUserRole

<table>
<thead>
<tr>
<th>IDL Interface</th>
<th>IONAUserRole Accessible Operations (Secure and semi-secure)</th>
<th>UnauthenticatedUserRole Accessible Operations (Semi-secure only)</th>
</tr>
</thead>
</table>
| IT_NotifyChannelAdmin::ConsumerAdmin | get_bridge_proxy_supplier obtain_subscription_types _for_admin  
_get_bridge_pull_suppliers 
_get_bridge_push_suppliers  
get_proxy_supplier obtain_notification_pull_supplier  
obtain_notification_push_supplier  
_get_MyID  
_get_MyChannel  
_get_MyOperator  
_get_priority_filter  
_get_lifetime_filter  
_get_pull_suppliers  
_get_push_suppliers  
get_qos validate_qos  
get_filter  
get_all_filters obtain_push_supplier obtain_pull_supplier destroy  
_set_priority_filter  
_set_lifetime_filter  
set_qos  
subscription_change add_filter  
remove_filter  
remove_all_filters | get_bridge_proxy_supplier obtain_subscription_types _for_admin  
_get_bridge_pull_suppliers 
_get_bridge_push_suppliers  
get_proxy_supplier obtain_notification_pull_supplier  
obtain_notification_push_supplier  
_get_MyID  
_get_MyChannel  
_get_MyOperator  
_get_priority_filter  
_get_lifetime_filter  
_get_pull_suppliers  
_get_push_suppliers  
get_qos validate_qos  
get_filter  
get_all_filters obtain_push_supplier obtain_pull_supplier  
subscription_change |
Table 10: Notification Service Interfaces and Operations Accessible to the IONAUserRole and the UnauthenticatedUserRole

<table>
<thead>
<tr>
<th>IDL Interface</th>
<th>IONAUserRole Accessible Operations (Secure and semi-secure)</th>
<th>UnauthenticatedUserRole Accessible Operations (Semi-secure only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT_NotifyChannelAdmin::SupplierAdmin</td>
<td>get_bridge_proxy_consumer obtain_offered_types_for_admin _get_bridge_pull_consumers _get_bridge_push_consumers _get_MyID _get_MyChannel _get_MyOperator get_qos validate_qos get_filter get_all_filters obtain.Typed_notification _pull_consumer obtain.Typed_notification _push_consumer get_proxy_consumer obtain_notification_pull_consumer obtain_notification_push_consumer destroy _get_pull_consumers _get_push_consumers set_qos offer_change add_filter remove_filter remove_all_filters obtain_push_consumer obtain_pull_consumer</td>
<td>get_bridge_proxy_consumer obtain_offered_types_for_admin _get_bridge_pull_consumers _get_bridge_push_consumers _get_MyID _get_MyChannel _get_MyOperator get_qos validate_qos get_filter get_all_filters</td>
</tr>
<tr>
<td>IT_NotifyChannelAdmin::Manager</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>IT_NotifyChannelAdmin::GroupProxyPushSupplier</td>
<td>All</td>
<td>All</td>
</tr>
</tbody>
</table>

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### Table 10: Notification Service Interfaces and Operations Accessible to the IONAUserRole and the UnauthenticatedUserRole

<table>
<thead>
<tr>
<th>IDL Interface</th>
<th>IONAUserRole Accessible Operations (Secure and semi-secure)</th>
<th>UnauthenticatedUserRole Accessible Operations (Semi-secure only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT_NotifyChannelAdmin::GroupStructuredProxyPushSupplier</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_NotifyChannelAdmin::GroupSequenceProxyPushSupplier</td>
<td>All</td>
<td>All</td>
</tr>
</tbody>
</table>
| IT_NotifyChannelAdminInternal::EventChannel | All | obtain_offered_types  
obtain_subscribed_types  
_get_event_info  
get_consumeradmin  
get_supplieradmin  
get_all_consumeradmins  
get_all_supplieradmins  
_get_MyFactory  
_get_default_consumer_admin  
_in  
_get_default_supplier_admin  
_in  
_get_default_filter_factory  
get_qos  
validate_qos  
get_admin  
for_consumers  
new_for_consumers_delegate  
new_for_consumers |
| IT_NotifyChannelAdminInternal::EventChannelFactory | All | _get_default_filter_factory  
find_channel  
find_channel_by_id  
list_channels  
_get_manager  
get_all_channels  
get_event_channel  
create_named_channel  
create_channel |
Table 10: Notification Service Interfaces and Operations Accessible to the IONAUserRole and the UnauthenticatedUserRole

<table>
<thead>
<tr>
<th>IDL Interface</th>
<th>IONAUserRole Accessible Operations (Secure and semi-secure)</th>
<th>UnauthenticatedUserRole Accessible Operations (Semi-secure only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT.NotifyChannelAdminInternal::BridgeProxyPushSupplier</td>
<td>All</td>
<td>None</td>
</tr>
<tr>
<td>IT.NotifyChannelAdminInternal::BridgeProxyPushConsumer</td>
<td>All</td>
<td>None</td>
</tr>
</tbody>
</table>
Basic Log Service ACL

Overview

The default action-role mappings for the basic log service are designed to protect the service by differentiating between non-intrusive operations (for example, read operations) and intrusive operations that might threaten the integrity of the service (for example, write operations).

Two different action-role mappings are provided, as follows:

- **Secure domain**—intrusive access to the basic log service is restricted to authenticated applications only.
- **Semi-secure domain**—intrusive access to the basic log service is available to both authenticated and unauthenticated applications.

Note: It is recommended that you check whether the default basic log ACL provides the level of security you need before deploying it in a real system.

Secure domain

In a secure domain, the basic log service’s action-role mapping file is:

`etc/DomainName/basic_log_action_role_mapping.xml`

Only authenticated applications can connect to the basic log service.

Authenticated applications can create new logs, retrieve existing logs, or delete logs. They also have unlimited access to all of the operations related to records.

Authenticated applications also have full access to the administrative functions of the logs (for example, setting the quality of service properties on the log, changing the maximum log size, disabling a log, and so on).

Semi-secure domain

In a semi-secure domain, the basic log service’s action-role mapping file is:

`etc/DomainName/basic_log_semi_secure_action_role_mapping.xml`

The security scheme for the semi-secure domain is very permissive, because all applications have full access to the service by default. The scheme could be made more secure by denying unauthenticated peers access to some of the write operations of the services (such as log creation or deletion).

IONAServiceRole

The IONAServiceRole can access all interfaces and operations in both secure and semi-secure domains.
IONAUserRole and UnauthenticatedUserRole

The IONAUserRole can access the basic log service interfaces and operations shown in Table 11 in both secure and semi-secure domains.

Unauthenticated users (represented by the special UnauthenticatedUserRole in the action-role mapping file) can access the interfaces and operations shown in Table 11 in semi-secure domains only.

Table 11: Basic Log Service Interfaces and Operations Accessible to the IONAUserRole and the UnauthenticatedUserRole

<table>
<thead>
<tr>
<th>IDL Interface</th>
<th>IONAUserRole Accessible Operations (Secure and semi-secure)</th>
<th>UnauthenticatedUserRole Accessible Operations (Semi-secure only)</th>
</tr>
</thead>
</table>
| IT_BasicLogAdmin::BasicLogFactory | _get_manager  
create  
create_with_id  
list_logs  
find_log  
list_logs_by_id | _get_manager  
create  
create_with_id  
list_logs  
find_log  
list_logs_by_id |
| IT_MessagingAdmin::Manager | _get_name  
_get_host  
shutdown | _get_name  
_get_host  
shutdown |
| DsLogAdmin::BasicLog | All | All\(^a\) |
| DsLogAdmin::Iterator | get  
destroy | get  
destroy |

a. Security could be tightened at this level by removing access to the destroy operation, for example, or to some of the operations used to access log records (see operations inherited from the DsLogAdmin::Log interface).
Event Log Service ACL

Overview

The default action-role mappings for the event log service are designed to protect the service by differentiating between non-intrusive operations (for example, read operations) and intrusive operations that might threaten the integrity of the service (for example, write operations).

Two different action-role mappings are provided, as follows:

- **Secure domain**—intrusive access to the event log service is restricted to authenticated applications only.
- **Semi-secure domain**—intrusive access to the event log service is available to both authenticated and unauthenticated applications.

**Note:** It is recommended that you check whether the default event log ACL provides the level of security you need before deploying it in a real system.

Secure domain

In a secure domain, the event log service’s action-role mapping file is:

```
etc/DomainName/event_log_action_role_mapping.xml
```

Only authenticated applications can connect to the event log service. With this security scheme in place, consumers connected to the built-in event channel can trust that the events they receive are legitimate (because they are known to originate from authenticated suppliers). Event suppliers can trust that their events will be sent only to legitimate consumers (because consumers are also authenticated).

Authenticated applications can create new logs, retrieve existing logs, or delete logs.

Authenticated applications also have full access to the administrative functions of the logs (for example, setting the quality of service properties on the log, changing the maximum log size, disabling a log, and so on).
**Semi-secure domain**

In a semi-secure domain, the event log service’s action-role mapping file is:

`etc/DomainName/event_log_semi_secure_action_role_mapping.xml`

The security scheme for the semi-secure domain is very permissive, since by default all applications have full access to the service. This scheme could be made more secure by restricting the role of unauthenticated applications to simple listeners (by denying them the privilege of connecting suppliers to the event channel as well as restricting write access to the logs and log records).

The semi-secure scheme should not be used if events carry security-sensitive information, because the identity of neither the suppliers or the consumer can be guaranteed. The integrity of the logs cannot be guaranteed since unauthenticated peers have access to all of the write operations and can alter the content of the logs.

**IONAServiceRole**

The `IONAServiceRole` can access all interfaces and operations in both secure and semi-secure domains.

**IONAUserRole and UnauthenticatedUserRole**

The `IONAUserRole` can access the event log service interfaces and operations shown in Table 12 in both secure and semi-secure domains.

Unauthenticated users (represented by the special `UnauthenticatedUserRole` in the action-role mapping file) can access the interfaces and operations shown in Table 12 in semi-secure domains only.

**Table 12: Event Log Service Interfaces and Operations Accessible to the IONAUserRole and the UnauthenticatedUserRole**

<table>
<thead>
<tr>
<th>IDL Interface</th>
<th>IONAUserRole Accessible Operations (Secure and semi-secure)</th>
<th>UnauthenticatedUserRole Accessible Operations (Semi-secure only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT_EventLogAdmin::EventLogFactory</td>
<td>_get_manager, create, create_with_id, list_logs, find_log, list_logs_by_id, obtain_push_supplier, obtain_pull_supplier</td>
<td>_get_manager, create, create_with_id, list_logs, find_log, list_logs_by_id, obtain_push_supplier, obtain_pull_supplier</td>
</tr>
</tbody>
</table>
Table 12:  Event Log Service Interfaces and Operations Accessible to the IONAUserRole and the UnauthenticatedUserRole

<table>
<thead>
<tr>
<th>IDL Interface</th>
<th>IONAUserRole Accessible Operations (Secure and semi-secure)</th>
<th>UnauthenticatedUserRole Accessible Operations (Semi-secure only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT_MessagingAdmin::Manager</td>
<td>_get_name</td>
<td>_get_name</td>
</tr>
<tr>
<td></td>
<td>_get_host</td>
<td>_get_host</td>
</tr>
<tr>
<td></td>
<td>shutdown</td>
<td>shutdown</td>
</tr>
<tr>
<td>DsEventLogAdmin::EventLog</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>DsLogAdmin::Iterator</td>
<td>get</td>
<td>get</td>
</tr>
<tr>
<td></td>
<td>destroy</td>
<td>destroy</td>
</tr>
<tr>
<td>CosEventChannelAdmin::ConsumerAdmin</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>CosEventChannelAdmin::SupplierAdmin</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>CosEventChannelAdmin::ProxyPushSupplier</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>CosEventChannelAdmin::ProxyPullConsumer</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>CosEventChannelAdmin::ProxyPullSupplier</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>CosEventChannelAdmin::ProxyPushConsumer</td>
<td>All</td>
<td>All</td>
</tr>
</tbody>
</table>
Notify Log Service ACL

Overview
The default action-role mappings for the notify log service are designed to protect the service by differentiating between non-intrusive operations (for example, read operations) and intrusive operations that might threaten the integrity of the service (for example, write operations).

Two different action-role mappings are provided, as follows:

- **Secure domain**—both intrusive and non-intrusive access to the notify log service are restricted to authenticated applications only.
- **Semi-secure domain**—non-intrusive access to the notify log service is available to both authenticated and unauthenticated applications. Intrusive access is limited to authenticated applications only.

**Note:** It is recommended that you check whether the default notify log ACL provides the level of security you need before deploying it in a real system.

Secure domain
In a secure domain, the notify log service’s action-role mapping file is:

```
/etc/DomainName/notify_log_action_role_mapping.xml
```

Only authenticated applications can connect to the notify log service. With this security scheme in place, consumers connected to the built-in event channel can trust that the events they receive are legitimate (because they are known to originate from authenticated suppliers). Suppliers that send events through the notification service can trust that their events will reach only legitimate consumers (because consumers are also authenticated).

Authenticated applications can create new logs, retrieve existing logs, or delete logs.

Authenticated applications also have full access to the administrative functions of the logs (for example, setting the quality of service properties on the log, changing the maximum log size, disabling a log, and so on).

Authenticated applications are allowed to create and apply both types of filters supported by the service: log filters (which decide which events get logged) and notification-style filters (which decide which kind of events pass through the built-in event channel).
Semi-secure domain

In a semi-secure domain, the notify log service’s action-role mapping file is:

```
/etc/DomainName/notify_log_semi_secure_action_role_mapping.xml
```

The security scheme for the semi-secure domain requires event suppliers (applications that create logs or write log records) to authenticate with the notify log service. Any consumer (even if unauthenticated) can connect to the service, however, in order to receive events and access the logs. Only authenticated applications (normally event suppliers) can create new logs or alter the list of existing logs (for example, by removing logs). This ensures that unauthenticated applications are not able to interfere with the logging logic or alter critical information by tampering with the service's database (by removing log entries, for example).

With this semi-secure scheme, consumers are able to trust the notifications they receive from the built-in event channel to be legitimate (because the events must have originated from an authenticated application). Consumers can also trust all logs to be genuine. On the other hand, suppliers do not know whether the events they send and/or the logs they create will reach authenticated and/or unauthenticated consumers.

Unauthenticated applications have unlimited read-only access to all the properties of the service and the logs. They can receive events from the built-in channel, access the list of existing logs and obtain records from any existing log. Unauthenticated applications can also examine, but not change, the filtering logic applied to the service. However, even unauthenticated consumers can decide which events they want to receive by applying filters to their proxy supplier.

**Note:** This semi-secure scheme allows unauthenticated applications to create filters. This is a safe policy, because the unauthenticated applications cannot apply the newly created filters in places they are not supposed to.

IONAServiceRole

The IONAServiceRole can access all interfaces and operations in both secure and semi-secure domains.
IONAUserRole and UnauthenticatedUserRole

The IONAUserRole can access the notify log service interfaces and operations shown in Table 13 in both secure and semi-secure domains.

Unauthenticated users (represented by the special UnauthenticatedUserRole in the action-role mapping file) can access the interfaces and operations shown in Table 13 in semi-secure domains only.
### Table 13: Notify Log Service Interfaces and Operations Accessible to the IONAUserRole and the UnauthenticatedUserRole

<table>
<thead>
<tr>
<th>IDL Interface</th>
<th>IONAUserRole Accessible Operations (Secure and semi-secure)</th>
<th>UnauthenticatedUserRole Accessible Operations (Semi-secure only)</th>
</tr>
</thead>
</table>
| IT_NotifyLogAdmin::NotifyLog | All | _nonexistent 
obtain_offered_types 
obtain_subscribed_types 
get_filter 
my_factory 
id 
get_log_qos 
get_max_record_life 
get_max_size 
get_current_size 
get_n_records 
get_log_full_action 
get_administrative_state 
get_forwarding_state 
get_operational_state 
get_interval 
get_availability_status 
get_capacity_alarm_thresholds 
get_week_mask 
query 
retrieve 
match 
get_record_attribute 
get_consumeradmin 
get_supplieradmin 
get_all_consumeradmins 
get_all_supplieradmins 
_get_MyFactory 
_get_default_consumer_admin 
in 
_get_default_supplier_admin 
in 
_get_default_filter_factory 
get_qos 
validate_qos 
get_admin 
for_consumers 
new_for_consumers |
### Table 13: Notify Log Service Interfaces and Operations Accessible to the IONAUserRole and the UnauthenticatedUserRole

<table>
<thead>
<tr>
<th>IDL Interface</th>
<th>IONAUserRole Accessible Operations (Secure and semi-secure)</th>
<th>UnauthenticatedUserRole Accessible Operations (Semi-secure only)</th>
</tr>
</thead>
</table>
| IT_NotifyLogAdmin::NotifyLogFactory  | _get_default_filter_factory  
create  
create_with_id  
list_logs  
find_log  
list_logs_by_id  
get_proxy_supplier  
obtain_notification_pull_supplier  
obtain_notification_push_supplier  
_get_MyID  
_get_MyChannel  
_get_MyOperator  
_get_priority_filter  
_get_lifetime_filter  
_get_pull_suppliers  
_get_push_suppliers  
get_qos  
validate_qos  
get_filter  
get_all_filters  
obtain_push_supplier  
obtain_pull_supplier  
destroy  
_set_priority_filter  
_set_lifetime_filter  
set_qos  
subscription_change  
add_filter  
remove_filter  
remove_all_filters | _get_default_filter_factory  
get_manager  
create  
create_with_id  
list_logs  
find_log  
list_logs_by_id  
get_proxy_supplier  
obtain_notification_pull_supplier  
obtain_notification_push_supplier  
_get_MyID  
_get_MyChannel  
_get_MyOperator  
_get_priority_filter  
_get_lifetime_filter  
_get_pull_suppliers  
_get_push_suppliers  
get_qos  
validate_qos  
get_filter  
get_all_filters  
obtain_push_supplier  
obtain_pull_supplier  
destroy  
_set_priority_filter  
_set_lifetime_filter  
set_qos  
subscription_change |  

<table>
<thead>
<tr>
<th>IT_MessagingAdmin::Manager</th>
<th>All</th>
<th>None</th>
</tr>
</thead>
</table>
| DsLogAdmin::Iterator                 | get  
destroy                                                         | get  
destroy |
Table 13: Notify Log Service Interfaces and Operations Accessible to the IONAUserRole and the UnauthenticatedUserRole

<table>
<thead>
<tr>
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<th>IONAUserRole Accessible Operations (Secure and semi-secure)</th>
<th>UnauthenticatedUserRole Accessible Operations (Semi-secure only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT_NotifyChannelAdmin::ConsumerAdmin</td>
<td>All</td>
<td>get_bridge_proxy_supplier obtain_subscription_types _for_admin _get_bridge_pull_suppliers _get_bridge_push_suppliers get_proxy_supplier obtain_notification_pull_supplier obtain_notification_push_supplier _get_MyID _get_MyChannel _get_MyOperator _get_priority_filter _get_lifetime_filter _get_pull_suppliers _get_push_suppliers get_qos validate_qos get_filter get_all_filters obtain_push_supplier obtain_pull_supplier subscription_change</td>
</tr>
</tbody>
</table>
Table 13: Notify Log Service Interfaces and Operations Accessible to the IONAUserRole and the UnauthenticatedUserRole

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<th>UnauthenticatedUserRole Accessible Operations (Semi-secure only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT_NotifyChannelAdmin::SupplierAdmin</td>
<td>All</td>
<td>get_bridge_proxy_consumer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>obtain_offered_types_for_admin</td>
</tr>
<tr>
<td></td>
<td></td>
<td>_get_bridge_pull_consumers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>_get_bridge_push_consumers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>_get_MyID</td>
</tr>
<tr>
<td></td>
<td></td>
<td>_get_MyChannel</td>
</tr>
<tr>
<td></td>
<td></td>
<td>_get_MyOperator</td>
</tr>
<tr>
<td></td>
<td></td>
<td>get_qos</td>
</tr>
<tr>
<td></td>
<td></td>
<td>validate_qos</td>
</tr>
<tr>
<td></td>
<td></td>
<td>get_filter</td>
</tr>
<tr>
<td></td>
<td></td>
<td>get_all_filters</td>
</tr>
<tr>
<td>IT_NotifyChannelAdmin::ProxyPushSupplier</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_NotifyChannelAdmin::StructuredProxyPushSupplier</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_NotifyChannelAdmin::SequenceProxyPushSupplier</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_NotifyChannelAdmin::ProxyPullSupplier</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_NotifyChannelAdmin::StructuredProxyPullSupplier</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_NotifyChannelAdmin::SequenceProxyPullSupplier</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_NotifyChannelAdmin::ProxyPushConsumer</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_NotifyChannelAdmin::StructuredProxyPushConsumer</td>
<td>All</td>
<td>All</td>
</tr>
</tbody>
</table>
### Table 13: Notify Log Service Interfaces and Operations Accessible to the IONAUserRole and the UnauthenticatedUserRole

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<th>IONAUserRole Accessible Operations (Secure and semi-secure)</th>
<th>UnauthenticatedUserRole Accessible Operations (Semi-secure only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT_NotifyChannelAdmin::SequenceProxyPushConsumer</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_NotifyChannelAdmin::ProxyPullConsumer</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_NotifyChannelAdmin::StructuredProxyPullConsumer</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_NotifyChannelAdmin::SequenceProxyPullConsumer</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_NotifyChannelAdmin::GroupProxyPushSupplier</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_NotifyChannelAdmin::GroupStructuredProxyPushSupplier</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_NotifyChannelAdmin::GroupSequenceProxyPushSupplier</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_NotifyFilterInternal::Filter</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_NotifyFilterInternal::MappingFilter</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>IT_NotifyFilterInternal::FilterFactory</td>
<td>All</td>
<td>All</td>
</tr>
</tbody>
</table>
Part III

SSL/TLS Administration

This part contains the following chapters:

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<th>Page</th>
</tr>
</thead>
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<td>277</td>
</tr>
<tr>
<td>Managing Certificates</td>
<td>289</td>
</tr>
<tr>
<td>Configuring SSL/TLS Secure Associations</td>
<td>333</td>
</tr>
<tr>
<td>Configuring SSL/TLS Authentication</td>
<td>361</td>
</tr>
<tr>
<td>Automatic Activation of Secure Servers</td>
<td>389</td>
</tr>
</tbody>
</table>
CHAPTER 10

Choosing an SSL/TLS Toolkit

This chapter describes the SSL/TLS toolkit replaceability feature, which enables you to replace the underlying third-party toolkit that implements the SSL/TLS protocol for Orbix applications.

In this chapter

This chapter contains the following sections:

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<th>page 278</th>
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<tr>
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<td>page 279</td>
</tr>
<tr>
<td>OpenSSL Toolkit for C++</td>
<td>page 280</td>
</tr>
<tr>
<td>Schannel Toolkit for C++</td>
<td>page 281</td>
</tr>
<tr>
<td>JSSE/JCE Architecture</td>
<td>page 283</td>
</tr>
</tbody>
</table>
Toolkit Replaceability

Overview

In Orbix, the underlying SSL/TLS security layer is provided by a third-party security toolkit. The Orbix security configuration variables and programming APIs wrap the third-party toolkit in order to integrate it with CORBA technology.

Orbix provides a toolkit replaceability feature by exploiting Orbix’s Adaptive Runtime Technology (ART) to encapsulate third-party SSL/TLS toolkits in an ART plug-in. Using this modular approach, you can replace the SSL/TLS security layer underlying Orbix by specifying a different ART plug-in to load at runtime.

Toolkits for C++ applications

The following SSL/TLS toolkits are currently available for use with Orbix C++ applications:

- “Baltimore Toolkit for C++ and Java” on page 279.
- “OpenSSL Toolkit for C++” on page 280.
- “Schannel Toolkit for C++” on page 281.

JSSE/JCE architecture for Java applications

To replace the SSL/TLS toolkit underlying your Orbix Java applications, you can configure Orbix to use the JSSE toolkit option. For details, see:

- “JSSE/JCE Architecture” on page 283.

Custom toolkit plug-in for C++

Orbix also provides an option to develop a custom toolkit plug-in for C++ applications, using the Orbix plug-in development kit (PDK). You can use this feature to integrate any third-party SSL/TLS toolkit with Orbix.

Please contact Progress Consulting for more details:
http://web.progress.com/consulting/index.html
### Overview

This section describes how to configure Orbix to use the SSL/TLS toolkit from Baltimore technologies.

### Default SSL/TLS toolkit

Orbix applications use the Baltimore SSL/TLS toolkit by default. Hence, there is no need to alter your Orbix configuration to use this toolkit.

**Note:** The Baltimore toolkit is deprecated from Orbix 6.3 SP4 onwards and will be removed from later releases of Orbix. It is recommended that you migrate C++ applications to the OpenSSL toolkit and that you migrate Java applications to the JSSE toolkit.

### Choosing the Baltimore toolkit for C++ applications

To ensure that Orbix uses the Baltimore toolkit for C++ applications, you can optionally add the settings shown in Example 32 to your Orbix configuration. These settings are *not* necessary, however, because the Baltimore toolkit is used by default.

**Example 32: Configuring Orbix to use the Baltimore Toolkit in C++**

```bash
# Orbix configuration file
initial_references:IT_TLS_Toolkit:plugin = "baltimore_toolkit";
plugins:baltimore_toolkit:shlib_name = "it_tls_baltimore";
```

### Choosing the Baltimore toolkit for Java applications

To ensure that Orbix uses the Baltimore toolkit for Java applications, you can optionally add the setting shown in Example 33 to your Orbix configuration. This setting is *not* necessary, however, because the Baltimore toolkit is used by default.

**Example 33: Configuring Orbix to use the Baltimore Toolkit in Java**

```bash
# Orbix configuration file
plugins:atli2_tls:use_jsse_tk = "false";
```
OpenSSL Toolkit for C++

Overview
This section describes how to configure Orbix to use the OpenSSL toolkit from the OpenSSL project.

Migrating to OpenSSL
From Orbix 6.3 SP4 onwards, OpenSSL is the preferred toolkit for C++ applications. Although the Baltimore toolkit is still used by default in Orbix 6.3, it is recommended that you migrate applications to the OpenSSL toolkit.

Note: The Baltimore toolkit is now deprecated and will be removed in later versions of Orbix.

Choosing the OpenSSL toolkit for C++ applications
To ensure that Orbix uses the OpenSSL toolkit for C++ applications, add (or change) the settings shown in Example 34 in your Orbix configuration.

Example 34: Configuring Orbix to use the OpenSSL Toolkit in C++

```bash
# Orbix configuration file
initial_references:IT_TLS_Toolkit:plugin = "openssl_toolkit";
plugins:openssl_toolkit:shlib_name = "it_tls_openssl";
```
Schannel Toolkit for C++

Overview

This section describes how to configure Orbix to use the Schannel toolkit from Microsoft. Schannel is a software implementation of the SSL/TLS security protocol which uses the Microsoft Crypto API (MS CAPI) to implement the cryptographic functionality required by SSL/TLS.

Note: The Schannel toolkit is available only on Windows platforms for the purpose of securing C++ applications.

The following special features are available to C++ applications that use the Schannel toolkit:

- **Smart cards.**
- **Schannel certificate stores.**

Smart cards

Because almost all smart card hardware vendors make their devices available as an MS CAPI Cryptographic Service Provider (CSP), applications that use Schannel can access a very wide range of cryptographic devices and smart cards.

Schannel certificate stores

With Schannel, application certificates and trusted CA certificates are stored in the standard Windows certificate store, thus simplifying the administration of certificates on Windows platforms.

Choosing the Schannel toolkit

You can specify that Orbix uses the Schannel toolkit by adding the settings shown in Example 32 to your Orbix configuration.

Example 35: Configuring Orbix to use the Schannel Toolkit

```plaintext
# Orbix configuration file
initial_references:IT_TLS_Toolkit:plugin = "schannel_toolkit";
plugins:schannel_toolkit:shlib_name = "it_tls_schannel"
```

Administration impact of switching to Schannel

Orbix toolkit replaceability is designed to be as transparent as possible to the user. Nevertheless, there are some aspects of administration that are affected by the switch to using Schannel, as follows:
Programming impact of switching to Schannel

The following aspects of security programming are affected by the switch to using Schannel:

- “Creating SSL/TLS Credentials” on page 474.
## JSSE/JCE Architecture

### Overview

The Java Cryptography Extension (JCE) is a pluggable framework that allows you to replace the Java security implementation with arbitrary third-party toolkits, known as *security providers*.

By default, Orbix does *not* use the JSSE/JCE framework (it accesses the Baltimore toolkit directly instead). It is possible, however, to configure Orbix to use the JSSE/JCE architecture, as described in this section.

### Prerequisites

The following prerequisites must be satisfied to use the JSSE/JCE architecture with Orbix:

1. *Install the appropriate version of J2SE (JDK)*—consult the Orbix *Installation Guide* to find the recommended JDK version for your platform. It is crucial to install an up-to-date version of the JDK, because some earlier versions of the JDK do not have the required support for JSSE/JCE.

2. *Install the unlimited strength JCE policy files*—these files allow you to use security providers that implement strong cryptography. You can obtain these files from the *Java Cryptography Extension (JCE) Unlimited Strength Jurisdiction Policy Files* download link on the JDK downloads page:

   http://java.sun.com/javase/downloads/index.jsp

### Using JSSE/JCE with Orbix

To use the JSSE/JCE architecture with your Orbix Java applications and to install a third-party security provider, perform the following steps:

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Configure Orbix to use JSSE/JCE.</td>
</tr>
<tr>
<td>2</td>
<td>Configure the java.security file <em>(Optional).</em></td>
</tr>
<tr>
<td>3</td>
<td>Install the provider JAR files <em>(Optional).</em></td>
</tr>
</tbody>
</table>
Configure Orbix to use JSSE/JCE

To configure Orbix to use JSSE/JCE, add the setting shown in Example 36 to your Orbix configuration.

**Example 36: Configuring Orbix to use JSSE/JCE**

```bash
# Orbix configuration file
plugins:atli2_tls:use_jsse_tk = "true";
```

Configure the java.security file

(Optional) Normally, you do not need to configure the java.security file. If you are using a default JDK installation, it is already configured to use the SunJSSE security provider.

JCE security providers are selected by specifying a list of security provider classes in the java.security file, which is found at the following location in your JDK installation:

`JAVA_HOME/jre/lib/security/java.security`

If you are using a Java Runtime Environment (JRE) instead of a JDK, omit `/jre` from the preceding path.

For example, to use the Sun JSSE security implementation you would configure java.security as shown in Example 37.

**Example 37: Sample Java Security File**

```bash
security.provider.1=sun.security.provider.Sun
security.provider.2=com.sun.net.ssl.internal.ssl.Provider
security.provider.3=com.sun.rsajca.Provider
security.provider.4=com.sun.crypto.provider.SunJCE
security.provider.5=sun.security.jgss.SunProvider
```

The properties in Example 37 are organized as a prioritized list. When JCE looks for the implementation of a Java security interface, it first checks the class specified by `security.provider.1` and then proceeds to the higher positions until it finds an interface implementation. Hence, it is possible for different aspects of security to be implemented by different security providers.

For more details, see Configuring the Provider (http://java.sun.com/j2se/1.5.0/docs/guide/security/jce/JCERefGuide.html#Configuring).
Install the provider JAR files

(Optional) Normally, you do not need to install provider JARs. The SunJSSE provider files are already available in the Java runtime.

If you are using a third-party security provider (not SunJSSE), you need to add the third-party JAR files to your CLASSPATH to make the security provider accessible to Orbix. Please follow the installation instructions provided by your third-party security provider.

For more details about installing the provider classes, see:
http://java.sun.com/j2se/1.5.0/docs/guide/security/jce/JCERefGuide.html#InstallProv

Add a provider by programming

The JCE architecture provides an API that enables you to add a security provider by programming—see Configuring the Provider (http://java.sun.com/j2se/1.4.2/docs/guide/security/jce/JCERefGuide.html#InstallProv). The java.security.Security API can be used instead of or in addition to configuring the java.security file.

java.security.Security.addProvider()
Add a security provider to the next available position.

java.security.Security.insertProviderAt()
Add a security provider to the specified position. The succeeding security providers are shifted down by one position.

For more details, see the java.security.Security reference page:
http://java.sun.com/j2se/1.5.0/docs/api/java/security/Security.html

Using the Orbix principal sponsor and PKCS#12 files

When you switch to the JSSE/JCE framework with the SunJSSE provider, you can continue to use the Orbix principal sponsor settings to specify an application’s own certificate in PKCS#12 format—for example:

```java
# Orbix Configuration File
principal_sponsor:use_principal_sponsor = "true";
principal_sponsor:auth_method_id = "pkcs12_file";
principal_sponsor:auth_method_data = [
  "filename=C:\Programs\Orbix\asp\6.3\etc\tls\x509\certs\demos\bank_server.p12", 
  "password=bankserverpass"
];
```
You can also continue to provide the trusted CA list in PEM format—for example:

```
# Orbix Configuration File
policies:trusted_ca_list_policy = "C:\Programs\Orbix\asp\6.3\etc\tls\x509\trusted_ca_lists\ca_list1.pem";
```

See “Specifying an Application’s Own Certificate” on page 371 and “Specifying Trusted CA Certificates” on page 369.

**Using the Orbix principal sponsor and keystore files**

If you switch to the JSSE/JCE framework with the SunJSSE provider, you have the option of supplying an application’s own certificate in Java Keystore (JKS) format. To use this feature, set the `principal_sponsor:auth_method_id` variable to `keystore` and configure the principal sponsor variables as follows:

```
# Orbix Configuration File
principal_sponsor:use_principal_sponsor = "true";
principal_sponsor:auth_method_id = "keystore";
principal_sponsor:auth_method_data =
   ["keystore_name=C:\Programs\Orbix\asp\6.3\etc\tls\x509\certs\demos\bank_server.ks", "password=bankserverpass"];
```

The `keystore_name` property specifies the location of a keystore file that contains a single key entry (the application’s own certificate and associated private key). The `password` property specifies a password that is used both to unlock the keystore file (store password) and to decrypt the key entry (key password). Hence, when you create the keystore file, you must ensure that these two passwords are identical.

**Migrating certificates to keystore format**

If you need to migrate certificates from the PKCS#12 format to the keystore format, use the `-importkeystore` option of the Java `keytool` utility.

**Note:** The `keytool -importkeystore` option is available only from JDK 6 onwards.
For example, if you have a certificate in PKCS#12 format, bank_server.p12, with password, bankserverpass, you can convert it to a keystore file, bank_server.ks, using the following command:

```
keytool -importkeystore
    -srckeystore bank_server.p12
    -destkeystore bank_server.ks
    -srcstoretype pkcs12
    -deststoretype jks
    -srcstorepass bankserverpass
    -deststorepass bankserverpass
```

If you use the preceding form of the `keytool -importkeystore` command, the store password and the key password for `bank_server.ks` are identical and equal to `bankserverpass`.

---

### Logging

When using the JSSE/JCE architecture with Orbix, the log records which security provider performs an action. This is a useful debugging aid when multiple security providers are installed.

For example, the following is a log extract for an application that uses the Bouncy Castle security provider to read PKCS#12 files (PKCS12 BC) and the IAIK security provider to read PKCS#11 smart card credentials (PKCS11 IAIK PKCS#11:1).

```
11:24:15 2/20/2003
    [__it_orb_id_1@yogibear.dublin.emea.iona.com/10.2.3.6]
    (IT_ATLI_TLS:250) I - "Using the following provider: PKCS12 BC"
11:24:21 2/20/2003
    [__it_orb_id_1@yogibear.dublin.emea.iona.com/10.2.3.6]
    (IT_TLS:201) I - Authentication succeeded using the IT_TLS_AUTH METH_PKCS12_FILE method

11:24:15 2/20/2003
    [__it_orb_id_1@yogibear/10.2.3.58]
    (IT_ATLI_TLS:250) I - "Using the following provider: PKCS11 IAIK PKCS#11:1"
11:24:15 2/20/2003
    [__it_orb_id_1@yogibear/10.2.3.58]
    (IT_TLS:201) I - Authentication succeeded using the IT_TLS_AUTH METH_PKCS11 method
```
Troubleshooting

At the time of writing, the JSSE/JCE architecture is a relatively new technology and some of the third-party security providers have specific limitations or bugs. One approach to working around these problems is by using a combination of security providers, with different security providers implementing different aspects of security.

For example, the following general security features could be implemented by distinct security providers:

- PKCS#12 functionality—loading credentials from PKCS#12 files.
- PKCS#11 functionality—loading credentials from a smart card.
- SSL/TLS encryption.

References

For more information about Sun’s JSSE/JCE architecture, see the following links:

- Java Cryptography Extension
  (http://java.sun.com/javase/technologies/security/).
- J2SE (JDK) 1.5.0 Security
  (http://java.sun.com/j2se/1.5.0/docs/guide/security//).
- JCE Reference Guide
  (http://java.sun.com/j2se/1.5.0/docs/guide/security/jce/JCERefGuide.html)
- How to implement a security provider
  (http://java.sun.com/j2se/1.5.0/docs/guide/security/jce/HowToImplAJCEP rovider.html).
- Installing JCE providers
  (http://java.sun.com/j2se/1.5.0/docs/guide/security/jce/JCERefGuide.html
  #InstallProvider).
Managing Certificates

TLS authentication uses X.509 certificates—a common, secure and reliable method of authenticating your application objects. This chapter explains how you can create X.509 certificates that identify your Orbix applications.

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<td>Certificate Chaining</td>
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<td>Deploying Certificates with Schannel</td>
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What are X.509 Certificates?

<table>
<thead>
<tr>
<th>Role of certificates</th>
<th>An X.509 certificate binds a name to a public key value. The role of the certificate is to associate a public key with the identity contained in the X.509 certificate.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integrity of the public key</td>
<td>Authentication of a secure application depends on the integrity of the public key value in the application’s certificate. If an impostor replaced the public key with its own public key, it could impersonate the true application and gain access to secure data. To prevent this form of attack, all certificates must be signed by a certification authority (CA). A CA is a trusted node that confirms the integrity of the public key value in a certificate.</td>
</tr>
<tr>
<td>Digital signatures</td>
<td>A CA signs a certificate by adding its digital signature to the certificate. A digital signature is a message encoded with the CA’s private key. The CA’s public key is made available to applications by distributing a certificate for the CA. Applications verify that certificates are validly signed by decoding the CA’s digital signature with the CA’s public key.</td>
</tr>
<tr>
<td>The contents of an X.509 certificate</td>
<td>An X.509 certificate contains information about the certificate subject and the certificate issuer (the CA that issued the certificate). A certificate is encoded in Abstract Syntax Notation One (ASN.1), a standard syntax for describing messages that can be sent or received on a network. The role of a certificate is to associate an identity with a public key value. In more detail, a certificate includes:</td>
</tr>
<tr>
<td></td>
<td>• X.509 version information.</td>
</tr>
</tbody>
</table>

WARNING: Most of the demonstration certificates supplied with Orbix are signed by the CA abigbank_ca.pem. This CA is completely insecure because anyone can access its private key. To secure your system, you must create new certificates signed by a trusted CA. This chapter describes the set of certificates required by an Orbix application and shows you how to replace the default certificates.
What are X.509 Certificates?

- A serial number that uniquely identifies the certificate.
- A subject DN that identifies the certificate owner.
- The public key associated with the subject.
- An issuer DN that identifies the CA that issued the certificate.
- The digital signature of the issuer.
- Information about the algorithm used to sign the certificate.
- Some optional X.509 v.3 extensions. For example, an extension exists that distinguishes between CA certificates and end-entity certificates.

### Distinguished names

A distinguished name (DN) is a general purpose X.500 identifier that is often used in the context of security.

See “ASN.1 and Distinguished Names” on page 645 for more details about DNs.
Certification Authorities

Choice of CAs

A CA must be trusted to keep its private key secure. When setting up an Orbix system, it is important to choose a suitable CA, make the CA certificate available to all applications, and then use the CA to sign certificates for your applications.

There are two types of CA you can use:

- A commercial CA is a company that signs certificates for many systems.
- A private CA is a trusted node that you set up and use to sign certificates for your system only.

In this section

This section contains the following subsections:

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<th>Page</th>
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<td>Commercial Certification Authorities</td>
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<tr>
<td>Private Certification Authorities</td>
<td>294</td>
</tr>
</tbody>
</table>
# Commercial Certification Authorities

<table>
<thead>
<tr>
<th>Signing certificates</th>
<th>There are several commercial CAs available. The mechanism for signing a certificate using a commercial CA depends on which CA you choose.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Advantages of commercial CAs</strong></td>
<td>An advantage of commercial CAs is that they are often trusted by a large number of people. If your applications are designed to be available to systems external to your organization, use a commercial CA to sign your certificates. If your applications are for use within an internal network, a private CA might be appropriate.</td>
</tr>
<tr>
<td><strong>Criteria for choosing a CA</strong></td>
<td>Before choosing a CA, you should consider the following criteria:</td>
</tr>
<tr>
<td></td>
<td>• What are the certificate-signing policies of the commercial CAs?</td>
</tr>
<tr>
<td></td>
<td>• Are your applications designed to be available on an internal network only?</td>
</tr>
<tr>
<td></td>
<td>• What are the potential costs of setting up a private CA?</td>
</tr>
</tbody>
</table>
Private Certification Authorities

Choosing a CA software package

If you wish to take responsibility for signing certificates for your system, set up a private CA. To set up a private CA, you require access to a software package that provides utilities for creating and signing certificates. Several packages of this type are available.

OpenSSL software package

One software package that allows you to set up a private CA is OpenSSL, http://www.openssl.org. OpenSSL is derived from SSLeay, an implementation of SSL developed by Eric Young (eay@cryptsoft.com). Complete license information can be found in Appendix I on page 687. The OpenSSL package includes basic command line utilities for generating and signing certificates and these utilities are available with every installation of Orbix. Complete documentation for the OpenSSL command line utilities is available from http://www.openssl.org/docs.

Setting up a private CA using OpenSSL

For instructions on how to set up a private CA, see “Creating Your Own Certificates” on page 300.

Choosing a host for a private certification authority

Choosing a host is an important step in setting up a private CA. The level of security associated with the CA host determines the level of trust associated with certificates signed by the CA.

If you are setting up a CA for use in the development and testing of Orbix applications, use any host that the application developers can access. However, when you create the CA certificate and private key, do not make the CA private key available on hosts where security-critical applications run.

Security precautions

If you are setting up a CA to sign certificates for applications that you are going to deploy, make the CA host as secure as possible. For example, take the following precautions to secure your CA:

• Do not connect the CA to a network.
• Restrict all access to the CA to a limited set of trusted users.
• Protect the CA from radio-frequency surveillance using an RF-shield.
Certificate Chaining

Certificate chain

A certificate chain is a sequence of certificates, where each certificate in the chain is signed by the subsequent certificate.

Self-signed certificate

The last certificate in the chain is normally a self-signed certificate—a certificate that signs itself.

Example

Figure 45 shows an example of a simple certificate chain.

![Certificate Chain Diagram]

Figure 45: A Certificate Chain of Depth 2

Chain of trust

The purpose of certificate chain is to establish a chain of trust from a peer certificate to a trusted CA certificate. The CA vouches for the identity in the peer certificate by signing it. If the CA is one that you trust (indicated by the presence of a copy of the CA certificate in your root certificate directory), this implies you can trust the signed peer certificate as well.
**Certificates signed by multiple CAs**

A CA certificate can be signed by another CA. For example, an application certificate may be signed by the CA for the finance department of Progress Software, which in turn is signed by a self-signed commercial CA. Figure 46 shows what this certificate chain looks like.

![Figure 46: A Certificate Chain of Depth 3](image)

**Trusted CAs**

An application can accept a signed certificate if the CA certificate for any CA in the signing chain is available in the certificate file in the local root certificate directory.

See “Providing a List of Trusted Certificate Authorities” on page 309.

**Maximum chain length policy**

You can limit the length of certificate chains accepted by your applications, with the maximum chain length policy. You can set a value for the maximum length of a certificate chain with the `policies:iiop_tls:max_chain_length_policy` and `policies:https:max_chain_length_policy` configuration variables for IIOP/TLS and HTTPS respectively.
# PKCS#12 Files

<table>
<thead>
<tr>
<th>Contents of a PKCS#12 file</th>
<th>A PKCS#12 file contains the following:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• An X.509 peer certificate (first in a chain).</td>
</tr>
<tr>
<td></td>
<td>• All the CA certificates in the certificate chain.</td>
</tr>
<tr>
<td></td>
<td>• A private key.</td>
</tr>
<tr>
<td></td>
<td>The file is encrypted with a password.</td>
</tr>
<tr>
<td></td>
<td>PKCS#12 is an industry-standard format and is used by browsers such as Netscape and Internet Explorer. They are also used in Orbix. Orbix does not support .pem format certificate chains, however.</td>
</tr>
</tbody>
</table>

| Creating a PKCS#12 file | To create a PKCS#12 file, see “Use the CA to Create Signed Certificates” on page 304. |

<table>
<thead>
<tr>
<th>Viewing a PKCS#12 file</th>
<th>To view a PKCS#12 file, CertName.p12:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>openssl pkcs12 -in CertName.p12</td>
</tr>
</tbody>
</table>

| Importing and exporting PKCS#12 files | The generated PKCS#12 files can be imported into browsers such as IE or Netscape. Exported PKCS#12 files from these browsers can be used in Orbix. |

| Note: | Use OpenSSL v0.9.2 or later; Internet Explorer 5.0 or later; Netscape 4.7 or later. |
## Using the Demonstration Certificates

### Location of the demonstration certificates
The Orbix certificates directory contains a set of demonstration certificates that enable you to run the Orbix example applications. The certificates are contained in this directory:

`ASPInstallDir/asp/6.0/etc/tls/x509/certs`

### Default CA certificate
The CA used to sign the demonstration certificates is the default Orbix CA:
- The CA certificate is `x509/certs/ca/abigbank_ca.pem`.
- The list of trusted CA’s is contained in `x509/certs/trusted_ca_lists/ca_list1.pem`. This initially contains only the `abigbank_ca.pem` CA, but other CAs can be appended.

*Note:* No whitespace or text is allowed in this file outside the `BEGIN/END` statements.

### Certificates for demonstration programs
The PKCS#12 certificates in Table 14 are used by the Orbix demonstration programs. These certificates are located in the `x509/certs/demos` directory and signed by the `x509/certs/ca/abigbank_ca.pem` CA certificate.

<table>
<thead>
<tr>
<th>Demonstration Certificate</th>
<th>Password</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>certs/demos/admin.p12</code></td>
<td>adminpass</td>
</tr>
<tr>
<td><code>certs/demos/alice.p12</code></td>
<td>alicepass</td>
</tr>
<tr>
<td><code>certs/demos/bankserver.p12</code></td>
<td>bankserverpass</td>
</tr>
<tr>
<td><code>certs/demos/bob.p12</code></td>
<td>bobpass</td>
</tr>
<tr>
<td><code>certs/demos/CertName.p12</code></td>
<td>CertNamepass</td>
</tr>
</tbody>
</table>

### Untrusted demonstration certificate
In the demonstration programs, the following certificate, `bad_guy.p12`, is used to represent a certificate from an untrusted CA:

`certs/demos/bad_guy.p12`
[REVISIT - What is the password for bad_guy.p12? I don’t think it is bad_guypass.]

Certificates for the Orbix services

The Orbix services all use the same certificate, as shown in Table 15.

Table 15: Demonstration Certificate for the Orbix Services

<table>
<thead>
<tr>
<th>Services Demonstration Certificate</th>
<th>Password</th>
</tr>
</thead>
<tbody>
<tr>
<td>certs/services/administrator.p12</td>
<td>administratorpass</td>
</tr>
</tbody>
</table>
Creating Your Own Certificates

Overview
This section describes the steps involved in setting up a CA and signing certificates.

OpenSSL utilities
The steps described in this section are based on the OpenSSL command-line utilities from the OpenSSL project, http://www.openssl.org—see Appendix F on page 661. Further documentation of the OpenSSL command-line utilities can be obtained from http://www.openssl.org/docs.

Sample CA directory structure
For the purposes of illustration, the CA database is assumed to have the following directory structure:

X509CA/ca
X509CA/certs
X509CA/newcerts
X509CA/crl

Where X509CA is the parent directory of the CA database.

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This section contains the following subsections:

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<td>301</td>
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<tr>
<td>Use the CA to Create Signed Certificates</td>
<td>304</td>
</tr>
</tbody>
</table>
Set Up Your Own CA

Substeps to perform

This section describes how to set up your own private CA. Before setting up a CA for a real deployment, read the additional notes in “Choosing a host for a private certification authority” on page 294.

To set up your own CA, perform the following substeps:

• Step 1—Add the bin directory to your PATH
• Step 2—Create the CA directory hierarchy
• Step 3—Copy and edit the openssl.cnf file
• Step 4—Initialize the CA database
• Step 5—Create a self-signed CA certificate and private key

Step 1—Add the bin directory to your PATH

On the secure CA host, add the Orbix bin directory to your path:

Windows

> set PATH=ASPInstallDir\asp\6.0\bin;%PATH%

UNIX

% PATH=ASPInstallDir/asp/6.0/bin:$PATH; export PATH

This step makes the openssl utility available from the command line.

Step 2—Create the CA directory hierarchy

Create a new directory, X509CA, to hold the new CA. This directory will be used to hold all of the files associated with the CA. Under the X509CA directory, create the following hierarchy of directories:

X509CA/ca
X509CA/certs
X509CA/newcerts
X509CA/crl

Step 3—Copy and edit the openssl.cnf file

Copy the openssl.cnf file to the X509CA directory, as follows:

Windows

copy ASPInstallDir\asp\6.0\etc\tls\x509\openssl.cnf X509CA\openssl.cnf

UNIX


Edit the openssl.cnf to reflect the directory structure of the X509CA directory and to identify the files used by the new CA.

Edit the [CA_default] section of the openssl.cnf file to make it look like the following:

```
[ CA_default ]
dir = X509CA  # Where CA files are kept
certs = $dir/certs  # Where issued certs are kept
crl_dir = $dir/crl  # Where the issued crl are kept
database = $dir/index.txt  # Database index file
new_certs_dir = $dir/newcerts  # Default place for new certs
certificate = $dir/ca/new_ca.pem  # The CA certificate
serial = $dir/serial  # The current serial number
crl = $dir/crl.pem  # The current CRL
private_key = $dir/ca/new_ca_pk.pem  # The private key
RANDFILE = $dir/ca/.rand  # Private random number file
x509_extensions = usr_cert  # The extensions to add to the cert ...
```

You might like to edit other details of the OpenSSL configuration at this point—for more details, see “The OpenSSL Configuration File” on page 671.

---

**Step 4—Initialize the CA database**

In the X509CA directory, initialize two files, serial and index.txt.

**Windows**

> echo 01 > serial

To create an empty file, index.txt, in Windows start a Windows Notepad at the command line in the X509CA directory, as follows:

> notepad index.txt

In response to the dialog box with the text, Cannot find the text.txt file. Do you want to create a new file?, click Yes, and close Notepad.

**UNIX**

% echo "01" > serial
% touch index.txt
Creating Your Own Certificates

These files are used by the CA to maintain its database of certificate files.

Note: The `index.txt` file must initially be completely empty, not even containing white space.

Step 5—Create a self-signed CA certificate and private key

Create a new self-signed CA certificate and private key:

```
openssl req -x509 -new -config
   X509CA/openssl.cnf -days 365 -out X509CA/ca/new_ca.pem
   -keyout X509CA/ca/new_ca_pk.pem
```

The command prompts you for a pass phrase for the CA private key and details of the CA distinguished name:

Using configuration from X509CA/openssl.cnf
Generating a 512 bit RSA private key
....+++++
.++++++
writing new private key to 'new_ca_pk.pem'
Enter PEM pass phrase: Enter PEM pass phrase: ----- You are about to be asked to enter information that will be incorporated into your certificate request. What you are about to enter is what is called a Distinguished Name or a DN. There are quite a few fields but you can leave some blank. For some fields there will be a default value, If you enter '.', the field will be left blank. ----- Country Name (2 letter code) []:IE State or Province Name (full name) []:Co. Dublin Locality Name (eg, city) []:Dublin Organization Name (eg, company) []:IONA Technologies PLC Organizational Unit Name (eg, section) []:Finance Common Name (eg, YOUR name) []:Gordon Brown Email Address []:gbrown@iona.com

Note: The security of the CA depends on the security of the private key file and private key pass phrase used in this step.

You should ensure that the file names and location of the CA certificate and private key, `new_ca.pem` and `new_ca_pk.pem`, are the same as the values specified in `openssl.cnf` (see the preceding step).

You are now ready to sign certificates with your CA.
Use the CA to Create Signed Certificates

Substeps to perform

If you have set up a private CA, as described in “Set Up Your Own CA” on page 301, you are now ready to create and sign your own certificates.

To create and sign a certificate in PKCS#12 format, CertName.p12, perform the following substeps:

• Step 1—Add the bin directory to your PATH
• Step 2—Create a certificate signing request
• Step 3—Sign the CSR
• Step 4—Concatenate the files
• Step 5—Create a PKCS#12 file
• Step 6—Repeat steps as required

Step 1—Add the bin directory to your PATH

If you have not already done so, add the Orbix bin directory to your path:

Windows
> set PATH=ASPInstallDir\asp\6.0\bin;%PATH%

UNIX
% PATH=ASPInstallDir/asp/6.0/bin:$PATH; export PATH

This step makes the openssl utility available from the command line.

Step 2—Create a certificate signing request

Create a new certificate signing request (CSR) for the CertName.p12 certificate:

openssl req -new -config X509CA/openssl.cnf
-days 365 -out X509CA/certs/CertName_csr.pem -keyout
X509CA/certs/CertName_pk.pem

This command prompts you for a pass phrase for the certificate’s private key and information about the certificate’s distinguished name.

Some of the entries in the CSR distinguished name must match the values in the CA certificate (specified in the CA Policy section of the openssl.cnf file). The default openssl.cnf file requires the following entries to match:

• Country Name
• State or Province Name
• Organization Name
Creating Your Own Certificates

The Common Name must be distinct for every certificate generated by OpenSSL.

Using configuration from /etc/ssl/openssl.cnf
Generating a 512 bit RSA private key
+++++
+++++
writing new private key to '/etc/ssl/certs/CertName_pk.pem'
Enter PEM pass phrase:
Verifying password - Enter PEM pass phrase:

You are about to be asked to enter information that will be incorporated into your certificate request.
What you are about to enter is what is called a Distinguished Name or a DN. There are quite a few fields but you can leave some blank. For some fields there will be a default value, If you enter '.', the field will be left blank.

Country Name (2 letter code) []:IE
State or Province Name (full name) []:Co. Dublin
Locality Name (eg, city) []:Dublin
Organization Name (eg, company) []:IONA Technologies PLC
Organizational Unit Name (eg, section) []:Systems
Common Name (eg, YOUR name) []:Orbix
Email Address []:info@iona.com

Please enter the following 'extra' attributes to be sent with your certificate request
A challenge password []:password
An optional company name []:IONA

Step 3—Sign the CSR

Sign the CSR using your CA:

openssl ca -config /etc/ssl/openssl.cnf -days 365 -in /etc/ssl/certs/CertName_csr.pem -out /etc/ssl/certs/CertName.pem

This command requires the pass phrase for the private key associated with the new_ca.pem CA certificate:

Using configuration from /etc/ssl/openssl.cnf
Enter PEM pass phrase:
Check that the request matches the signature
Signature ok

The Subject’s Distinguished Name is as follows

countryName :PRINTABLE:'IE'
stateOrProvinceName :PRINTABLE:'Co. Dublin'
localityName :PRINTABLE:'Dublin'
organizationName :PRINTABLE:'IONA Technologies PLC'
organizationalUnitName: PRINTABLE: 'Systems'
commonName: PRINTABLE: 'Bank Server Certificate'
emailAddress: IA5STRING: 'info@iona.com'

Certificate is to be certified until May 24 13:06:57 2000 GMT (365 days)
Sign the certificate? [y/n]: y
1 out of 1 certificate requests certified, commit? [y/n]: y
Write out database with 1 new entries
Data Base Updated

To sign the certificate successfully, you must enter the CA private key pass phrase—see “Set Up Your Own CA” on page 301.

---

**Step 4—Concatenate the files**

Concatenate the CA certificate file, CertName certificate file, and CertName_pk.pem private key file as follows:

**Windows**

```
copy $X509CA\ca\new_ca.pem +
X509CA\certs\CertName.pem +
X509CA\certs\CertName_pk.pem
X509CA\certs\CertName_list.pem
```

**UNIX**

```
cat $X509CA/ca/new_ca.pem
X509CA/certs/CertName.pem
X509CA/certs/CertName_pk.pem >
X509CA/certs/CertName_list.pem
```

---

**Step 5—Create a PKCS#12 file**

Create a PKCS#12 file from the CertName_list.pem file as follows:

```
openssl pkcs12 -export -in $X509CA/certs/CertName_list.pem -out
$X509CA/certs/CertName.p12 -name "New cert"
```

---

**Step 6—Repeat steps as required**

Repeat steps 2 to 5, creating a complete set of certificates for your system. A minimum set of Orbix certificates must include a set of certificates for the secure Orbix services.
Deploying Certificates

Overview

This section provides an overview of deploying X.509 certificates in a typical secure Orbix system, with detailed instructions on how to deploy certificates for different parts of the Orbix system.

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</table>
Overview of Certificate Deployment

Overview

Figure 47 provides an overview of the certificates used in a typical deployment of Orbix.

Sample deployment directory structure

For the purposes of illustration, the examples in this section deploy certificates into the following sample directory structure:

```
X509Deploy/trusted_ca_lists
X509Deploy/certs/applications
X509Deploy/certs/services
X509Deploy/certs/admin
```

Where `X509Deploy` is the parent directory for the deployed certificates.
Providing a List of Trusted Certificate Authorities

Configuration variable

You can specify the list of root trusted certificates authorities by setting the policies:iiop_tls:trusted_ca_list_policy and policies:https:trusted_ca_list_policy configuration variables for IIOP/TLS and HTTPS respectively.

This variable contains a list of strings, each of which provides the filename and path of a file containing one or more trusted CA certificates. For example:

```
policies:iiop_tls:trusted_ca_list_policy =
    ["ASPInstallDir/asp/6.0/etc/tls/x509/certs/trusted_ca_lists/ca_list1.pem"];
```

The directory containing the trusted CA certificate lists (for example, ASPInstallDir/asp/6.0/etc/tls/x509/certs/trusted_ca_lists/) should be a secure directory.

**Note:** If an application supports authentication of a peer, that is a client supports EstablishTrustInTarget, then a file containing trusted CA certificates must be provided. If not, a NO_RESOURCES exception is raised.

Choosing a configuration domain

Before deploying the CA certificate on a target host, you must have access to a secure configuration domain or you can create a new domain—see the Administrator’s Guide.

For example, if you create a secure file-based configuration domain, SecureDomain, you could view or modify the configuration by editing the corresponding ASPInstallDir/etc/domains/SecureDomain.cfg file.

Choosing a deployment directory

CA certificates are deployed as concatenated lists. These CA list files can be stored in any location; however, it is convenient to store them under a common deployment directory, for example:

```
X509Deploy/trusted_ca_lists
```

Deploying

To deploy a trusted CA certificate, perform the following steps:
1 If you have access to an existing secure domain, *SecureDomain*, you can append the CA certificate contents to one of the files specified in the `policies:iiop_tls:trusted_ca_list_policy` configuration variable for IIOP/TLS or in the `policies:https:trusted_ca_list_policy` configuration variable for HTTPS.

For example, consider how to configure the IIOP/TLS protocol. If `policies:iiop_tls:trusted_ca_list_policy` lists the file, `X509Deploy/trusted_ca_lists/ca_list1.pem`, you can add your new CA to the `ca_list1.pem` file as follows:

**Windows**

```plaintext
copy X509Deploy\trusted_ca_lists\ca_list1.pem + X509CA\ca\new_ca.pem
X509Deploy\trusted_ca_lists\ca_list1.pem
```

**UNIX**

```plaintext
cat X509CA/ca/new_ca.pem >> X509Deploy/trusted_ca_lists/ca_list1.pem
```

The CA certificate is now deployed; hence you can skip steps 2 and 3.

2 Alternatively, you can create a new CA list file to hold your CA certificate. Copy the `new_ca.pem` certificate to the `X509Deploy/trusted_ca_lists` directory. Rename `new_ca.pem` to `ca_list.pem`, to remind you that this file is actually a list of certificates that happens to contain one certificate.

Do not copy the CA private key to the target host.

3 Add the `ca_list.pem` file to your list of trusted CA files. For example, in the case of IIOP/TLS:

```plaintext
policies:iiop_tls:trusted_ca_list_policy = [
"X509Deploy/trusted_ca_lists/existing_list.pem",
"X509Deploy/trusted_ca_lists/ca_list.pem"];
```
Deploying Certificates

Deploying Application Certificates

Choosing a deployment directory
Application certificates are stored as PKCS#12 files (with .p12 suffix). The certificates can be stored in arbitrary locations; however, it is usually convenient to store the application certificates under a common deployment directory, for example:

```
X509Deploy/certs/applications
```

Deploying
To deploy an application certificate, `CertName.p12`, for an application that uses the `SampleApp` ORB name in the `DomainName` domain, perform the following steps:

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Copy the application certificate, <code>CertName.p12</code>, to the certificates directory—for example, <code>X509Deploy/certs/applications</code>—on the deployment host. The certificates directory should be a secure directory that is accessible only to administrators and other privileged users.</td>
</tr>
</tbody>
</table>
| 2    | Edit the `DomainName` configuration file (usually `ASPIInstallDir/etc/domains/DomainName.cfg`). In the `SampleApp` scope, change the principal sponsor configuration to specify the `CertName.p12` certificate, as follows:
```
# Orbix Configuration File
SampleApp {
  ...
  principal_sponsor:use_principal_sponsor = "true";
  principal_sponsor:auth_method_id = "pkcs12_file";
  principal_sponsor:auth_method_data = [
    "filename=X509Deploy/certs/applications/CertName.p12"],
};
```
| 3    | By default, the application will prompt the user for the certificate pass phrase as it starts up. To choose another option for providing the pass phrase, see “Providing a Certificate Pass Phrase” on page 376. |
If you are using the KDM to enable automatic activation of your secure servers, make sure you update the KDM database with the new certificate passwords. See “Automatic Activation of Secure Servers” on page 389.

<table>
<thead>
<tr>
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<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>If you are using the KDM to enable automatic activation of your secure servers, make sure you update the KDM database with the new certificate passwords. See “Automatic Activation of Secure Servers” on page 389.</td>
</tr>
</tbody>
</table>
Deploying Certificates in Smart Cards

Overview

Orbix supports an option to store credentials (that is, an X.509 certificate chain and private key) on a smart card.

Prerequisites

Before deploying your certificates in a smart card, you must have the following third-party products installed:

- **Baltimore smart card toolkit**—a software library that supports the PKCS#11 interface and enables Orbix to communicate with the smart card. This library is bundled with Orbix.
- Tools and utilities to administer the smart card (usually bundled with the hardware).

Deploying the certificates

Smart card hardware is normally delivered with drivers and utilities that enable you to deploy X.509 certificate chains and private keys to the smart card. Consult the third-party documentation that accompanies your smart-card hardware for details.

Deployment constraints

Please note the following constraints when deploying the certificates:

- You must deploy the certificate chain and private key to slot 0. This is currently the only supported smart card slot.
- The slot 0 should contain only one certificate chain and public/private key pair.

Configuring an application to use the smart card

To configure an application to use the smart card, edit the configuration for your domain (usually ASRDInstallDir/etc/domains/DomainName.cfg). In the SmartCardApp scope, ensure that the principal sponsor is configured to use the smart card, as follows:

```plaintext
# Orbix Configuration File
SmartCardApp {
...
principal_sponsor:use_principal_sponsor = "true";
principal_sponsor:auth_method_id = "pkcs11";
principal_sponsor:auth_method_data = ["provider=dkck132.dll", "slot=0"];
};
```
By default, the application will prompt the user for the smart card PIN as it starts up. To choose another option for providing the PIN, see “Providing a Smart Card PIN” on page 380.
Deploying OrbiX Service Certificates

OrbiX services requiring certificates

In a secure system, all OrbiX services should be capable of servicing secure connections; hence, all of the services require certificates. A minimal system typically includes the following secure services:

- Locator,
- Node daemon,
- Naming service,
- Interface repository (IFR),
- Management service.
- Security service.

Additionally, your system might also require certificates for the events, notification, and OTS services.

Choosing a deployment directory

OrbiX service certificates are stored as PKCS#12 files. The service certificates are similar to application certificates and, like application certificates, can be stored in arbitrary locations. It is usually convenient to store the service certificates in their own subdirectory—for example:

X509Deploy/certs/services

Deploying

To deploy a service certificate, CertName.p12, for a service that uses the Service ORB name in the DomainName domain, perform the following steps:

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Copy the service certificate, CertName.p12, to the service certificates directory X509Deploy/certs/services on the deployment host. The service certificates directory should be a secure directory that is accessible only to administrators and other privileged users.</td>
</tr>
</tbody>
</table>
Providing pass phrases for Orbix services

It is possible to combine the different ways of providing pass phrases to the Orbix services. For example, some of the alternatives for setting up the Orbix services are:

- Use a password file for all Orbix services.
- Provide the pass phrase from a dialog prompt for all Orbix services.
- Use a password file for the locator and the node daemon. Use the KDM for all other Orbix services.
- Provide the pass phrase from a dialog prompt for the locator and the node daemon. Use the KDM for all other Orbix services.

<table>
<thead>
<tr>
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<th>Action</th>
</tr>
</thead>
</table>
| 2    | Edit the DomainName configuration file (usually ASPInstallDir/etc/domains/DomainName.cfg). In the Service scope, change the principal sponsor configuration to specify the CertName.p12 certificate, as follows: # Orbix Configuration File Service {
  
  principal_sponsor:use_principal_sponsor = "true";
  principal_sponsor:auth_method_id = "pkcs12_file";
  principal_sponsor:auth_method_data = ["filename=X509Deploy/certs/services/CertName.p12" ];
}; |
| 3    | By default, the application will prompt the user for the certificate pass phrase as it starts up. To choose another option for providing the pass phrase, see “Providing a Certificate Pass Phrase” on page 376. |
| 4    | If you are using the KDM to enable automatic activation of the Orbix service, make sure you update the KDM database with the new certificate pass phrase. See “Automatic Activation of Secure Servers” on page 389. |
Example configuration

The default configuration of the Orbix services specifies that all services use the `administrator.p12` certificate. The principal sponsor for services is configured as follows:

```bash
# Orbix Configuration File
iona_services
{
  principal_sponsor:use_principal_sponsor = "true";
  principal_sponsor:auth_method_id = "pkcs12_file";
  principal_sponsor:auth_method_data =
    [
      "filename=ASPInstallDir\asp\6.0\etc\tls\x509\certs\services\administrator.p12",
      "password_file=ASPInstallDir\asp\6.0\etc\tls\x509\certs\services\administrator.pwf"
    ];
...
ServiceA
{
  // Inherit principal sponsor settings from outer scope.
  ...
};
ServiceB
{
  // Inherit principal sponsor settings from outer scope.
  ...
};
...;
```

The sub-scopes, ServiceA, ServiceB and so on, use the principal sponsor settings from the outer scope, iona_services. Hence, all of the Orbix services use the same certificate, administrator.p12.

It is possible to override settings from the iona_services outer scope by configuring the principal sponsor in a local scope—for example, within the ServiceA scope.
Deploying itadmin Certificates

Overview

The Orbix command-line administration utility, itadmin, requires a certificate when used in a secure domain. Two categories of certificate can be used with itadmin, as follows:

- **Ordinary certificates**—for users with ordinary privileges who want to perform routine administration tasks such as checking the status of servers and administering the naming service.
- **Administrator certificates**—for users with administrator privileges who need to administer pass phrases and security checksums stored in the KDM—see “KDM Administration” on page 397.

Specifying a deployment directory for administrator certificates

Before deploying itadmin certificates for the first time, you can edit the Orbix configuration file to specify the directory that will contain the administrator certificates. You can specify the administrator certificates deployment directory using the itadmin_x509_cert_root configuration variable.

For example, if you choose the following deployment directory for your itadmin certificates:

```
X509Deploy/certs/admin
```

you should then set itadmin_x509_cert_root as follows:

```
# Orbix Configuration File
itadmin_x509_cert_root = "X509Deploy/certs/admin";
```

Deploying an ordinary certificate for itadmin

To deploy an ordinary certificate for itadmin, OrdinaryCert.p12, in the DomainName domain, perform the following steps:

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Copy the ordinary certificate, OrdinaryCert.p12, to the service certificates directory X509Deploy/certs/services on the deployment host. The service certificates directory should be a secure directory that is accessible only to administrators and other privileged users.</td>
</tr>
</tbody>
</table>
To deploy an administrator certificate for itadmin, perform the following steps:

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Copy the administrator certificate, AdminCert.p12, to the itadmin certificates directory specified by the itadmin_x509_cert_root configuration variable. The itadmin certificates directory should be a secure directory that is accessible only to administrators and other privileged users.</td>
</tr>
</tbody>
</table>

To perform administrator tasks requiring special privileges, such as administering the KDM, you must override the ordinary certificate with the administrator certificate using the itadmin admin_logon subcommand. See “KDM Administration” on page 397 for details.
Configuring Certificate Warnings

Overview

Orbix enables you to configure the following kinds of certificate warning:

- Certificate expiration warning.
- Own credentials warning.

Certificate expiration warning

Normally, an X.509 certificate would be defined to expire after a certain date. You can arrange to send a warning message to the Orbix log, if certificate expiration is imminent, thus helping to avoid unexpected failure.

To configure a certificate expiration warning, add the configuration variables from Example 38 to your application’s configuration scope.

Example 38: Configuring a Certificate Expiration Warning

```bash
#Orbix Configuration File
plugins:iiop_tls:enable_warning_for_approaching_cert_expiration = "true";
plugins:iiop_tls:cert_expiration_warning_days = "31";
```

The configuration in Example 38 would send a warning to the Orbix log, if the application’s own certificate is less than 31 days away from expiry. Only an application’s own certificate is checked, not the peer certificates.

Own credentials warning

You can also configure Orbix to log a warning, if the subject DN from an application’s own certificate matches a certain pattern. This can be useful, for example, if you want to ensure that demonstration certificates are not accidentally deployed in a production system.

Example 39 shows how to configure the own credentials warning. If the specified certificate constraints match the subject DN of an application’s own certificate, a warning is issued to the Orbix log. For details of the constraint language, see “Applying Constraints to Certificates” on page 555.

Example 39: Configuring an Own Credentials Warning

```bash
#Orbix Configuration File
plugins:iiop_tls:own_credentials_warning_cert_constraints = [
  "C=US,ST=Massachusetts"
];
```
Deploying Certificates with Schannel

Overview

This section describes how to deploy X.509 certificates into the Schannel certificate store. This method of deployment is used only for C++ applications that use the Schannel SSL/TLS toolkit on the Windows platform—see “Choosing an SSL/TLS Toolkit” on page 277 for more details.

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</tbody>
</table>
## Schannel Certificate Store

### Overview
This subsection describes how to manage certificates in the Schannel certificate store (Windows C++ applications only).

### Prerequisites
The Schannel certificate store is *only* available to C++ applications on the Windows platform when you have selected Schannel as the underlying SSL/TLS toolkit. See “Choosing an SSL/TLS Toolkit” on page 277 for details.

### Managing the certificate store
Windows makes the Schannel certificate store accessible through the following O/S utilities:

- **Internet Explorer.**
- **Microsoft Management Console.**

### Internet Explorer
To access the certificate store from Internet Explorer:

1. Choose the **Tools|Internet Options...** menu option to open the **Internet Options** dialog box.
2. Click on the **Content** tab.
3. Click **Certificates...** to open the **Certificates** dialog box.
4. Use the **Certificates** dialog box to manage the certificate store.

### Microsoft Management Console
You can also access the certificate store from within the Microsoft Management Console (MMC), using the **certificate snap-in.** The MMC is a general-purpose, customizable management tool for the Windows operating system. The functionality of the MMC can be customized by adding, removing and configuring a variety of different MMC snap-ins.
You can add the certificate snap-in to the MMC as follows:

1. Start the MMC from the start menu by selecting Start > Run and then entering the command `mmc`. The MMC opens as shown in Figure 48.

**Figure 48:** The Microsoft Management Console
2. From the MMC, select the **Console|Add/Remove Snap-In...** menu option. The **Add/Remove Snap-In** dialog opens as shown in **Figure 49**.

![Add/Remove Snap-In Dialog Box](image-url)

**Figure 49**: The Add/Remove Snap-In Dialog Box
3. Click **Add...** to open the **Add Standalone Snap-In** dialog box, as shown in Figure 50.

![Add Standalone Snap-In Dialog Box](image)

**Figure 50:** The Add Standalone Snap-In Dialog Box

4. From the snap-in list box, select the Certificates snap-in and then click **Add**.

5. A wizard utility starts up to guide you through the process of adding the Certificates snap-in. Follow the instructions in the wizard to add the snap-in.
6. After finishing the certificate snap-in wizard, close the dialog boxes. The console window should now look similar to Figure 51.

**Figure 51:** Microsoft Management Console with Certificates Snap-In

7. To save the current console configuration for future use, select **Console|Save As...** and save the customized console in a convenient location.

---

**References**

For more details about the MMC utility, see the following white paper from Microsoft:

Deploying Trusted Certificate Authorities

Overview

This subsection describes how to deploy trusted certificate authority (CA) certificates to the Schannel certificate store (Windows C++ applications only). Your Orbix application must be configured to use Schannel as its underlying SSL/TLS toolkit.

CA certificate format

A trusted CA certificate is distributed as a plain certificate without a private key (the private key is known only to the certification authority). For example, trusted CA certificates might be distributed in PEM format, but not in PKCS#12 format (which includes a private key).

Deploying

To deploy a trusted CA certificate to the Schannel certificate store, perform the following steps:

1. Launch an MMC utility that has been configured with a certificates snap-in (see “Schannel Certificate Store” on page 322).
2. From the MMC console tree, select the Console Root\Certificates\Trusted Root Certification Authorities\Certificates directory.
3. Right-click the Certificates directory and select the All Tasks|Import... option. A Certificate Import Wizard launches.
4. Follow the instructions in the Certificate Import Wizard to add a trusted CA certificate to the certificate store.

Note: The Orbix policies:iiop_tls:trusted_ca_list_policy configuration variable is ignored when your C++ application is configured to use the Schannel SSL/TLS toolkit.
Deploying Application Certificates

Overview

This subsection describes how to deploy application certificates in the Schannel certificate store (Windows C++ applications only). Your Orbix application must be configured to use Schannel as its underlying SSL/TLS toolkit.

Deploying

To deploy an application certificate to the Schannel certificate store, perform the following steps:

1. Launch an MMC utility that has been configured with a certificates snap-in (see “Schannel Certificate Store” on page 322).
2. From the MMC console tree, select the Console Root\Certificates\Personal\Certificates directory.
3. Right-click the Certificates directory and select the All Tasks|Import... option. A Certificate Import Wizard launches.
4. Follow the instructions in the Certificate Import Wizard to add an application certificate to your personal certificate store.
5. To configure an Orbix application to use the certificate, you need to know the common name (CN) from the certificate’s subject DN.

If you do not already know the certificate’s common name, you can easily find out by double-clicking the certificate entry in the Console Root\Certificates\Personal\Certificates directory of the MMC console. In the Certificate dialog, click the Details tab and then select the Subject.
field from the scrollbox. Figure 52 shows the Certificate dialog at this point.

![Certificate Dialog Showing the Certificate’s Subject DN.](image)

**Figure 52:** Certificate Dialog Showing the Certificate’s Subject DN.

The lower pane shows the AVA settings from the certificate’s subject DN (for an explanation of X.509 certificate terminology, see “ASN.1 and Distinguished Names” on page 645). From Figure 52, you can see that the common name (CN) of this certificate is Alice.
6. Edit the Orbix configuration for your domain (usually `ASPInstallDir/etc/domains/DomainName.cfg`). In your application’s configuration scope, `MyApp`, ensure that the principal sponsor is configured to use the new certificate, as shown in Example 40.

```
# Orbix Configuration File
...
MyApp {

    ...
    principal_sponsor:use_principal_sponsor = "true";
    principal_sponsor:auth_method_id = "security_label";
    principal_sponsor:auth_method_data =
        ["label=CommonName"];
}
```

Where `CommonName` is the common name (CN) from the new certificate’s subject DN. For example, if using the certificate shown in Figure 52 on page 329, the `CommonName` would be `Alice`.

**Note:** When Orbix is configured to use Schannel, you cannot use PKCS#12 files directly. Hence, the `pkcs12_file` value of `principal_sponsor:auth_method_id` cannot be used with Schannel.

7. When you start an Orbix application that uses the new certificate, Schannel might or might not prompt you for a private key password. The behavior at runtime depends on whether or not you chose the **Enable strong private key protection** option when importing the certificate with the Certificate Import Wizard.

### Importing PKCS#12 files

If you want to import a PKCS#12 certificate (`.p12` file suffix) into the certificate store, there is an easy short cut available: double-click the PKCS#12 file and follow the instructions in the **Certificate Import Wizard** to add the certificate to your personal certificate store.
Deploying Certificates in Smart Cards

Overview
Orbix supports an option to store credentials (that is, an X.509 certificate chain and private key) on a smart card.

This subsection describes how to deploy certificates in a smart card which is accessible through the Schannel certificate store (Windows C++ applications only). Your Orbix application must be configured to use Schannel as its underlying SSL/TLS toolkit.

Prerequisites
Before deploying your certificates in a smart card, you must have the following third-party products installed:

- **Third-party smart card toolkit**—a software library that integrates the smart card hardware with the Schannel toolkit and certificate store.
- Tools and utilities to administer the smart card (usually bundled with the hardware).

Deploying the certificates
Smart card hardware is normally delivered with drivers and utilities that enable you to deploy X.509 certificate chains and private keys to the smart card. Consult the *third-party documentation* that accompanies your smart-card hardware for details.

Smart card transparency in Schannel
As soon as a smart card is inserted into the card reader, the smart card credentials automatically appear in the Schannel certificate store. The credentials are then accessible in just the same way as any other certificate in the store.

Configuring an application to use the smart card
To configure an Orbix application to use the smart card through Schannel, edit the configuration for your domain (usually `ASPInstallDir/etc/domains/DomainName.cfg`). In your application’s
configuration scope, SmartCardApp, ensure that the principal sponsor is configured to use the smart card, as shown in Example 40.

**Example 40:** Configuring an Application to Use a Smart Card in Schannel

```
# Orbix Configuration File
...
SmartCardApp {
  ...
  principal_sponsor:use_principal_sponsor = "true";
  principal_sponsor:auth_method_id = "security_label";
  principal_sponsor:auth_method_data = ["label=CommonName"];  }
```  
Where **CommonName** is the common name (CN) from the smart card certificate’s subject DN (see “ASN.1 and Distinguished Names” on page 645).

**Supplying the smart card PIN**  
By default, Schannel will prompt the user for the smart card PIN as it starts up. There is currently no alternative to supplying the smart card PIN in Schannel.
CHAPTER 12

Configuring SSL/TLS Secure Associations

You can govern the behavior of client-server connections by setting configuration variables to choose association options and to specify cipher suites.

In this chapter

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Overview of Secure Associations

Secure association

Secure association is the CORBA term for any link between a client and a server that enables invocations to be transmitted securely. In practice, a secure association is often realized as a TCP/IP network connection augmented by a particular security protocol (such as TLS) but many other realizations are possible.

In the context of Orbix, secure associations always use TLS.

TLS session

A TLS session is the TLS implementation of a secure client-server association. The TLS session is accompanied by a session state that stores the security characteristics of the association.

A TLS session underlies each secure association in Orbix.

Colocation

For colocated invocations, that is where the calling code and called code share the same address space, Orbix supports the establishment of colocated secure associations. A special interceptor, TLS_Coloc, is provided by the security plug-in to optimize the transmission of secure, colocated invocations.

Configuration overview

The security characteristics of an association can be configured through the following CORBA policy types:

- **Client secure invocation policy**—enables you to specify the security requirements on the client side by setting association options. See “Choosing Client Behavior” on page 340 for details.
- **Target secure invocation policy**—enables you to specify the security requirements on the server side by setting association options. See “Choosing Target Behavior” on page 342 for details.
- **Mechanism policy**—enables you to specify the security mechanism used by secure associations. In the case of TLS, you are required to specify a list of cipher suites for your application. See “Specifying Cipher Suites” on page 349 for details.
Figure 53 illustrates all of the elements that configure a secure association. The security characteristics of the client and the server can be configured independently of each other.

Figure 53: Configuration of a Secure Association
Setting Association Options

Overview

This section explains the meaning of the various SSL/TLS association options and describes how you can use the SSL/TLS association options to set client and server secure invocation policies for both SSL/TLS and HTTPS connections.

In this section

The following subsections discuss the meaning of the settings and flags:

<table>
<thead>
<tr>
<th>Secure Invocation Policies</th>
<th>page 337</th>
</tr>
</thead>
<tbody>
<tr>
<td>Association Options</td>
<td>page 338</td>
</tr>
<tr>
<td>Choosing Client Behavior</td>
<td>page 340</td>
</tr>
<tr>
<td>Choosing Target Behavior</td>
<td>page 342</td>
</tr>
<tr>
<td>Hints for Setting Association Options</td>
<td>page 344</td>
</tr>
</tbody>
</table>
Secure Invocation Policies

Secure invocation policies

You can set the minimum security requirements of objects in your system with two types of security policy:

- **Client secure invocation policy**—specifies the client association options.
- **Target secure invocation policy**—specifies the association options on a target object.

These policies can only be set through configuration; they cannot be specified programmatically by security-aware applications.

OMG-defined policy types

The client and target secure invocation policies correspond to the following policy types, as defined in the OMG security specification:

- Security::SecClientSecureInvocation
- Security::SecTargetSecureInvocation

These policy types are, however, not directly accessible to programmers.

Configuration example

For example, to specify that client authentication is required for IIOP/TLS connections, you can set the following target secure invocation policy for your server:

```plaintext
# Orbix Configuration File
secure_server_enforce_client_auth
{
    policies:iiop_tls:target_secure_invocation_policy:requires =
        ["EstablishTrustInClient", "Confidentiality"];

    policies:iiop_tls:target_secure_invocation_policy:supports =
        ["EstablishTrustInClient", "Confidentiality", "Integrity",
        "DetectReplay", "DetectMisordering",
        "EstablishTrustInTarget"];

    // Other settings (not shown)...
};
```
Association Options

Available options

You can use association options to configure Orbix. They can be set for clients or servers where appropriate. These are the available options:

- NoProtection
- Integrity
- Confidentiality
- DetectReplay
- DetectMisordering
- EstablishTrustInTarget
- EstablishTrustInClient

NoProtection

Use the NoProtection flag to set minimal protection. This means that insecure bindings are supported, and (if the application supports something other than NoProtection) the object can accept secure and insecure invocations. This is the equivalent to SEMI_SECURE servers in OrbixSSL.

Integrity

Use the Integrity flag to indicate that the object supports integrity-protected invocations. Setting this flag implies that your TLS cipher suites support message digests (such as MD5, SHA1).

Confidentiality

Use the Confidentiality flag if your object requires or supports at least confidentiality-protected invocations. The object can support this feature if the cipher suites specified by the MechanismPolicy support confidentiality-protected invocations.

DetectReplay

Use the DetectReplay flag to indicate that your object supports or requires replay detection on invocation messages. This is determined by characteristics of the supported TLS cipher suites.

DetectMisordering

Use the DetectMisordering flag to indicate that your object supports or requires error detection on fragments of invocation messages. This is determined by characteristics of the supported TLS cipher suites.
**EstablishTrustInTarget**

The `EstablishTrustInTarget` flag is set for client policies only. Use the flag to indicate that your client supports or requires that the target authenticate its identity to the client. This is determined by characteristics of the supported TLS cipher suites. This is normally set for both client supports and requires unless anonymous cipher suites are supported.

**EstablishTrustInClient**

Use the `EstablishTrustInClient` flag to indicate that your target object requires the client to authenticate its privileges to the target. This option cannot be required as a client policy.

If this option is supported on a client’s policy, it means that the client is prepared to authenticate its privileges to the target. On a target policy, the target supports having the client authenticate its privileges to the target.

**Note:** Examples of all the common cases for configuring association options can be found in the default Orbix configuration file—see the `demos.tls` scope of the `ASPIInstallDir/etc/domains/DomainName.cfg` configuration file.
# Choosing Client Behavior

## Client secure invocation policy

The `Security::SecClientSecureInvocation` policy type determines how a client handles security issues.

## IIOP/TLS configuration

You can set this policy for IIOP/TLS connections through the following configuration variables:

- `policies:iiop_tls:client_secure_invocation_policy:requires` Specifies the minimum security features that the client requires to establish an IIOP/TLS connection.
- `policies:iiop_tls:client_secure_invocation_policy:supports` Specifies the security features that the client is able to support on IIOP/TLS connections.

## HTTPS configuration

You can set this policy for HTTPS connections through the following configuration variables:

- `policies:https:client_secure_invocation_policy:requires` Specifies the minimum security features that the client requires to establish a HTTPS connection.
- `policies:https:client_secure_invocation_policy:supports` Specifies the security features that the client is able to support on HTTPS connections.

## Association options

In both cases, you provide the details of the security levels in the form of `AssociationOption` flags—see “Association Options” on page 338 and Appendix D on page 651.

## Default value

The default value for the client secure invocation policy is:

- `supports` Integrity, Confidentiality, DetectReplay, DetectMisordering, EstablishTrustInTarget
- `requires` Integrity, Confidentiality, DetectReplay, DetectMisordering, EstablishTrustInTarget
Example

In the default configuration file, the `demos.tls.bank_client` scope specifies the following association options:

```plaintext
# Orbix Configuration File
# In 'demos.tls' scope
  bank_client {
    ...
    policies:iiop_tls:client_secure_invocation_policy:requires =
      ["Confidentiality", "EstablishTrustInTarget"];
    policies:iiop_tls:client_secure_invocation_policy:supports =
      ["Confidentiality", "Integrity", "DetectReplay",
       "DetectMisordering", "EstablishTrustInTarget"];
  }
  ...
};
```
Choosing Target Behavior

Target secure invocation policy

The `Security::SecTargetSecureInvocation` policy type operates in a similar way to the `Security::SecClientSecureInvocation` policy type. It determines how a target handles security issues.

IIOP/TLS configuration

You can set the target secure invocation policy for IIOP/TLS connections through the following configuration variables:

- `policies:iiop_tls:target_secure_invocation_policy:requires`:
  Specifies the minimum security features that your targets require, before they accept an IIOP/TLS connection.

- `policies:iiop_tls:target_secure_invocation_policy:supports`:
  Specifies the security features that your targets are able to support on IIOP/TLS connections.

HTTPS configuration

You can set the target secure invocation policy for HTTPS connections through the following configuration variables:

- `policies:https:target_secure_invocation_policy:requires`:
  Specifies the minimum security features that your targets require, before they accept a HTTPS connection.

- `policies:https:target_secure_invocation_policy:supports`:
  Specifies the security features that your targets are able to support on HTTPS connections.

Association options

In both cases, you can provide the details of the security levels in the form of `AssociationOption` flags—see “Association Options” on page 338 and Appendix D on page 651.

Default value

The default value for the target secure invocation policy is:

- `supports`:
  Integrity, Confidentiality, DetectReplay, DetectMisordering, EstablishTrustInTarget

- `requires`:
  Integrity, Confidentiality, DetectReplay, DetectMisordering
Example

In the default configuration file, the `demos.tls.bank_server` scope specifies the following association options:

```
# Orbix Configuration File
# In 'demos.tls' scope
...
  bank_server {
    ...
    policies:iiop_tls:target_secure_invocation_policy:requires =
      ["Confidentiality"];

    policies:iiop_tls:target_secure_invocation_policy:supports =
      ["Confidentiality", "Integrity", "DetectReplay",
       "DetectMisordering", "EstablishTrustInTarget"];
    ...
  };
  ...
```
Hints for Setting Association Options

Overview
This section gives an overview of how association options can be used in real applications.

Use the sample scopes
The quickest way to configure a secure SSL/TLS application is by basing the configuration on one of the sample `demos.tls` scopes in the `DomainName.cfg` configuration file. In `demos.tls`, there are sample scopes that match all of the common use cases for SSL/TLS configuration.
For more details, see “Configuration samples” on page 64.

Rules of thumb
The following rules of thumb should be kept in mind:

- If an association option is *required* by a particular invocation policy, it must also be *supported* by that invocation policy. It makes no sense to require an association option without supporting it.

- It is important to be aware that the secure invocation policies and the security mechanism policy mutually interact with each other. That is, the association options effective for a particular secure association depend on the available cipher suites (see “Constraints Imposed on Cipher Suites” on page 355).

- The `NoProtection` option must appear alone in a list of *required* options. It does not make sense to require other security options in addition to `NoProtection`. 
Association options can be categorized into the following different types, as shown in Table 16.

Table 16: Description of Different Types of Association Option

<table>
<thead>
<tr>
<th>Description</th>
<th>Relevant Association Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Request or require TLS peer authentication.</td>
<td>EstablishTrustInTarget and EstablishTrustInClient</td>
</tr>
<tr>
<td>Quality of protection.</td>
<td>Confidentiality, Integrity, DetectReplay, and DetectMisordering.</td>
</tr>
<tr>
<td>Allow or require insecure connections.</td>
<td>NoProtection.</td>
</tr>
</tbody>
</table>

EstablishTrustInTarget and EstablishTrustInClient

These association options are used as follows:

- **EstablishTrustInTarget**—determines whether a server sends its own X.509 certificate to a client during the SSL/TLS handshake. In practice, secure Orbix applications must enable EstablishTrustInTarget, because all of the cipher suites supported by Orbix require it.

  The EstablishTrustInTarget association option should appear in all of the configuration variables shown in the relevant row of Table 17.

- **EstablishTrustInClient**—determines whether a client sends its own X.509 certificate to a server during the SSL/TLS handshake. The EstablishTrustInClient feature is optional and various combinations of settings are possible involving this association option.
The `EstablishTrustInClient` association option can appear in any of the configuration variables shown in the relevant row of Table 17.

**Table 17: Setting `EstablishTrustInTarget` and `EstablishTrustInClient` Association Options**

<table>
<thead>
<tr>
<th>Association Option</th>
<th>Client side—can appear in...</th>
<th>Server side—can appear in...</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>EstablishTrustInTarget</code></td>
<td>policies:client_secure_invocation_policy:supports</td>
<td>policies:target_secure_invocation_policy:supports</td>
</tr>
<tr>
<td></td>
<td>policies:client_secure_invocation_policy:requires</td>
<td>policies:target_secure_invocation_policy:requires</td>
</tr>
<tr>
<td><code>EstablishTrustInClient</code></td>
<td>policies:client_secure_invocation_policy:supports</td>
<td>policies:target_secure_invocation_policy:supports</td>
</tr>
<tr>
<td></td>
<td>policies:client_secure_invocation_policy:requires</td>
<td>policies:target_secure_invocation_policy:requires</td>
</tr>
</tbody>
</table>

**Note:** The SSL/TLS client authentication step can also be affected by the `policies:allow_unauthenticated_clients_policy` configuration variable. See “policies” on page 582.

**Confidentiality, Integrity, DetectReplay, and DetectMisordering**

These association options can be considered together, because normally you would require either all or none of these options. Most of the cipher suites supported by Orbix support all of these association options, although there are a couple of integrity-only ciphers that do not support Confidentiality (see Table 21 on page 356). As a rule of thumb, if you want security you generally would want all of these association options.

**Table 18: Setting Quality of Protection Association Options**

<table>
<thead>
<tr>
<th>Association Options</th>
<th>Client side—can appear in...</th>
<th>Server side—can appear in...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confidentiality, Integrity, DetectReplay, and DetectMisordering</td>
<td>policies:client_secure_invocation_policy:supports</td>
<td>policies:target_secure_invocation_policy:supports</td>
</tr>
<tr>
<td></td>
<td>policies:client_secure_invocation_policy:requires</td>
<td>policies:target_secure_invocation_policy:requires</td>
</tr>
</tbody>
</table>
A typical secure application would list all of these association options in all of the configuration variables shown in Table 18.

**Note:** Some of the sample configurations appearing in the generated configuration file require Confidentiality, but not the other qualities of protection. In practice, however, the list of required association options is implicitly extended to include the other qualities of protection, because the cipher suites that support Confidentiality also support the other qualities of protection. This is an example of where the security mechanism policy interacts with the secure invocation policies.

---

**NoProtection**

The NoProtection association option is used for two distinct purposes:

- **Disabling security selectively**—security is disabled, either in the client role or in the server role, if NoProtection appears as the sole required association option and as the sole supported association option in a secure invocation policy. This mechanism is selective in the sense that the client role and the server role can be independently configured as either secure or insecure.

  **Note:** In this case, the orb_plugins configuration variable should include the iiop plug-in to enable insecure communication.

- **Making an application semi-secure**—an application is semi-secure, either in the client role or in the server role, if NoProtection appears as the sole required association option and as a supported association option along with other secure association options. The meaning of semi-secure in this context is, as follows:

  - **Semi-secure client**—the client will open either a secure or an insecure connection, depending on the disposition of the server (that is, depending on whether the server accepts only secure connections or only insecure connections). If the server is semi-secure, the type of connection opened depends on the order of the bindings in the binding:client_binding_list.
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- **Semi-secure server**—the server accepts connections either from a secure or an insecure client.

**Note:** In this case, the `orb_plugins` configuration variable should include both the `iiop_tls` plug-in and the `iiop` plug-in.

Table 19 shows the configuration variables in which the NoProtection association option can appear.

**Table 19: Setting the NoProtection Association Option**

<table>
<thead>
<tr>
<th>Association Option</th>
<th>Client side—can appear in...</th>
<th>Server side—can appear in...</th>
</tr>
</thead>
<tbody>
<tr>
<td>NoProtection</td>
<td>policies:client_secure_invocation_policy:supports</td>
<td>policies:target_secure_invocation_policy:supports</td>
</tr>
<tr>
<td></td>
<td>policies:client_secure_invocation_policy:requires</td>
<td>policies:target_secure_invocation_policy:requires</td>
</tr>
</tbody>
</table>

**References**

For more information about setting association options, see the following:

- “Securing Communications with SSL/TLS” on page 64.
- The `demos.tls` scope in a generated Orbix configuration file.
Specifying Cipher Suites

Overview
This section explains how to specify the list of cipher suites that are made available to an application (client or server) for the purpose of establishing secure associations. During a security handshake, the client chooses a cipher suite that matches one of the cipher suites available to the server. The cipher suite then determines the security algorithms that are used for the secure association.

In this section
This section contains the following subsections:

<table>
<thead>
<tr>
<th>Supported Cipher Suites</th>
<th>page 350</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setting the Mechanism Policy</td>
<td>page 352</td>
</tr>
<tr>
<td>Constraints Imposed on Cipher Suites</td>
<td>page 355</td>
</tr>
</tbody>
</table>
### Supported Cipher Suites

**Orbix cipher suites**

The following cipher suites are supported by Orbix:

- **Null encryption, integrity-only ciphers:**
  - RSA_WITH_NULL_MD5
  - RSA_WITH_NULL_SHA
- **Standard ciphers**
  - RSA_EXPORT_WITH_RC4_40_MD5
  - RSA_WITH_RC4_128_MD5
  - RSA_WITH_RC4_128_SHA
  - RSA_EXPORT_WITH_DES40_CBC_SHA
  - RSA_WITH_DES_CBC_SHA
  - RSA_WITH_3DES_EDE_CBC_SHA

**Security algorithms**

Each cipher suite specifies a set of three security algorithms, which are used at various stages during the lifetime of a secure association:

- **Key exchange algorithm**—used during the security handshake to enable authentication and the exchange of a symmetric key for subsequent communication. Must be a public key algorithm.
- **Encryption algorithm**—used for the encryption of messages after the secure association has been established. Must be a symmetric (private key) encryption algorithm.
- **Secure hash algorithm**—used for generating digital signatures. This algorithm is needed to guarantee message integrity.

**Key exchange algorithms**

The following key exchange algorithms are supported by Orbix:

<table>
<thead>
<tr>
<th>Algorithm</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RSA</td>
<td>Rivest Shamir Adleman (RSA) public key encryption using X.509v3 certificates. No restriction on the key size.</td>
</tr>
<tr>
<td>RSA_EXPORT</td>
<td>RSA public key encryption using X.509v3 certificates. Key size restricted to 512 bits.</td>
</tr>
</tbody>
</table>

**Encryption algorithms**

The following encryption algorithms are supported by Orbix:

<table>
<thead>
<tr>
<th>Algorithm</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RC4_40</td>
<td>A symmetric encryption algorithm developed by RSA data security. Key size restricted to 40 bits.</td>
</tr>
</tbody>
</table>
Secure hash algorithms

The following secure hash algorithms are supported by Orbix:

- **MD5**: Message Digest 5 (MD5) hash algorithm. This algorithm produces a 128-bit digest.
- **SHA**: Secure hash algorithm (SHA). This algorithm produces a 160-bit digest, but is somewhat slower than MD5.

Cipher suite definitions

The Orbix cipher suites are defined as follows:

<table>
<thead>
<tr>
<th>Cipher Suite</th>
<th>Key Exchange Algorithm</th>
<th>Encryption Algorithm</th>
<th>Secure Hash Algorithm</th>
<th>Exportable?</th>
</tr>
</thead>
<tbody>
<tr>
<td>RSA_WITH_NULL_MD5</td>
<td>RSA</td>
<td>NULL</td>
<td>MD5</td>
<td>yes</td>
</tr>
<tr>
<td>RSA_WITH_NULL_SHA</td>
<td>RSA</td>
<td>NULL</td>
<td>SHA</td>
<td>yes</td>
</tr>
<tr>
<td>RSA_EXPORT_WITH_RC4_40_MD5</td>
<td>RSA_EXPORT</td>
<td>RC4_40</td>
<td>MD5</td>
<td>yes</td>
</tr>
<tr>
<td>RSA_WITH_RC4_128_MD5</td>
<td>RSA</td>
<td>RC4_128</td>
<td>MD5</td>
<td>no</td>
</tr>
<tr>
<td>RSA_WITH_RC4_128_SHA</td>
<td>RSA</td>
<td>RC4_128</td>
<td>SHA</td>
<td>no</td>
</tr>
<tr>
<td>RSA_EXPORT_WITH_DES40_CBC_SHA</td>
<td>RSA_EXPORT</td>
<td>DES40_CBC</td>
<td>SHA</td>
<td>yes</td>
</tr>
<tr>
<td>RSA_WITH_DES_CBC_SHA</td>
<td>RSA</td>
<td>DES_CBC</td>
<td>SHA</td>
<td>no</td>
</tr>
<tr>
<td>RSA_WITH_3DES_EDE_CBC_SHA</td>
<td>RSA</td>
<td>3DES_EDE_CBC</td>
<td>SHA</td>
<td>no</td>
</tr>
</tbody>
</table>

Reference

For further details about cipher suites in the context of TLS, see RFC 2246 from the Internet Engineering Task Force (IETF). This document is available from the IETF Web site: http://www.ietf.org.
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Setting the Mechanism Policy

Mechanism policy

To specify cipher suites, use the *mechanism policy*. The mechanism policy is a client and server side security policy that determines

- Whether SSL or TLS is used, and
- Which specific cipher suites are to be used.

The protocol_version configuration variable

You can specify whether SSL, TLS or both are used with a transport protocol by assigning a list of protocol versions to the `policies:iiop_tls:mechanism_policy:protocol_version` configuration variable for IIOP/TLS and the `policies:https:mechanism_policy:protocol_version` configuration variable for HTTPS. For example:

```
# Orbix Configuration File
policies:iiop_tls:mechanism_policy:protocol_version = ["TLS_V1", "SSL_V3"];
```

You can set the `protocol_version` configuration variable to include one or more of the following protocols:

- TLS_V1
- SSL_V3

The order of the entries in the `protocol_version` list is unimportant. During the SSL/TLS handshake, the highest common protocol will be negotiated.

Interoperating with CORBA applications on OS/390

There are some implementations of SSL/TLS on the OS/390 platform that erroneously send SSL V2 client hellos at the start of an SSL V3 or TLS V1 handshake. If you need to interoperate with a CORBA application running on OS/390, you can configure Artix to accept SSL V2 client hellos using the `policies:iiop_tls:mechanism_policy:accept_v2_hellos` configuration variable for IIOP/TLS. For example:

```
# Orbix Configuration File
policies:iiop_tls:mechanism_policy:accept_v2_hellos = "true";
```

The default is `false`. 
Interoperating with Orbix versions 3.3.6 and earlier

The default configuration of the mechanism policy protocol version—that is, support for both SSLv3 and the TLSv1—is not compatible with Orbix versions 3.3.6 and earlier. To work around this interoperability problem, you should edit the policies:iiop_tls:mechanism_policy:protocol_version configuration setting for IIOP/TLS, such that only the SSL_v3 protocol appears in the protocol version list. For example:

```
# Orbix Configuration File
policies:iiop_tls:mechanism_policy:protocol_version = ["SSL_V3"];
```

This interoperability problem arises because of a bug in the older SSLeay security toolkits on which Orbix versions 3.3.6 and earlier are based. The older SSLeay toolkits support only the SSLv3 protocol, which in itself is not a problem, because an SSL toolkit always negotiates the protocol version during the SSL handshake. A problem does arise, however, because the early SSLeay kits implement the protocol negotiation phase incorrectly. The only solution to this problem is to restrict the protocol version list to SSLv3 in Orbix 6.2.

Note: The implementation of SSL protocol negotiation in Orbix 6.2 SP1 is compliant with the SSL/TLS standards. As long as Orbix 6.2 SP1 is communicating with other SSL/TLS-compliant applications, you should not encounter interoperability problems of this kind.

The cipher suites configuration variable

You can specify the cipher suites available to a transport protocol by setting the policies:iiop_tls:mechanism_policy:ciphersuites configuration variable for IIOP/TLS and the policies:https:mechanism_policy:ciphersuites configuration variable for HTTPS. For example:

```
# Orbix Configuration File
policies:iiop_tls:mechanism_policy:ciphersuites = ["RSA_EXPORT_WITH_RC4_40_MD5", "RSA_WITH_RC4_128_MD5"];
```

Cipher suite order

The order of the entries in the mechanism policy’s cipher suites list is important.
During a security handshake, the client sends a list of acceptable cipher suites to the server. The server then chooses the first of these cipher suites that it finds acceptable. The secure association is, therefore, more likely to use those cipher suites that are near the beginning of the ciphersuites list.

**Valid cipher suites**

You can specify any of the following cipher suites:

- **Null encryption, integrity only ciphers**:
  - `RSA_WITH_NULL_MD5`
  - `RSA_WITH_NULL_SHA`

- **Standard ciphers**:
  - `RSA_EXPORT_WITH_RC4_40_MD5`
  - `RSA_EXPORT_WITH_RC4_128_MD5`
  - `RSA_EXPORT_WITH_RC4_128_SHA`
  - `RSA_EXPORT_WITH_DES40_CBC_SHA`
  - `RSA_WITH_DES_CBC_SHA`
  - `RSA_WITH_3DES_EDE_CBC_SHA`

**Default values**

If no cipher suites are specified through configuration or application code, the following apply:

- `RSA_WITH_RC4_128_SHA`
- `RSA_WITH_RC4_128_MD5`
- `RSA_WITH_3DES_EDE_CBC_SHA`
- `RSA_WITH_DES_CBC_SHA`
Constraints Imposed on Cipher Suites

Effective cipher suites

Figure 54 shows that cipher suites initially specified in the configuration are *not* necessarily made available to the application. Orbix checks each cipher suite for compatibility with the specified association options and, if necessary, reduces the size of the list to produce a list of effective cipher suites.

![Diagram](image)

**Figure 54: Constraining the List of Cipher Suites**

Required and supported association options

For example, in the context of the IIOP/TLS protocol the list of cipher suites is affected by the following configuration options:

- *Required association options*—as listed in
  - `policies:iiop_tls:client_secure_invocation_policy:requires` on the client side, or
  - `policies:iiop_tls:target_secure_invocation_policy:requires` on the server side.

- *Supported association options*—as listed in
  - `policies:iiop_tls:client_secure_invocation_policy:supports` on the client side, or
  - `policies:iiop_tls:target_secure_invocation_policy:supports` on the server side.
Cipher suite compatibility table

Use Table 21 to determine whether or not a particular cipher suite is compatible with your association options.

**Table 21: Association Options Supported by Cipher Suites**

<table>
<thead>
<tr>
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<td>Integrity, DetectReplay, DetectMisordering, Confidentiality</td>
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</table>

Determining compatibility

The following algorithm is applied to the initial list of cipher suites:

1. For the purposes of the algorithm, ignore the EstablishTrustInClient and EstablishTrustInTarget association options. These options have no effect on the list of cipher suites.
2. From the initial list, remove any cipher suite whose supported association options (see Table 21) do not satisfy the configured required association options.
3. From the remaining list, remove any cipher suite that supports an option (see Table 21) not included in the configured supported association options.
### No suitable cipher suites available

If no suitable cipher suites are available as a result of incorrect configuration, no communications will be possible and an exception will be raised. Logging also provides more details on what went wrong.

### Example

For example, specifying a cipher suite such as RSA_WITH_RC4_128_MD5 that supports Confidentiality, Integrity, DetectReplay, DetectMisordering, EstablishTrustInTarget (and optionally EstablishTrustInClient) but specifying a secure_invocation_policy that supports only a subset of those features results in that cipher suite being ignored.
# Caching TLS Sessions

**Session caching policy**
You can use the `IT_TLS_API::SessionCachingPolicy` to control TLS session caching and reuse for both the client side and the server side.

**Configuration variable**
You can set the `IT_TLS_API::SessionCachingPolicy` with the `policies:iiop_tls:session_caching_policy` or `policies:https:session_caching_policy` configuration variables. For example:
```
policies:iiop_tls:session_caching_policy = "CACHE_CLIENT";
```

**Valid values**
You can apply the following values to the session caching policy:
- CACHE_NONE
- CACHE_CLIENT
- CACHE_SERVER
- CACHE_SERVER_AND_CLIENT

**Default value**
The default value is CACHE_NONE.

**Configuration variable**
`plugins:atli_tls_tcp:session_cache_validity_period`
This allows control over the period of time that SSL/TLS session caches are valid for.

**Valid values**
`session_cache_validity_period` is specified in seconds.

**Default value**
The default value is 1 day.

**Configuration variable**
`plugins:atli_tls_tcp:session_cache_size`
`session_cache_size` is the maximum number of SSL/TLS sessions that are cached before sessions are flushed from the cache.

**Default value**
This defaults to no limit specified for C++.
This defaults to 100 for Java.
CHAPTER 13

Configuring SSL/TLS Authentication

This chapter describes how to configure the authentication requirements for your application.

In this chapter

This chapter discusses the following topics:

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Requiring Authentication

Overview

This section discusses how to specify whether a target object must authenticate itself to a client and whether the client must authenticate itself to the target. For a given client-server link, the authentication requirements are governed by the following policies:

- Client secure invocation policy.
- Target secure invocation policy.
- Mechanism policy.

These policies are explained in detail in “Configuring SSL/TLS Secure Associations” on page 333. This section focuses only on those aspects of the policies that affect authentication.

In this section

There are two possible arrangements for a TLS secure association:

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Target Authentication Only

Overview
When an application is configured for target authentication only, the target authenticates itself to the client but the client is not authentic to the target object—see Figure 55.

Security handshake
Prior to running the application, the client and server should be set up as follows:

- A certificate chain is associated with the server—the certificate chain is provided in the form of a PKCS#12 file. See “Specifying an Application’s Own Certificate” on page 371.
- One or more lists of trusted certification authorities (CA) are made available to the client—see “Providing a List of Trusted Certificate Authorities” on page 309.

During the security handshake, the server sends its certificate chain to the client—see Figure 55. The client then searches its trusted CA lists to find a CA certificate that matches one of the CA certificates in the server’s certificate chain.

Client configuration
For target authentication only, the client policies should be configured as follows:
• Client secure invocation policy—must be configured both to require and support the EstablishTrustInTarget association option.
• Mechanism policy—at least one of the specified cipher suites must be capable of supporting target authentication. All of the cipher suites currently provided by Orbix E2A support target authentication.

Server configuration

For target authentication only, the target policies should be configured as follows:

• Target secure invocation policy—must be configured to support the EstablishTrustInTarget association option.
• Mechanism policy—at least one of the specified cipher suites must be capable of supporting target authentication. All of the cipher suites currently provided by Orbix E2A support target authentication.

Example of target authentication only

The following sample extract from an Orbix E2A configuration file shows a configuration for a CORBA client application, bank_client, and a CORBA server application, bank_server, in the case of target authentication only.

```
# Orbix Configuration File
...
policies:iiop_tls:mechanism_policy:protocol_version = "SSL_V3";
policies:iiop_tls:mechanism_policy:ciphersuites =
    ["RSA_WITH_RC4_128_SHA", "RSA_WITH_RC4_128_MD5"];

bank_server {
policies:iiop_tls:target_secure_invocation_policy:requires =
    ["Confidentiality"];
policies:iiop_tls:target_secure_invocation_policy:supports =
    ["Confidentiality", "Integrity", "DetectReplay",
    "DetectMisordering", "EstablishTrustInTarget"];
...}

bank_client {
...}
policies:iiop_tls:client_secure_invocation_policy:requires =
    ["Confidentiality", "EstablishTrustInTarget"];
policies:iiop_tls:client_secure_invocation_policy:supports =
    ["Confidentiality", "Integrity", "DetectReplay",
    "DetectMisordering", "EstablishTrustInTarget"];
};
```
Target and Client Authentication

Overview

When an application is configured for target and client authentication, the target authenticates itself to the client and the client authenticates itself to the target. This scenario is illustrated in Figure 56. In this case, the server and the client each require an X.509 certificate for the security handshake.

![Figure 56: Target and Client Authentication](image)

Security handshake

Prior to running the application, the client and server should be set up as follows:

- Both client and server have an associated certificate chain (PKCS#12 file)—see “Specifying an Application’s Own Certificate” on page 371.
• Both client and server are configured with lists of trusted certification authorities (CA)—see “Providing a List of Trusted Certificate Authorities” on page 309.

During the security handshake, the server sends its certificate chain to the client, and the client sends its certificate chain to the server—see Figure 55.

Client configuration
For target and client authentication, the client policies should be configured as follows:
• Client secure invocation policy—must be configured both to require and support the EstablishTrustInTarget association option. The client also must support the EstablishTrustInClient association option.
• Mechanism policy—at least one of the specified cipher suites must be capable of supporting target authentication.

Server configuration
For target and client authentication, the target policies should be configured as follows:
• Target secure invocation policy—must be configured to support the EstablishTrustInTarget association option. The target must also require and support the EstablishTrustInClient association option.
• Mechanism policy—at least one of the specified cipher suites must be capable of supporting target and client authentication.
Example of target and client authentication

The following sample extract from an Orbix E2A configuration file shows a configuration for a client application, secure_client_with_cert, and a server application, secure_server_enforce_client_auth, in the case of target and client authentication.

```
# Orbix Configuration File
...  
policies:iiop_tls:mechanism_policy:protocol_version = "SSL_V3";
policies:iiop_tls:mechanism_policy:ciphersuites =  
  ["RSA_WITH_RC4_128_SHA", "RSA_WITH_RC4_128_MD5"];  
secure_server_enforce_client_auth  
{  
policies:iiop_tls:target_secure_invocation_policy:requires =  
  ["EstablishTrustInClient", "Confidentiality"];  
policies:iiop_tls:target_secure_invocation_policy:supports =  
  ["EstablishTrustInClient", "Confidentiality", "Integrity",  
  "DetectReplay", "DetectMisordering",  
  "EstablishTrustInTarget"];  
...  
};  
secure_client_with_cert  
{  
policies:iiop_tls:client_secure_invocation_policy:requires =  
  ["Confidentiality", "EstablishTrustInTheTarget"];  
policies:iiop_tls:client_secure_invocation_policy:supports =  
  ["Confidentiality", "Integrity", "DetectReplay",  
  "DetectMisordering", "EstablishTrustInTheClient",  
  "EstablishTrustInTheTarget"];  
...  
};  ```
Specifying Trusted CA Certificates

Overview
When an application receives an X.509 certificate during an SSL/TLS handshake, the application decides whether or not to trust the received certificate by checking whether the issuer CA is one of a pre-defined set of trusted CA certificates. If the received X.509 certificate is validly signed by one of the application’s trusted CA certificates, the certificate is deemed trustworthy; otherwise, it is rejected.

Which applications need to specify trusted CA certificates?
Any application that is likely to receive an X.509 certificate as part of an SSL/TLS or HTTPS handshake must specify a list of trusted CA certificates. For example, this includes the following types of application:
• All IIOP/TLS or HTTPS clients.
• Any IIOP/TLS or HTTPS servers that support mutual authentication.

Deploying trusted CA certificates
You can use one of the following approaches to deploying trusted CA certificates, depending on which SSL/TLS toolkit your application uses:
• Baltimore toolkit (all platforms), OpenSSL toolkit (all C++ platforms), JSSE/JCE (Java platform)—use the Trusted CA list policy.
• Schannel toolkit (Windows C++ applications only)—use the Schannel certificate store.

Trusted CA list policy
The trusted CA list policy specifies a list of files, each of which contains a concatenated list of CA certificates in PEM format. You can configure this policy by setting one of the following configuration variables in your application’s configuration scope:
• `policies:iiop_tls:trusted_ca_list_policy`, for IIOP/TLS, and
• `policies:https:trusted_ca_list_policy`, for HTTPS.

Schannel certificate store
If you have configured your application to use the Schannel SSL/TLS toolkit (Windows C++ applications only), you would deploy trusted CA certificates by adding them to the Schannel certificate store, which is an integral part of the Windows operating system.
More details

For more details about deploying trusted CA certificates, see one of the following references:

- Baltimore toolkit, OpenSSL toolkit, JSSE/JCE toolkit—“Providing a List of Trusted Certificate Authorities” on page 309.
- Schannel toolkit—“Deploying Trusted Certificate Authorities” on page 327.
Specifying an Application’s Own Certificate

Overview

To enable an Orbix application to identify itself, it must be associated with an X.509 certificate. The X.509 certificate is needed during an SSL/TLS handshake, where it is used to authenticate the application to its peers. The method you use to specify the certificate depends on the type of application:

- Security unaware—configuration only,
- Security aware—configuration or programming.

This section describes how to specify a certificate by configuration only. For details of the programming approach, see “Authentication” on page 469.

PKCS#12 files

In practice, the TLS protocol needs more than just an X.509 certificate to support application authentication. Orbix therefore stores X.509 certificates in a PKCS#12 file, which contains the following elements:

- The application certificate, in X.509 format.
- One or more certificate authority (CA) certificates, which vouch for the authenticity of the application certificate (see also “Certification Authorities” on page 292).
- The application certificate’s private key (encrypted).

In addition to the encryption of the private key within the certificate, the whole PKCS#12 certificate is also stored in encrypted form.

**Note:** The same pass phrase is used both for the encryption of the private key within the PKCS#12 file and for the encryption of the PKCS#12 file overall. This condition (same pass phrase) is not officially part of the PKCS#12 standard, but it is enforced by most Web browsers and by Orbix.
Figure 57 shows the typical elements in a PKCS#12 file.

**PKCS#11 and smart cards**
Orbix supports the use of smart cards for storing credentials. Orbix accesses the smart card through a standard PKCS#11 interface (implemented by the third-party toolkit from Baltimore).

Smart card storage is arranged as a series of slots. To use the smart card with Orbix, slot 0 should be initialized to contain an X.509 certificate chain and a public/private key pair. The user gains access to the data in the smart card by supplying a slot number and a PIN.

**Schannel certificate store**
(Windows C++ applications only) If you have configured your application to use the Schannel toolkit, the application’s own certificate will be stored in the Schannel certificate store, which is an integral part of the Windows operation system. For details of how to manage the certificate store, see “Schannel Certificate Store” on page 322.

**SSL/TLS principal sponsor**
The SSL/TLS principal sponsor is a piece of code embedded in the security plug-in that obtains SSL/TLS authentication information for an application. It is configured by setting variables in the Orbix configuration.
Specifying an Application’s Own Certificate

Single or multiple certificates

The SSL/TLS principal sponsor is limited to specifying a single certificate for each ORB scope. This is sufficient for most applications.

Specifying multiple certificates for a single ORB can only be achieved by programming (see “Authentication” on page 469). If an application is programmed to own multiple certificates, that application ought to be accompanied by documentation that explains how to specify the certificates.

Principal sponsor configuration

To use a principal sponsor, you must set the principal_sponsor configuration variables:

1. Set the variable principal_sponsor:use_principal_sponsor to true.

Sample PKCS #12 configuration

For example, to use a certificate, DemoCerts/demo_cert_ie5.p12, that has its password in the DemoCerts/demo_cert_ie5.pwf file:

```python
principal_sponsor:use_principal_sponsor = "true";
principal_sponsor:auth_method_id = "pkcs12_file";
principal_sponsor:auth_method_data = [
    "filename=DemoCerts/demo_cert_ie5.p12",
    "password_file=DemoCerts/demo_cert_ie5.pwf"
];
```

Details of these configuration variables can be found in “principal_sponsor Namespace” on page 507.

Sample PKCS #11 configuration

(Java only.) For example, to use a smart card from the provider, dkck132.dll (Baltimore), with credentials in slot 0:

```python
principal_sponsor:use_principal_sponsor = "true";
principal_sponsor:auth_method_id = "pkcs11";
principal_sponsor:auth_method_data = [
    "provider=dkck132.dll",
    "slot=0"
];
```

Details of these configuration variables can be found in “principal_sponsor Namespace” on page 507.

Sample Schannel configuration

(Windows C++ applications only) If you have configured your application to use the Schannel toolkit, you should set the principal sponsor as follows:

```python
principal_sponsor:use_principal_sponsor = "true";
principal_sponsor:auth_method_id = "security_label";
```
principal_sponsor:auth_method_data = ["label=CommonName"]; Where *CommonName* is the common name (CN) from the certificate’s subject DN (see “ASN.1 and Distinguished Names” on page 645).

**Credentials sharing**

Normally, when you specify an own credential using the SSL/TLS principal sponsor, the credential is available only to the ORB that created it. By setting the `plugins:security:share_credentials_across_orbs` variable to true, however, the own credentials created by one ORB are automatically made available to any other ORBs that are configured to share credentials.
Providing a Pass Phrase or PIN

Overview

When you specify an application’s own certificate, in the form of a certificate file or smart card, you must also provide authorization data that decrypts the certificate’s private key, as follows:

- PKCS#12 certificate file—provide a pass phrase,
- PKCS#11 or Schannel smart card—provide a PIN.

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Providing a Certificate Pass Phrase

Overview

Once you have specified a PKCS#12 certificate, you must also provide its *pass phrase*. The pass phrase is needed to decrypt the certificate’s private key (which is used during the TLS security handshake to prove the certificate’s authenticity).

The pass phrase can be provided in one of the following ways:

- From a dialog prompt.
- From the KDM server.
- In a password file.
- Directly in configuration.
- By programming.

From a dialog prompt

If the pass phrase is not specified in any other way, Orbix will prompt the user for the pass phrase as the application starts up. This approach is suitable for persistent (that is, manually-launched) servers.

C++ Applications

When a C++ application starts up, the user is prompted for the pass phrase at the command line as follows:

```
Initializing the ORB
Enter password:
```
Java Applications Using PKCS #12

If the Java application uses a PKCS #12 file to store its certificate, the following dialog window pops up to prompt the user for the pass phrase:

![Login dialog window](image)

**Figure 58: Java Dialog Window for Certificate Pass Phrase**

The Java dialog window can also be customized by programming. See “principal_sponsor Namespace” on page 507.

From the KDM server

The pass phrase can be obtained automatically from the KDM server as the application starts up. This mechanism is suitable for automatically launched servers. See “Automatic Activation of Secure Servers” on page 389 for details.
In a password file

The pass phrase is stored in a password file whose location is specified in the `principal_sponsor:auth_method_data` configuration variable using the `password_file` option. For example, the `iona_services` scope configures the principal sponsor as follows:

```plaintext
# Orbix Configuration File
iona_services {
  ...
  principal_sponsor:use_principal_sponsor = "true";
  principal_sponsor:auth_method_id = "pkcs12_file";
  principal_sponsor:auth_method_data = 
    [{"filename=ASPInstallDir\asp\6.0\etc\tls\x509\certs\services\administrator.p12",
      "password_file=ASPInstallDir\asp\6.0\etc\tls\x509\certs\services\administrator.pwf"}];
  ...
};
```

In this example, the pass phrase for the `bank_server.p12` certificate is stored in the `administrator.pwd` file, which contains the following pass phrase:

```
administratorpass
```

**WARNING:** Because the password file stores the pass phrase in plain text, the password file should not be readable by anyone except the administrator. For greater security, you could supply the pass phrase from a dialog prompt instead.

Directly in configuration

For a PKCS #12 file, the pass phrase can be specified directly in the `principal_sponsor:auth_method_data` configuration variable using the `password` option. For example, the `bank_server` demonstration configures the principal sponsor as follows:

```plaintext
# Orbix Configuration File
bank_server {
  ...
  principal_sponsor:use_principal_sponsor = "true";
  principal_sponsor:auth_method_id = "pkcs12_file";
  principal_sponsor:auth_method_data = 
    [{"filename=ASPInstallDir\asp\6.0\etc\tls\x509\certs\demos\bank_server.p12",
      "password=bankserverpass"}];
};
```
Providing a Pass Phrase or PIN

In this example, the pass phrase for the bank_server.p12 certificate is bankserverpass.

**WARNING:** Storing the pass phrase directly in configuration is not recommended for deployed systems. The pass phrase is in plain text and could be read by anyone.

---

**By programming**

A CORBA application developer can specify X.509 certificate credentials by programming—see “Creating SSL/TLS Credentials” on page 474.

In this case, an administrator should ensure that the SSL/TLS principal sponsor is disabled for the application. Either the principal_sponsor:use_principal_sponsor variable can be set to false, or the SSL/TLS principal sponsor variables can be removed from the application’s configuration.

The best approach is to set the principal_sponsor:use_principal_sponsor variable to false in the application’s configuration scope. For example:

```plaintext
# Orbix configuration file
outer_config_scope {
    ...
    my_app_config_scope {
        principal_sponsor:use_principal_sponsor = "false";
        ...
    }
    ...
};
```

This ensures that the principal sponsor cannot be enabled accidentally by picking up configuration variables from the outer configuration scope.
Providing a Smart Card PIN

Overview

If you are using a smart card (PKCS #11 or Schannel), you must provide a PIN when the application starts up to gain access to the smart card. The PIN can be provided in one of the following ways:

- From a dialog prompt.
- Directly in configuration (PKCS#11 only).

From a dialog prompt

If the PIN is not specified in any other way, Orbix will prompt the user for the PIN as the application starts up.

Java Applications Using PKCS #11 (Smart Card)

If the Java application uses a smart card to store its certificate, the following dialog window pops up to prompt the user for the provider name, slot number, and PIN:

![Java Dialog Window for Certificate PIN](image)

**Figure 59:** Java Dialog Window for Certificate PIN
Windows C++ Application Using Schannel (Smart Card)

If your C++ application is configured to use Schannel in combination with a smart card, the following dialog window pops up to prompt the user for the smart card PIN:

![Schannel Dialog Window for Certificate PIN](image)

**Figure 60:** Schannel Dialog Window for Certificate PIN

Directly in configuration (PKCS#11 only)

The PKCS #11 authentication mechanism allows you to specify the PIN directly in configuration.

The PIN can be specified directly in the `principal_sponsor:auth_method_data` configuration variable using the `pin` option. For example:

```plaintext
# Orbix Configuration File
bank_server {
    ...
    principal_sponsor:use_principal_sponsor = "true";
    principal_sponsor:auth_method_id = "pkcs11";
    principal_sponsor:auth_method_data = ["provider=dkck132.dll",
                                      "slot=0", "pin=1234"];
};
```

In this example, the PIN for slot 0 of the smart card is 1234.

**WARNING:** Storing the PIN directly in configuration is not recommended for deployed systems. The PIN is in plain text and could be read by anyone.
For added security, Orbix allows you to apply extra conditions on certificates. Before reading this section you might find it helpful to consult “Managing Certificates” on page 289, which provides some background information on the structure of certificates.

This section discusses the following advanced configuration options:

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## Setting a Maximum Certificate Chain Length

**Max chain length policy**
You can use the `MaxChainLengthPolicy` to enforce the maximum length of certificate chains presented by a peer during handshaking.

A certificate chain is made up of a root CA at the top, an application certificate at the bottom and any number of CA intermediaries in between. The length that this policy applies to is the (inclusive) length of the chain from the application certificate presented to the first signer in the chain that appears in the list of trusted CA’s (as specified in the `TrustedCAListPolicy`).

**Example**
For example, a chain length of 2 mandates that the certificate of the immediate signer of the peer application certificate presented must appear in the list of trusted CA certificates.

**Configuration variable**
You can specify the maximum length of certificate chains used in `MaxChainLengthPolicy` with the `policies:iiop_tls:max_chain_length_policy` and `policies:https:max_chain_length_policy` configuration variables. For example:

```
policies:iiop_tls:max_chain_length_policy = "4";
```

**Default value**
The default value is 2 (that is, the application certificate and its signer, where the signer must appear in the list of trusted CA’s).
Applying Constraints to Certificates

Certificate constraints policy
You can use the CertConstraintsPolicy to apply constraints to peer X.509 certificates by the default CertificateValidatorPolicy. These conditions are applied to the owner’s distinguished name (DN) on the first certificate (peer certificate) of the received certificate chain. Distinguished names are made up of a number of distinct fields, the most common being Organization Unit (OU) and Common Name (CN).

Configuration variable
You can specify a list of constraints to be used by CertConstraintsPolicy through the policies:iiop_tls:certificate_constraints_policy or policies:https:certificate_constraints_policy configuration variables. For example:

```
policies:iiop_tls:certificate_constraints_policy = [
  "CN=Johnny*,OU=[unit1|IT_SSL],O=IONA,C=Ireland,ST=Dublin,L=Earth",
  "CN=Paul*,OU=SSLTEAM,O=IONA,C=Ireland,ST=Dublin,L=Earth",
  "CN=TheOmnipotentOne"];
```

Constraint language
These are the special characters and their meanings in the constraint list:

```
* Matches any text. For example:
an* matches ant and anger, but not aunt

[ ] Grouping symbols.

| Choice symbol. For example:

OU=[unit1|IT_SSL] signifies that if the OU is unit1 or IT_SSL, the certificate is acceptable.

=, != Signify equality and inequality respectively.
```

Example
This is an example list of constraints:

```
policies:iiop_tls:certificate_constraints_policy = [
  "OU=[unit1|IT_SSL],CN=Steve*,L=Dublin",
  "OU=IT_ART*,OU!=IT_ARTtesters,CN=[Jan|Donal],ST=Boston" ];
```

This constraint list specifies that a certificate is deemed acceptable if and only if it satisfies one or more of the constraint patterns:

```
If
```
The OU is unit1 or IT_SSL
And
The CN begins with the text Steve
And
The location is Dublin
Then the certificate is acceptable
Else  (moving on to the second constraint)
If
    The OU begins with the text IT_ART but isn’t IT_ARTtesters
    And
    The common name is either Donal or Jan
    And
    The State is Boston
Then the certificate is acceptable
Otherwise the certificate is unacceptable.

The language is like a boolean OR, trying the constraints defined in each line until the certificate satisfies one of the constraints. Only if the certificate fails all constraints is the certificate deemed invalid.

Note that this setting can be sensitive about white space used within it. For example, “CN =” might not be recognized, where “CN=” is recognized.

**Distinguished names**

For more information on distinguished names, see “ASN.1 and Distinguished Names” on page 645.
Delaying Credential Gathering

**Overview**

Delayed credential gathering is a feature that enables a client to send an X.509 certificate to a secure server at a later point in the SSL/TLS handshake. The advantage of this handshake procedure is that the server sends the client a list of trusted CA certificates. Hence, the client can select a certificate at runtime which is compatible with the server’s trusted CA certificates.

**Note:** Delayed credential gathering is currently only supported in combination with the Schannel SSL/TLS toolkit (Windows C++ applications only). See “Choosing an SSL/TLS Toolkit” on page 277.

**SSL/TLS handshake process**

Delayed credential gathering occurs during the course of the SSL/TLS handshake process as follows:

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A client opens a new connection to a secure server and initiates the SSL/TLS connection handshake.</td>
</tr>
<tr>
<td>2</td>
<td>The client does not initially send an X.509 certificate to the server, although the client supports authentication (that is, the EstablishTrustInClient association option is supported on the client side, but the principal sponsor is disabled).</td>
</tr>
<tr>
<td>3</td>
<td>At a later stage of the handshake, the server gives the client a second chance to send an X.509 certificate. The server explicitly requests a certificate from the client and sends a list of all the CA certificates it is willing to trust.</td>
</tr>
<tr>
<td>4</td>
<td>At this point, if delayed credential gathering is enabled, the client will select a certificate and send it on to the server. Depending on the configuration, the certificate is selected either by default or manually by the user. If delayed credential gathering is not enabled, connection establishment would fail at this point.</td>
</tr>
</tbody>
</table>
Enabling delayed credential gathering

Delayed credential gathering is enabled by setting the following variable to true in the relevant scope of your Orbix configuration:

```plaintext
plugins:iiop_tls:delay_credential_gathering_until_handshake = "true";
```

When the server requests a client certificate during the SSL/TLS handshake, the certificate can be selected using one of the following procedures:

- Prompting the user for credentials.
- Choosing credentials by default.

Prompting the user for credentials

To enable the user to choose a client certificate at SSL/TLS handshake time, you should set the `plugins:schannel:prompt_with_credential_choice` variable to true. For example:

```plaintext
plugins:iiop_tls:delay_credential_gathering_until_handshake = "true";
plugins:schannel:prompt_with_credential_choice = "true";
```

Choosing credentials by default

If the `plugins:schannel:prompt_with_credential_choice` variable is set to false, the default behavior is for Orbix to choose the first certificate it can find in the certificate store that meets the applicable constraints. For example, you can enable a default credential choice as follows:

```plaintext
plugins:iiop_tls:delay_credential_gathering_until_handshake = "true";
plugins:schannel:prompt_with_credential_choice = "false";
```

Example client configuration

Example 41 shows how to configure an SSL/TLS client to use delayed credential gathering.

**Example 41: Client Configuration with Delayed Credential Gathering**

```plaintext
# Orbix configuration file
...
SchannelClientApplication {
    # Configuration to load Schannel toolkit (not shown)
    ...
    # SSL/TLS Configuration
    policies:client_secure_invocation_policy:requires = [
        "Confidentiality", "EstablishTrustInTarget"
    ];
```
Example 41: Client Configuration with Delayed Credential Gathering

```java
2 policies:client_secure_invocation_policy:supports = [
  "Confidentiality", "Integrity", "DetectReplay",
  "DetectMisordering", "EstablishTrustInTarget",
  "EstablishTrustInClient"
];
...
3 principal_sponsor:use_principal_sponsor = "false";
4 plugins:iiop_tls:delay_credential_gathering_until_handshake = "true";
5 plugins:schannel:prompt_with_credential_choice = "true";
};
```

The preceding configuration example can be explained as follows:

1. A basic prerequisite for delayed credential gathering is that your application is configured to use the Schannel toolkit (see “Schannel Toolkit for C++” on page 281 for details).
2. The client must support the EstablishTrustInClient association option.
3. The principal sponsor must be disabled when using the delayed credential gathering feature; in addition you must ensure that no certificate is associated with the client through programming the principal authenticator.
4. The delay_credential_gathering_until_handshake variable is set to true to enable delayed credential gathering.
5. In this example, the prompt_with_credential_choice variable is set to true so that Schannel will prompt the user for credentials at SSL/TLS handshake time. You could also set this variable to false, if you want to let Orbix choose the credentials by default.
Automatic Activation of Secure Servers

Every server secured with Orbix has an associated certificate and private key. To access its private key, and use it to encrypt messages, a server must retrieve the associated pass phrase. This chapter shows you how to use Orbix administration to supply pass phrases to servers.

In this chapter

This chapter covers the following topics:

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<th>Topic</th>
<th>Page</th>
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<tbody>
<tr>
<td>Managing Server Pass Phrases</td>
<td>390</td>
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<tr>
<td>Protecting against Server Imposters</td>
<td>393</td>
</tr>
<tr>
<td>How the KDM Activates a Secure Server</td>
<td>395</td>
</tr>
<tr>
<td>KDM Administration</td>
<td>397</td>
</tr>
<tr>
<td>Setting Up the KDM</td>
<td>400</td>
</tr>
<tr>
<td>Registering a Secure Server</td>
<td>402</td>
</tr>
</tbody>
</table>
Managing Server Pass Phrases

Overview

Every server secured with Orbix has an associated certificate and private key. To access the private key, which is stored in encrypted form, a pass phrase must be supplied to the server as it starts up. The server is then able to identify itself to other applications that require authentication.

Persistent activation

To activate a secure server persistently (manual start-up), the server’s pass phrase must be supplied by the operator who is starting the process. Typically, the operator types in the pass phrase manually in response to a login prompt at the console.

Automatic activation

To activate a secure server automatically (in response to a client request), the server’s pass phrase should be supplied automatically because it would be impractical for the server to wait for manual intervention. This is particularly true of high availability environments. It is necessary, therefore, to have a mechanism for automatic delivery of authentication data to a server.

Key distribution management

Orbix provides the key distribution management (KDM) mechanism to manage the authentication data required by servers. The KDM manages the storage of authentication data and is responsible for delivering the authentication data to automatically activated servers.
KDM architecture

Figure 61 shows the main components of the KDM architecture:

![Figure 61: The KDM Architecture](image)

The KDM server

The main component of the KDM is the KDM server, which is implemented as a plug-in and embedded in the locator service. The main responsibility of the KDM server is to manage the secure storage and retrieval of authentication data.

The key distribution repository

The key distribution repository (KDR) is the database that stores authentication data for the KDM server. The KDR currently stores the following information:

- **Pass phrases**—a pass phrase is stored in the form of an ORB name/pass phrase association. Given an ORB name, the KDM server can retrieve the associated pass phrase. Just one pass phrase can be stored per ORB name.

- **Checksums**—a checksum is generated for a particular server record in the IMR and stored in the form of a process name/checksum association. Checksums are described in “Protecting against Server Imposters” on page 393.
### Role of the locator

When the locator receives a client request for an inactive server, the role of the locator is to contact the KDM server (a plug-in to the locator), retrieve the server’s authentication data and send the authentication data on to the node daemon.

### Role of the node daemon

When the node daemon receives an activation request from the locator, the node daemon launches the corresponding server process and passes the authentication data to the server as it starts up.
Protecting against Server Imposters

Security threats
A server imposter is a rogue server executable that runs in place of a legitimate server application. The KDM must ensure that authentication data are not supplied to server imposters. The following forms of attack must be guarded against:

- Replacing the server executable by an imposter.
- Replacing one or more Orbix plug-ins by imposters.
- Tampering with the IMR record to point at a rogue executable.

Protection measures
The following measures should be taken to protect against server imposters:

- Place all server executables in a trusted directory (for example, one secured by the operating system).
- Place all plug-in libraries in a trusted directory.
- Specify the list of trusted directories in the node daemon’s `secure_directories` configuration variable.
- Use the KDM checksum facility to protect the IMR record from tampering.

The `secure_directories` configuration variable
The `secure_directories` configuration variable specifies a list of trusted directories to the node daemon. For example, on the Windows platform you could set it as follows:

```plaintext
# Orbix E2A Configuration File
iona_services {
    ...
    node_daemon {
        secure_directories = ["c:\trusted_servers",
                              "c:\trusted_apps"];  
    ...
};
};
```

If the node daemon’s `secure_directories` configuration variable is set, only server executables stored in one of the listed directories can be launched.
Checksums

The server’s IMR record contains details of where to find the server executable and other server activation information. By protecting the IMR record from tampering, you can ensure that the KDM passes its authentication data only to a known server executable.

After an administrator creates or modifies a server’s IMR record the administrator generates an associated checksum for the IMR record. The checksum is then stored in the KDR database, in the form of a process name/checksum association.
How the KDM Activates a Secure Server

Overview

When the KDM mechanism is used, two different kinds of server activation are supported, as follows:

- **Insecure server activation**—the server is activated using the normal (insecure) activation mechanism. A server is implicitly treated as insecure if no pass phrases are registered for the server.
- **Secure server activation**—the server is activated using a secure activation algorithm. The KDM supplies pass phrases to the server and verifies the server’s checksum.

Activation process

Figure 62 outlines the steps for activating a secure server:

**Figure 62: Automatic Activation of a Secure Server**
The secure server shown in Figure 62 is activated using the KDM, as follows:

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
</table>
| 1     | A client makes a request on a server that is currently inactive.  
In Figure 62, the client request (a Request or LocateRequest message) is sent to the locator. The example assumes that the target object belongs to an indirect persistent POA. |
| 2     | The locator requests the server’s checksum from the KDM, which attempts to retrieve the checksum from the KDR database.  
If there is a checksum for the server, the checksum for the server’s current IMR record is calculated and compared with the retrieved checksum. If the checksums do not match, the locator reports an error. |
| 3     | The locator requests the server pass phrases from the KDM, which retrieves the pass phrases from the KDR database.  
If there are pass phrases but no checksum for the server, the locator reports an error (unless the plugins:kdm:checksums_optional configuration variable is set to false).  
If there are no pass phrases registered for the server, the locator reverts to the standard procedure for activating an insecure server at this point. |
| 4     | The locator sends an activation request and authentication data to the node daemon. |
| 5     | The node daemon activates the server and passes the authentication data to the server as it starts up. |
KDM Administration

Overview

An administrator uses an extended version of the itadmin utility to manage the pass phrases and checksums stored in the KDR. In a secure environment, the itadmin utility includes a KDM administration plug-in, kdm_adm. Figure 63 shows how the itadmin utility communicates with the KDM server.

Figure 63: Using itadmin to Manage the KDM Server

Whenever the administrator invokes a KDM command (kdm_adm or checksum) the itadmin client communicates directly with a secure IP port on the KDM server (separate from the locator’s ports).

Logging In

Before invoking itadmin commands to manage the KDM, an administrator must log on to the itadmin utility. To log on, enter the following at a command prompt:

```
itadmin
% admin_logon login identity
Please enter password for identity identity:
%
```
After entering `itadmin`, subsequent commands are entered in `itadmin` script mode (see *Administrator’s Guide*). The `admin_logon` command logs the administrator on to the `itadmin` utility using the X.509 certificate specified by `identity`. The `identity` certificate refers to the PKCS#12 certificate, `identity.p12`, stored in the directory specified by the `itadmin_x509_cert_root` configuration variable. The administrator then enters the pass phrase to access the certificate. See the *Administrator’s Guide* for full details of the `admin_logon` command syntax.

## Commands

Two new administration commands, `kdm_adm` and `checksum`, are provided for the KDM. These commands are used from within the `itadmin` scripting mode. The `kdm_adm` command manages pass phrases stored in the KDR. The command supports the following subcommands and options:

<table>
<thead>
<tr>
<th>Command</th>
<th>Subcommand and Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>kdm_adm</td>
<td>create -orbname <code>name</code> [-password <code>pass_phrase</code>]</td>
</tr>
<tr>
<td></td>
<td>confirm -orbname <code>name</code></td>
</tr>
<tr>
<td></td>
<td>remove -orbname <code>name</code></td>
</tr>
<tr>
<td></td>
<td>list [-count]</td>
</tr>
<tr>
<td></td>
<td>change_pw</td>
</tr>
</tbody>
</table>

The `checksum` command manages server checksums stored in the KDR. The command supports the following subcommands and options:

<table>
<thead>
<tr>
<th>Command</th>
<th>Subcommand and Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>checksum</td>
<td>create -orbname <code>name</code> [-password <code>pass_phrase</code>]</td>
</tr>
<tr>
<td></td>
<td>confirm -orbname <code>name</code></td>
</tr>
<tr>
<td></td>
<td>remove -orbname <code>name</code></td>
</tr>
<tr>
<td></td>
<td>list [-count]</td>
</tr>
</tbody>
</table>
See the Administrator’s Guide for detailed descriptions of these commands. Examples of using these commands appear in “Registering a Secure Server” on page 402.

The KDM is configured by two sets of variables, as follows:

**Table 24: Prefixes for KDM Configuration Variables**

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>plugins:kdm</td>
<td>Variables with this prefix configure the KDM server plug-in, which is embedded in the locator service.</td>
</tr>
<tr>
<td>plugins:kdm_adm</td>
<td>Variables with this prefix configure the KDM administration plug-in, which is embedded in the itadmin utility.</td>
</tr>
</tbody>
</table>

A complete list and descriptions of KDM configuration variables is provided in the Appendix A on page 485.
CHAPTER 14 | Automatic Activation of Secure Servers

Setting Up the KDM

Setting up a secure domain

Use the `itconfigure` utility to create a secure domain that includes the KDM. You must choose file-based configuration instead of the configuration repository (CFR).

Using secure directories

When an administrator enables automatic activation of a secure server, it becomes possible for remote clients to trigger activation of the secure server. It is, therefore, essential to protect server executables from being overwritten by storing them in a trusted directory.

Create a directory, `SecureServerDir`, that is accessible only to administrators and store your secure server executables in this directory. Add the secure directory, `SecureServerDir`, to the node daemon’s list of trusted directories. For example:

```
# Orbix E2A Configuration File
iona_services {
  ...
  node_daemon {
    secure_directories = ["SecureServerDir"];
    ...
  };
};
```

Defining certificate constraints

In a real deployment, you must define a set of certificate constraints for the KDM. The following certificate constraints are relevant to the KDM:

- `plugins:kdm:cert_constraints`—restricts access to the KDM server, protecting it from unauthorized clients. See “plugins:kdm:cert_constraints” on page 494 for details of how to set this variable.

- `plugins:kdm_adm:cert_constraints`—protects the `itadmin` utility from rogue applications that might attempt to impersonate the KDM server. See “plugins:kdm_adm:cert_constraints” on page 495 for details of how to set this variable.
Creating and installing administration certificates

When you create a new set of X.509 certificates for use with Orbix, you need to choose a naming pattern for your Distinguished Names that is compatible with the KDM certificate constraints. In particular, your certificates should satisfy the following conditions:

- The Orbix locator certificate (also used by the KDM server) must satisfy the `plugins:kdm_adm:cert_constraints` certificate constraints.
- Certificates with administrator privileges should satisfy the `plugins:kdm:cert_constraints` certificate constraints.
- Other certificates must not satisfy the KDM certificate constraints.

To deploy the administrator certificates (that is, the certificates used by `itadmin`), create a secure directory `AdminCerts`, copy the administrator certificates to this directory, and set the `itadmin_x509_cert_root` configuration variable equal to `AdminCerts`. 
Registering a Secure Server

Server registration steps

You must register the server with the locator daemon to enable it to find the server when requested by a client. To register the server with the locator, perform the following steps:

1. Enter `itadmin`. This starts the Orbix administration command shell, and avoids typing `itadmin` before each command.

2. Register the server’s persistent POA name and ORB name with the locator, using the following commands:

   ```
   % orbname create demos.tls.secure_bank_extended_server
   % poa create -replica demos.tls.secure_bank_extended_server
       bank_server_persistent_poa
   ```

   The first command creates an ORB name called `demos.tls.secure_bank_extended_server`. The second creates a POA name called `bank_server_persistent_poa`, and associates it with `demos.tls.secure_bank_extended_server` ORB name, using the `-replica` option. For more details about POA names and ORB names, see the Administrator’s Guide.

3. Register the server process name with the locator.

   **C++ Server**

   To register a C++ process name, use the following command:

   **UNIX**

   ```
   % process create -node_daemon hostname/it_node_daemon
       -pathname
       {install-dir/asp/6.0/demos/tls/secure_bank_extended/
           cxx_server/server} -args "--use_kdm /tmp/bank.ior"
       secure_bank_extended_process
   ```

   **Windows**

   ```
   % process create -node_daemon hostname/it_node_daemon
       -pathname
       {install-dir\asp\6.0\demos\tls\secure_bank_extended\cxx_server\server.exe} -args "--use_kdm C:\temp\bank.ior"
       secure_bank_extended_process
   ```

   Replace `hostname` with your machine’s DNS name, and replace `install-dir` with the location of your Orbix installation (for example,
Registering a Secure Server

4. Register the server process name with the appropriate ORB name (in this case, `demos.tls.secure_bank_extended_server`):

   ```bash
   orbname modify -process secure_bank_extended_process
demos.tls.secure_bank_extended_server
   ```

5. From the `itadmin` command prompt, log on to the `itadmin` utility:

   ```bash
   % admin_logon login kdmadmin
   Please enter password for identity kdmadmin:
   ```

   This example uses the `kdmadmin.p12` certificate which has the password `kdmadminpass`.

6. Register the server's pass phrase with the KDM:

   ```bash
   % kdm_adm create -orbname
demos.tls.secure_bank_extended_server
   Please enter password for orb my_orb_name :
   ```

   The `secure_bank_extended_server` demonstration uses the `bankserver.p12` certificate which has the password `bankserverpass`.

7. Create and store a checksum for the server’s IMR record:

   ```bash
   % checksum create -process secure_bank_extended_process
   ```

---

Running the server

After registering the bank server, you must run the bank server once to initialize the `bank.ior` file containing a persistent object reference. It is only necessary to run the server explicitly once. Subsequently, the node daemon can activate the bank server automatically in response to client requests.
Part IV

CSIv2 Administration

In this part

This part contains the following chapters:

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<td>407</td>
</tr>
<tr>
<td>Configuring CSIv2 Authentication over Transport</td>
<td>417</td>
</tr>
<tr>
<td>Configuring CSIv2 Identity Assertion</td>
<td>437</td>
</tr>
</tbody>
</table>
Introduction to CSIv2

CSIv2 is the OMG’s Common Secure Interoperability protocol v2.0, which can provide the basis for application-level security in CORBA applications. The Orbix Security Framework uses CSIv2 to transmit usernames and passwords, and asserted identities between applications.

In this chapter

This chapter discusses the following topics:

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<tr>
<td>Basic CSIv2 Scenarios</td>
<td>410</td>
</tr>
<tr>
<td>Integration with the Orbix Security Framework</td>
<td>414</td>
</tr>
</tbody>
</table>
CSlv2 Features

Overview
This section gives a quick overview of the basic features provided by CSLv2 application-level security. Fundamentally, CSLv2 is a general, interoperable mechanism for propagating security data between applications. Because CSLv2 is designed to complement SSL/TLS security, CSLv2 focuses on providing security features not covered by SSL/TLS.

Application-level security
CSlv2 is said to provide application-level security because, in contrast to SSL/TLS, security data is transmitted above the transport layer and the security data is sent after a connection has been established.

Transmitting CSLv2-related security data
The CSLv2 specification defines a new GIOP service context type, the security attribute service context, which is used to transmit CSLv2-related security data. There are two important specializations of GIOP:

- IIOP—the Internet inter-ORB protocol, which specialises GIOP to the TCP/IP transport, is used to send CSLv2 data between CORBA applications.
- RMI/IIOP—RMI over IIOP, which is an IIOP-compatible version of Java’s Remote Method Invocation (RMI) technology, is used to send CSLv2 data between EJB applications and also for CORBA-to-EJB interoperability.

CSlv2 mechanisms
The following CSLv2 mechanisms are supported:
- CSLv2 authentication over transport mechanism.
- CSLv2 identity assertion mechanism.

CSlv2 authentication over transport mechanism
The CSLv2 authentication over transport mechanism provides a simple client authentication mechanism, based on a username and a password. This mechanism propagates a username, password, and domain name to the server. The server then authenticates the username and password before allowing the invocation to proceed.
### CSIv2 Features

| **CSIv2 identity assertion mechanism** | The CSIv2 identity assertion mechanism provides a way of asserting the identity of a caller without performing authentication. This mechanism is usually used to propagate a caller identity that has already been authenticated at an earlier point in the system. |
| **Applicability of CSIv2** | CSIv2 is applicable to both CORBA technology. CSIv2 can be used by the following kinds of application:  
  - CORBA C++ applications.  
  - CORBA Java applications. |
Basic CSIv2 Scenarios

Overview
The CSIv2 specification provides two independent mechanisms for sending credentials over the transport (authentication over transport, and identity assertion), but the CSIv2 specification does not mandate how the transmitted credentials are used. Hence, there are many different ways of using CSIv2 and different ways to integrate it into a security framework (such as iSF).
This section describes some of the basic scenarios that illustrate typical CSIv2 usage.

In this section
This section contains the following subsections:

| CSIv2 Authentication over Transport Scenario | page 411 |
| CSIv2 Identity Assertion Scenario | page 412 |
CSIv2 Authentication over Transport Scenario

Overview

Figure 64 shows a basic CSIv2 scenario where a CORBA client and a CORBA server are configured to use the CSIv2 authentication over transport mechanism.

Scenario description

The scenario shown in Figure 64 can be described as follows:

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The user enters a username, password, domain name on the client side (user login).</td>
</tr>
<tr>
<td>2</td>
<td>When the client makes a remote invocation on the server, CSIv2 transmits the username/password/domain authentication data to the server in a security attribute service context.</td>
</tr>
<tr>
<td>3</td>
<td>The server authenticates the received username/password before allowing the invocation to proceed.</td>
</tr>
</tbody>
</table>

More details

For more details about authentication over transport, see “Configuring CSIv2 Authentication over Transport” on page 417.
CSIv2 Identity Assertion Scenario

Overview

Figure 65 shows a basic CSIv2 scenario where a client and an intermediate server are configured to use the CSIv2 authentication over transport mechanism, and the intermediate server and a target server are configured to use the CSIv2 identity assertion mechanism. In this scenario, the client invokes on the intermediate server, which then invokes on the target server.

Figure 65: Basic CSIv2 Identity Assertion Scenario

Scenario description

The second stage of the scenario shown in Figure 65 (intermediate server invokes an operation on the target server) can be described as follows:

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The intermediate server can set the identity that will be asserted to the target in one of two ways:</td>
</tr>
<tr>
<td></td>
<td>• Implicitly—if the execution context has an associated CSIv2 received credentials, the intermediate server extracts the user identity from the received credentials, or</td>
</tr>
<tr>
<td></td>
<td>• Explicitly—by programming.</td>
</tr>
</tbody>
</table>
## Basic CSIv2 Scenarios

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>When the intermediate server makes a remote invocation on the target server, CSIv2 transmits the user identity data to the server in a security attribute service context.</td>
</tr>
<tr>
<td>3</td>
<td>The target server can access the propagated user identity programmatically (by extracting it from a <code>SecurityLevel2::ReceivedCredentials</code> object).</td>
</tr>
</tbody>
</table>

### More details

For more details about identity assertion, see “Configuring CSIv2 Identity Assertion” on page 437.
# Integration with the Orbix Security Framework

## Overview

This section presents an example of how CSIv2 works in the context of the Orbix Security Framework. The purpose of the example is to show the distinction between the purely CSIv2 functionality and the way in which CSIv2 is used in the Orbix Security Framework. The example also provides a case study of how to integrate the CSI plug-in within a wider security framework.

## CSIv2 authentication domain

In the context of the Orbix Security Framework, the CSIv2 authentication domain set by the user on the client side must match the CSIv2 authentication domain set on the server side.

## Plug-ins used by the iSF

Within the iSF, a typical CORBA server would load the following security plug-ins: IIOP/TLS, GSP, and CSI. The roles of the GSP plug-in and the CSI plug-in in particular are important in the context of the iSF, as follows:

- GSP plug-in,
- CSI plug-in.

## GSP plug-in

The role of the GSP plug-in is to manage the interpretation of authentication data and to perform authorization. The GSP plug-in implements features specific to the Orbix Security Framework.

## CSI plug-in

The role of the CSIv2 plug-in is to manage the propagation of authentication data. It handles the protocol that delivers the data and makes decisions such as whether to propagate authentication data in further calls to other servers.
How CSIv2 integrates with iSF

Figure 66 shows how the CSIv2 and the GSP plug-ins behave in the context of the iSF, for a server that is configured to use CSIv2 authentication over transport.

Figure 66: CSIv2 in the Orbix Security Framework

Description

The stages of a secure invocation using CSIv2 authentication over transport, as shown in Figure 66, can be described as follows:

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A secure operation invocation arrives at the server. Initially, the invocation passes through the IIOP/TLS plug-in, which is responsible for decrypting the incoming message and performing other transport layer security tasks.</td>
</tr>
<tr>
<td>2</td>
<td>The CSI plug-in extracts the username/password/domain authentication data, which identifies the calling user, from the incoming message’s security attribute service context.</td>
</tr>
</tbody>
</table>
The CSI plug-in delegates authentication to the `IT_CSI::AuthenticateGSSUPCredentials` callback object, which is implemented in the GSP plug-in.

The `AuthenticateGSSUPCredentials` object further delegates authentication to the central Orbix security service.

If authentication with the Orbix security service is successful, the GSP plug-in receives details of all the roles and realms for the calling user. The roles and realms are cached, to be used later during the authorization step.
CHAPTER 16

Configuring CSIv2 Authentication over Transport

This chapter explains the concepts underlying the CSIv2 authentication over transport mechanism and provides details of how to configure a client and a server to use this mechanism.

In this chapter

This chapter discusses the following topics:

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<th>Topic</th>
<th>Page</th>
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</thead>
<tbody>
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<td>418</td>
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<tr>
<td>SSL/TLS Prerequisites</td>
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<tr>
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<td>Providing a Username and Password</td>
<td>428</td>
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<tr>
<td>Sample Configuration</td>
<td>432</td>
</tr>
</tbody>
</table>
CSIv2 Authentication Scenario

Overview
This section describes a typical CSIv2 authentication scenario, where the client is authenticated over the transport by providing a username and a password.

Authentication over transport
The CSIv2 authentication over transport mechanism is a simple client authentication mechanism based on a username and a password. In a system with a large number of clients, it is significantly easier to administer CSIv2 client authentication than it is to administer SSL/TLS client authentication.

CSIv2 authentication is said to be over transport, because the authentication step is performed at the General Inter-ORB Protocol (GIOP) layer. Specifically, authentication data is inserted into the service context of a GIOP request message. CSIv2 authentication, therefore, occurs after a connection has been established (in contrast to SSL/TLS authentication).

GSSUP mechanism
The Generic Security Service Username/Password (GSSUP) mechanism is the basic authentication mechanism supported by CSIv2 at Level 0 conformance. Currently, this is the only authentication mechanism supported by Orbix’s implementation of CSIv2.

Dependency on SSL/TLS
Note, that CSIv2 authentication over transport cannot provide adequate security on its own. The authentication over transport mechanism relies on the transport layer security, that is SSL/TLS, to provide the following additional security features:

- Server authentication.
- Privacy of communication.
- Message integrity.
CSIv2 scenario

Figure 67 shows a typical scenario for CSIv2 authentication over transport:

**Figure 67: CSIv2 Authentication Over Transport Scenario**

How CSIv2 authentication over transport proceeds

As shown in Figure 67 on page 419, the authentication over transport mechanism proceeds as follows:

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>When a client initiates an operation invocation on the target, the client’s CSI plug-in inserts a client authentication token (containing username/password/domain) into the GIOP request message.</td>
</tr>
</tbody>
</table>
The client and server should both be configured to use a secure SSL/TLS connection. In this scenario, the SSL/TLS connection is configured for target authentication only. See “SSL/TLS Prerequisites” on page 422 for details of the SSL/TLS configuration for this scenario.

A client authentication token contains the data that a client uses to authenticate itself to a server through the CSIv2 authentication over transport mechanism, as follows:

- **Username**—a UTF-8 character string, which is guaranteed not to undergo conversion when it is sent over the wire.
- **Password**—a UTF-8 character string, which is guaranteed not to undergo conversion when it is sent over the wire.
- **Domain**—a string that identifies the CSIv2 authentication domain within which the user is authenticated.

**Note:** The client’s domain should match the target domain, which is specified by the `policies:csi:auth_over_transport:server_domain_name` configuration variable on the server side.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>The request, together with the client authentication token, is sent over the SSL/TLS connection. The SSL/TLS connection provides privacy and message integrity, ensuring that the username and password cannot be read by eavesdroppers.</td>
</tr>
<tr>
<td>3</td>
<td>Before permitting the request to reach the target object, the CSI server interceptor calls an application-supplied object (the authentication service) to check the username/password combination.</td>
</tr>
<tr>
<td>4</td>
<td>If the username/password combination are authenticated successfully, the request is allowed to reach the target object; otherwise the request is blocked and an error returned to the client.</td>
</tr>
</tbody>
</table>
The client authentication token is usually initialized by the CSIv2 principal sponsor (which prompts the user to enter the username/password and domain). See “Providing a Username and Password” on page 428.

**Authentication service**

The authentication service is an external service that checks the username and password received from the client. If the authentication succeeds, the request is allowed to proceed and an invocation is made on the target object; if the authentication fails, the request is automatically blocked and a CORBA::NO_PERMISSION system exception is returned to the client.

See “Providing an Authentication Service” on page 427.
SSL/TLS Prerequisites

Overview

The SSL/TLS protocol is an essential complement to CSIv2 security. The CSIv2 authentication over transport mechanism relies on SSL/TLS to provide the following additional security features:

- Server authentication.
- Privacy of communication.
- Message integrity.

**WARNING:** If you do not enable SSL/TLS for the client-server connection, the GSSUP username and password would be sent over the wire unencrypted and, therefore, could be read by eavesdroppers.

SSL/TLS target authentication only

For the scenario depicted in Figure 67 on page 419, the SSL/TLS connection is configured for target authentication only. The SSL/TLS configuration can be summarized as follows:

- **Client-side SSL/TLS configuration**—the client requires confidentiality, message integrity, and the `EstablishTrustInTarget` SSL/TLS association option. No X.509 certificate is provided on the client side, because the client is not authenticated at the transport layer.

- **Server-side SSL/TLS configuration**—the server requires confidentiality and message integrity, but the `EstablishTrustInClient` SSL/TLS association option is not required. An X.509 certificate is provided on the server side to enable the client to authenticate the server.

Configuration samples

The SSL/TLS configuration of this CSIv2 scenario is based on the following TLS demonstration configurations in your Orbix configuration (`DomainName.cfg` file or CFR service):

- `demos.tls.secure_client_with_no_cert`
- `demos.tls.secure_server_no_client_auth`
SSL/TLS principal sponsor configuration

In this scenario, the SSL/TLS principal sponsor needs to be enabled only on the server side, because it is only the server that has an associated X.509 certificate.

**Note:** The SSL/TLS principal sponsor is completely independent of the CSIv2 principal sponsor (see “CSIv2 principal sponsor” on page 428). It is possible, therefore, to enable both of the principal sponsors within the same application.

References

See “Sample Configuration” on page 432 for a detailed example of the client and server SSL/TLS configuration.

See “SSL/TLS Administration” on page 275 for complete details of configuring and administering SSL/TLS.
Requiring CSIV2 Authentication

Overview
This section describes the minimal configuration needed to enable CSIV2 authentication over transport. In a typical system, however, you also need to configure SSL/TLS (see “SSL/TLS Prerequisites” on page 422) and the CSIV2 principal sponsor (see “Providing a Username and Password” on page 428).

Loading the CSIV2 plug-in
To enable CSIV2 for a C++ or Java application, you must include the csiv2 plug-in in the orb_plugins list in your Orbix configuration. The binding:client_binding_list and binding:server_binding_list must also be initialized with the proper list of interceptor combinations.

Sample settings for these configuration variables can be found in the demos.tls.csiv2 configuration scope of your Orbix configuration. For example, you can load the csiv2 plug-in with the following configuration:

```
# Orbix configuration file
csiv2 {
    orb_plugins = ["local_log_stream", "iiop_profile", "giop", "iiop_tls", "csi"];


    binding:server_binding_list = ["CSI"];
    ...;
};
```

Client configuration
A client can be configured to support CSIV2 authentication over transport, as follows:

```
# Orbix configuration file
policies:csi:auth_over_transport:client_supports = ["EstablishTrustInClient"];`
Client CSIv2 association options

The `EstablishTrustInClient` option is a CSIv2 association option. Including this option in the `policies:csi:auth_over_transport:client_supports` list indicates that the client supports the CSIv2 authentication over transport mechanism.

Server configuration

A server can be configured to support CSIv2 authentication over transport, as follows:

```plaintext
# Orbix configuration file
policies:csi:auth_over_transport:target_supports = 
  ["EstablishTrustInClient"];
policies:csi:auth_over_transport:target_requires = 
  ["EstablishTrustInClient"];
policies:csi:auth_over_transport:server_domain_name = 
  "AuthDomain";
policies:csi:auth_over_transport:authentication_service = 
  "csiv2.AuthenticationServiceObject";
```

Server CSIv2 association options

Including the `EstablishTrustInClient` CSIv2 association option in the `policies:csi:auth_over_transport:target_supports` list indicates that the server supports the CSIv2 authentication over transport mechanism.

Including the `EstablishTrustInClient` CSIv2 association option in the `policies:csi:auth_over_transport:target_requires` list indicates that the server requires clients to authenticate themselves using the CSIv2 authentication over transport mechanism. If the client fails to authenticate itself to the server when the server requires it, the server throws a `CORBA::NO_PERMISSION` system exception back to the client.

Server domain name

The server domain name is the name of a valid CSIv2 authentication domain. A CSIv2 authentication domain is an administrative unit within which a username/password combination is authenticated.

A CSIv2 client will check that the domain name in its CSIv2 credentials is the same as the domain name set on the server side by the `policies:csi:auth_over_transport:server_domain_name` configuration variable. If the domain in the client credentials is an empty string, however, the domain always matches (the empty string is treated as a wildcard).
The `authentication_service` variable specifies a Java class that provides an implementation of the authentication service. This enables you to provide a custom implementation of the CSIv2 authentication service in Java.

When using CSIv2 in the context of the Orbix Security Framework, however, this configuration variable should be omitted. In the Orbix Security Framework, the GSP plug-in specifies the CSIv2 authentication service programmatically.

See “Providing an Authentication Service” on page 427 for more details.
## Providing an Authentication Service

### Overview

An implementation of the CSIv2 authentication service can be specified in one of the following ways:

- **By configuration (Java only).**
- **By programming a policy (Java only).**
- **By registering an initial reference.**

### By configuration (Java only)

In Java, the authentication service is provided by a customizable class which can be loaded by setting the `policies:csi:auth_over_transport:authentication_service` configuration variable to the fully-scoped name of the Java class.

### By programming a policy (Java only)

In Java, you can specify a CSIv2 authentication service object programmatically by setting the `IT_CSI::CSI_SERVER_AS_POLICY` policy with an `IT_CSI::AuthenticationService` struct as its policy value.

See the *CORBA Programmer’s Reference, Java* for more details.

### By registering an initial reference

You can specify a CSIv2 authentication service object (in C++ and Java) by registering an instance as the `IT_CSIAuthenticationObject` initial reference. This approach is mainly intended for use by Orbix plug-ins.

### Default authentication service

If no authentication service is specified, a default implementation is used that always returns `false` in response to `authenticate()` calls.

### Orbix Security Framework

In the context of the Orbix Security Framework, the GSP plug-in provides a proprietary implementation of the CSIv2 authentication service that delegates authentication to the Orbix security service.

### Sample implementation

A sample implementation of a CSIv2 authentication service can be found in the following demonstration directory:

```
ASPInstallDir/asp/Version/demos/corba/tls/csiv2/java/src/csiv2
```
Providing a Username and Password

Overview

This section explains how a user can provide a username and a password for CSIv2 authentication (logging on) as an application starts up. CSIv2 mandates the use of the GSSUP standard for transmitting a username/password pair between a client and a server.

CSIv2 principal sponsor

The CSIv2 principal sponsor is a piece of code embedded in the CSI plug-in that obtains authentication information for an application. It is configured by setting variables in the Orbix configuration. The great advantage of the CSIv2 principal sponsor is that it enables you to provide authentication data for security unaware applications, just by modifying the configuration.

The following configuration file extract shows you how to enable the CSIv2 principal sponsor for GSSUP-style authentication (assuming the application is already configured to load the CSI plug-in):

```
# Orbix configuration file
principal_sponsor:csi:use_principal_sponsor = "true";
principal_sponsor:csi:use_method_id = "GSSUPMech";
```

Credentials sharing

Normally, when you specify an own credential using the CSI principal sponsor, the credential is available only to the ORB that created it. By setting the plugins:security:share_credentials_across_orbs variable to true, however, the own credentials created by one ORB are automatically made available to any other ORBs that are configured to share credentials.

Logging in

The GSSUP username and password can be provided in one of the following ways:

- From a dialog prompt.
- Directly in configuration.
- By programming.
From a dialog prompt

If the login data are not specified in configuration, the CSIv2 principal sponsor will prompt the user for the username, password, and domain as the application starts up. The dialog prompt is displayed if the client supports the EstablishTrustInClient CSIv2 association option and one or more of the principal_sponsor:csi:auth_method_data fields are missing (username, password, or domain).

**C++ Applications**

When a C++ application starts up, the user is prompted for the username and password at the command line as follows:

```
Please enter username :
Enter password :
```

**Java Applications**

The following dialog window pops up to prompt the user for the username, password, and domain name:

![Java Dialog Window for GSSUP Username and Password](image)

**Figure 68:** Java Dialog Window for GSSUP Username and Password

*Note:* The password is not checked until the client communicates with a server secured by CSIv2. Hence, the dialog is unable to provide immediate confirmation of a user’s password and a mis-typed password will not be detected until the client begins communicating with the server.
Directly in configuration

The username, password, and domain can be specified directly in the `principal_sponsor:csi:auth_method_data` configuration variable. For example, the CSIv2 principal sponsor can be configured as follows:

```
# Orbix configuration file
principal_sponsor:csi:use_principal_sponsor = "true";
principal_sponsor:csi:use_method_id = "GSSUPMech";
principal_sponsor:csi:auth_method_data = ["username=User",
  "password=Pass",
  "domain=AuthDomain"];  
```

In this example, the `auth_method_data` variable specifies a `User` username, `Pass` password, and `AuthDomain` domain.

**WARNING:** Storing the password directly in configuration is not recommended for deployed systems. The password is in plain text and could be read by anyone.

By programming

A CORBA application developer can optionally specify the GSSUP username, password and domain name by programming—see “Creating CSIv2 Credentials” on page 478.

In this case, an administrator should ensure that the CSIv2 principal sponsor is disabled for the application. Either the `principal_sponsor:csi:use_principal_sponsor` variable can be set to `false`, or the CSIv2 principal sponsor variables can be removed from the application’s configuration.

The best approach is to set the `principal_sponsor:csi:use_principal_sponsor` variable to `false` in the application’s configuration scope. For example:

```
# Orbix configuration file
outer_config_scope {
  ...
  my_app_config_scope {
    principal_sponsor:csi:use_principal_sponsor = "false";
    ...
  }
  ...
};
```
Providing a Username and Password

This ensures that the principal sponsor cannot be enabled accidentally by picking up configuration variables from the outer configuration scope.
Sample Configuration

Overview
This section provides complete sample configurations, on both the client side and the server side, for the scenario described in “CSIv2 Authentication Scenario” on page 418.

In this section
This section contains the following subsections:

| Sample Client Configuration | page 433 |
| Sample Server Configuration | page 435 |
Sample Client Configuration

Overview
This section describes a sample client configuration for CSIv2 authentication over transport which has the following features:

- The `iiop_tls` and `csi` plug-ins are loaded into the application.
- The client supports the SSL/TLS `EstablishTrustInTarget` association option.
- The client supports the CSIv2 authentication over transport `EstablishTrustInClient` association option.
- The username and password are specified using the CSIv2 principal sponsor.

Configuration sample
The following sample shows the configuration of a client application that uses CSIv2 authentication over transport to authenticate a user, Paul (using the `csiv2.client.paul` ORB name):

```
# Orbix configuration file
csiv2 {
   orb_plugins = ["local_log_stream", "iop_profile", "giop", "iiop_tls", "csi"];
   event_log:filters = ["IT_CSI=*", "IT_TLS=*", "IT_IIOPTLS=*", "IT_ATLILIOP_TLS=*"];
   binding:server_binding_list = ["CSI"];

   client {
      policies:iiop_tls:client_secure_invocation_policy:supports = ["Integrity", "Confidentiality", "DetectReplay", "DetectMisordering", "EstablishTrustInTarget"];
      policies:iiop_tls:client_secure_invocation_policy:requires = ["Integrity", "Confidentiality", "DetectReplay", "DetectMisordering"];```
paul
{
  plugins:csi:allow_csi_reply_without_service_context = "false";
  policies:csi:auth_over_transport:client_supports = [*"EstablishTrustInClient"];
  policies:csi:auth_over_transport:target_requires = [*"EstablishTrustInClient"];

  principal_sponsor:csi:use_principal_sponsor = "true";
  principal_sponsor:csi:auth_method_id = "GSSUPMech";
  principal_sponsor:csi:auth_method_data = [*"username=Paul", "password=password", domain="DEFAULT"];
};
};
**Overview**

This section describes a sample server configuration for CSIv2 authentication over transport which has the following features:

- The `iiop_tls` and `csi` plug-ins are loaded into the application.
- The server supports the SSL/TLS `EstablishTrustInTarget` and `EstablishTrustInClient` association options.
- The server’s X.509 certificate is specified using the SSL/TLS principal sponsor.
- The server supports the CSIv2 authentication over transport `EstablishTrustInClient` association option.

---

**Configuration sample**

The following sample shows the configuration of a server application that supports CSIv2 authentication over transport (using the `csiv2.server` ORB name):

```bash
# Orbix configuration file

# For an example implementation of this configuration file,
# refer to the Orbix installation directory.

csiv2
{
    orb_plugins = ["local_log_stream", "iop_profile", "giop", "iiop_tls", "csi"];
    event_log:filters = ["IT_CSI=*", "IT_TLS=*", "IT_IIOPL_TLS=*", "IT_ATLI_TLS=*"];
    binding:server_binding_list = ["CSI"];

    server
    {
        policies:iiop_tls:target_secure_invocation_policy:supports = ["Integrity", "Confidentiality", "DetectReplay", "DetectMisordering", "EstablishTrustInTarget", "EstablishTrustInClient"];
        policies:iiop_tls:target_secure_invocation_policy:requires = ["Integrity", "Confidentiality", "DetectReplay", "DetectMisordering"];
    }
}
```
principal_sponsor:use_principal_sponsor = "true";
principal_sponsor:auth_method_id = "pkcs12_file";
principal_sponsor:auth_method_data =
["filename=C:\ASPInstallDir\asp\6.0\etc\tls\x509\certs\demos\bank_server.p12", "password=bankserverpass"];

policies:csi:auth_over_transport:target_supports =
["EstablishTrustInClient"];  
policies:csi:auth_over_transport:authentication_service =
"csiv2.AuthenticationServiceObject";
policies:csi:auth_over_transport:server_domain_name =
"DEFAULT";
};
};
CHAPTER 17

Configuring CSIv2 Identity Assertion

This chapter explains the concepts underlying the CSIv2 identity assertion (or delegation) mechanism and provides details of how to configure your applications to use this mechanism.

<table>
<thead>
<tr>
<th>In this chapter</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>This chapter discusses the following topics:</td>
<td></td>
</tr>
<tr>
<td>CSIv2 Identity Assertion Scenario</td>
<td>page 438</td>
</tr>
<tr>
<td>SSL/TLS Prerequisites</td>
<td>page 442</td>
</tr>
<tr>
<td>Enabling CSIv2 Identity Assertion</td>
<td>page 444</td>
</tr>
<tr>
<td>Sample Configuration</td>
<td>page 446</td>
</tr>
</tbody>
</table>
### CSIv2 Identity Assertion Scenario

#### Overview
This section describes a typical CSIv2 identity assertion scenario, involving a client, an intermediate server, and a target server. Once the client has authenticated itself to the intermediate server, the intermediate server can impersonate the client by including an *identity token* in the requests that it sends to the target server. The intermediate server thus acts as a proxy (or delegate) server.

#### Identity assertion
The CSIv2 *identity assertion* mechanism provides the basis for a general-purpose delegation or impersonation mechanism. Identity assertion is used in the context of a system where a client invokes an operation on an intermediate server which then invokes an operation on a target server (see Figure 69). When making a call on the target, the client identity (which is authenticated by the intermediate server) can be forwarded by the intermediate to the target. This enables the intermediate to impersonate the client.

#### Dependency on SSL/TLS
The CSIv2 identity assertion mechanism relies on SSL/TLS to provide the following security features at the transport layer (between the intermediate server and the target server):

- Authentication of the target server to the intermediate server.
- Authentication of the intermediate server to the target server.
- Privacy of communication.
- Message integrity.
CSIv2 scenario

Figure 69 shows a typical scenario for CSIv2 identity assertion:

**Figure 69: CSIv2 Identity Assertion Scenario**

How CSIv2 identity assertion proceeds

As shown in Figure 69 on page 439, the identity assertion mechanism proceeds as follows:

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>When a client initiates an operation invocation on the intermediate, the client’s CSI plug-in inserts a client authentication token (containing username/password/domain) into the GIOP request message.</td>
</tr>
</tbody>
</table>
### Stage Description

2. The request, together with the client authentication token, is sent over the SSL/TLS connection. The SSL/TLS connection provides privacy and message integrity, ensuring that the username and password cannot be read by eavesdroppers.

3. Before permitting the request to reach the target object in the intermediate, the intermediate’s CSI plug-in calls the authentication service to check the username/password combination.

4. If the username/password combination are authenticated successfully, the request is allowed to reach the object; otherwise the request is blocked and an error is returned to the client.

5. Within the context of the current invocation, the intermediate server invokes an operation on the target server. Because identity assertion has been enabled on the intermediate server, the intermediate’s CSI plug-in extracts the client username from the received GSSUP credentials, creates an identity token containing this username, and then inserts the identity token into the GIOP request message.

6. The request, together with the identity token, is sent over the SSL/TLS connection. The SSL/TLS connection provides privacy message integrity, and mutual authentication between the intermediate and the target.

7. When the request arrives at the target server, the asserted identity is extracted and made available to the target through the CORBA received credentials object—see “Retrieving Received Credentials” on page 497.

### SSL/TLS connection

The intermediate server and target server should both be configured to use a secure SSL/TLS connection. In this scenario, the intermediate-to-target SSL/TLS connection is configured for mutual authentication. See “SSL/TLS Prerequisites” on page 442 for details of the SSL/TLS configuration for this scenario.

### Identity token

An identity token can contain one of the following types of identity token:
CSIv2 Identity Assertion Scenario

- **ITTAbsent**—if no identity token is included in the GIOP message sent by the intermediate server (for example, if CSIv2 identity assertion is disabled in the intermediate server).
- **ITTAnonymous**—if the intermediate server is acting on behalf of an anonymous, unauthenticated client.
- **ITTPrincipalName**—if the intermediate server is acting on behalf of an authenticated client. In this case, the client identity contains the following data:
  - GSSUP username—automatically extracted from the GSSUP client authentication token received from the client.
  - Subject DN—if the intermediate server authenticates the client using an X.509 certificate, but not using a username and password, the intermediate would forward on an identity token containing the subject DN from the client certificate.

### Received credentials

The *received credentials* is an object, of `SecurityLevel2::ReceivedCredentials` type, defined by the OMG CORBA Security Service that encapsulates the security credentials received from a client. In this scenario, the target server is programmed to access the asserted identity using the received credentials.

For details of how to access the asserted identity through the received credentials object, see “Retrieving Received Credentials from the Current Object” on page 498.
SSL/TLS Prerequisites

Overview

The CSIv2 identity assertion mechanism relies on SSL/TLS to provide the following security features at the transport layer (between the intermediate server and the target server):

- Authentication of the target server to the intermediate server.
- Authentication of the intermediate server to the target server.
- Privacy of communication.
- Message integrity.

SSL/TLS mutual authentication

For the scenario depicted in Figure 69 on page 439, the SSL/TLS connection between the intermediate and the target server is configured for mutual authentication. The SSL/TLS configuration can be summarized as follows:

- Intermediate server SSL/TLS configuration—the intermediate server requires confidentiality, message integrity, and the EstablishTrustInTarget SSL/TLS association option. An X.509 certificate is provided, which enables the intermediate server to be authenticated both by the client and by the target server.

- Target server SSL/TLS configuration—the server requires confidentiality, message integrity, and the EstablishTrustInClient SSL/TLS association option. An X.509 certificate is provided, which enables the target server to be authenticated by the intermediate server.

See “Sample Intermediate Server Configuration” on page 449 for a detailed example of the SSL/TLS configuration in this scenario.

See “SSL/TLS Administration” on page 275 for complete details of configuring and administering SSL/TLS.

Setting certificate constraints

In the scenario depicted in Figure 69 on page 439, the target server grants a special type of privilege (backward trust) to the intermediate server—that is, the target accepts identities asserted by the intermediate without getting the chance to authenticate these identities itself. It is, therefore, recommended to set the certificate constraints policy on the target server to restrict the range of applications that can connect to it.
The certificate constraints policy prevents connections being established to the target server, unless the ASN.1 Distinguished Name from the subject line of the incoming X.509 certificate conforms to a certain pattern. See “Applying Constraints to Certificates” on page 384 for further details.

Principal sponsor configuration

In this scenario, the SSL/TLS principal sponsor needs to be enabled in the intermediate server and in the target server. See “Specifying an Application’s Own Certificate” on page 371 and “Providing a Certificate Pass Phrase” on page 376 for further details.

**Note:** The SSL/TLS principal sponsor is completely independent of the CSIv2 principal sponsor (see “Providing a Username and Password” on page 428). It is possible, therefore, to enable both of the principal sponsors within the same application.
CHAPTER 17 | Configuring CSIv2 Identity Assertion

Enabling CSIv2 Identity Assertion

Overview

Based on the sample scenario depicted in Figure 69 on page 439, this section describes the basic configuration variables that enable CSIv2 identity assertion. These variables on their own, however, are by no means sufficient to configure a system to use CSIv2 identity assertion. For a complete example of configuring CSIv2 identity assertion, see “Sample Configuration” on page 446.

Loading the CSI plug-in

To enable CSIv2, you must include the csi plug-in in the orb_plugins list in your Orbix configuration. The binding:client_binding_list and binding:server_binding_list must also be initialized with the proper list of interceptor combinations.

Sample settings for these configuration variables can be found in the demos.tls.csv2 configuration scope of your Orbix configuration. For example, you can load the csi plug-in with the following configuration:

```
# Orbix configuration file
csv2 {
    orb_plugins = ["local_log_stream", "iiop_profile", "giop", "iiop_tls", "csi"];


    binding:server_binding_list = ["CSI"];
    ...
};
```

Intermediate server configuration

The intermediate server can be configured to support CSIv2 identity assertion, as follows:

```
# Orbix configuration file
policies:csi:attribute_service:client_supports = ["IdentityAssertion"];`
### Intermediate server CSIv2 association options
Including the `IdentityAssertion` CSIv2 association option in the `policies:csi:attribute_service:client_supports` list indicates that the application supports CSIv2 identity assertion when acting as a client.

### Target server configuration
The target server can be configured to support CSIv2 identity assertion, as follows:

```plaintext
# Orbix configuration file
policies:csi:attribute_service:target_supports = [
  "IdentityAssertion"];
```

### Target server CSIv2 association options
Including the `IdentityAssertion` CSIv2 association option in the `policies:csi:attribute_service:target_supports` list indicates that the application supports CSIv2 identity assertion when acting as a server.
**Sample Configuration**

**Overview**
This section provides complete sample configurations, covering the client, the intermediate server, and the target server, for the scenario described in “CSIv2 Identity Assertion Scenario” on page 438.

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Sample Client Configuration

Overview

This section describes a sample client configuration for the CSIv2 identity assertion scenario. In this part of the scenario, the client is configured to use CSIv2 authentication over transport, as follows:

- The `iiop_tls` and `csi` plug-ins are loaded into the application.
- The client supports the SSL/TLS `EstablishTrustInTarget` association option.
- The client supports the CSIv2 authentication over transport `EstablishTrustInClient` association option.
- The username and password are specified using the CSIv2 principal sponsor.

Configuration sample

The following sample shows the configuration of a client application that uses CSIv2 authentication over transport to authenticate a user, Paul (using the `csiv2.client.paul` ORB name):

```bash
# Orbix configuration file
.csiv2
{
    orb_plugins = ["local_log_stream", "iiop_profile", "giop", "iiop_tls", "csi"];
    event_log:filters = ["IT_CSI=*", "IT_TLS=*", "IT_IIOPTLS=*", "IT_ATLI_TLS=*"];
    binding:server_binding_list = ["CSI"];

    client
    {
    policies:iiop_tls:client_secure_invocation_policy:supports = ["Integrity", "Confidentiality", "DetectReplay", "DetectMisordering", "EstablishTrustInTarget"];  
    policies:iiop_tls:client_secure_invocation_policy:requires = ["Integrity", "Confidentiality", "DetectReplay", "DetectMisordering"];
```
paul
{
  plugins:csi:allow_csi_reply_without_service_context = "false";
  policies:csi:auth_over_transport:client_supports = [*"EstablishTrustInClient"];

  principal_sponsor:csi:use_principal_sponsor = "true";
  principal_sponsor:csi:auth_method_id = "GSSUPMech";
  principal_sponsor:csi:auth_method_data = [*"username=Paul", "password=password", "domain=DEFAULT"];
};
};
Sample Intermediate Server Configuration

Overview

This section describes a sample intermediate server configuration for CSIv2 identity assertion which has the following features:

• The iiop_tls and csi plug-ins are loaded into the application.
• In the role of server, the intermediate server supports the SSL/TLS EstablishTrustInTarget and EstablishTrustInClient association options.
• In the role of client, the intermediate server supports the SSL/TLS EstablishTrustInTarget and EstablishTrustInClient association options.
• The intermediate server’s X.509 certificate is specified using the SSL/TLS principal sponsor.
• In the role of server, the intermediate server supports the CSIv2 authentication over transport EstablishTrustInClient association option.
• In the role of client, the intermediate server supports the CSIv2 IdentityAssertion association option.

Configuration sample

The following sample shows the configuration of an intermediate server application that supports CSIv2 authentication over transport (when acting as a server) and identity assertion (when acting as a client). In this example, the server executable should use the csiv2.intermed_server ORB name:

```bash
# Orbix configuration file
csv2
{
  orb_plugins = ["local_log_stream", "iiop_profile", "giop", "iiop_tls", "csi"];
  event_log:filters = ["IT_CSI=*", "IT_TLS=*", "IT_IIOPTLS=*", "IT_ATLI_TLS=*"];
  binding:server_binding_list = ["CSI"];```
intermed_server
{
    policies:iiop_tls:target_secure_invocation_policy:supports = 
    ["Integrity", "Confidentiality", "DetectReplay", 
    "DetectMisordering", "EstablishTrustInTarget", 
    "EstablishTrustInClient"]; 
    policies:iiop_tls:target_secure_invocation_policy:requires = 
    ["Integrity", "Confidentiality", "DetectReplay", 
    "DetectMisordering"]; 
    policies:iiop_tls:client_secure_invocation_policy:supports = 
    ["Integrity", "Confidentiality", "DetectReplay", 
    "DetectMisordering", "EstablishTrustInTarget", 
    "EstablishTrustInClient"]; 
    policies:iiop_tls:client_secure_invocation_policy:requires = 
    ["Integrity", "Confidentiality", "DetectReplay", 
    "DetectMisordering"]; 

    principal_sponsor:use_principal_sponsor = "true"; 
    principal_sponsor:auth_method_id = "pkcs12_file"; 
    principal_sponsor:auth_method_data = 
    ["filename=C:\ASPInstallDir\art\6.0\etc\tls\x509\certs\demos\bank_server.p12", 
    "password=bankserverpass"];

    plugins:csi:allow_csi_reply_without_service_context = 
    "false";
    policies:csi:attribute_service:client_supports = 
    ["IdentityAssertion"]; 
    policies:csi:auth_over_transport:target_supports = 
    ["EstablishTrustInClient"]; 
    policies:csi:auth_over_transport:targetRequires = 
    ["EstablishTrustInClient"]; 

    policies:csi:auth_over_transport:authentication_service = 
    "csiv2.AuthenticationServiceObject";
    policies:csi:auth_over_transport:server_domain_name = 
    "DEFAULT";
};
Sample Target Server Configuration

Overview
This section describes a sample target server configuration for CSIv2 identity assertion which has the following features:

- The `iiop_tls` and `csi` plug-ins are loaded into the application.
- The server supports the SSL/TLS `EstablishTrustInTarget` and `EstablishTrustInClient` association options.
- The server requires the SSL/TLS `EstablishTrustInClient` association option.
- The server’s X.509 certificate is specified using the SSL/TLS principal sponsor.
- The intermediate server supports the CSIv2 `IdentityAssertion` association option.

Configuration sample
The following sample shows the configuration of a target server application that supports identity assertion (using the `csiv2.target_server` ORB name).

```plaintext
# Orbix configuration file

csv2
{
  orb_plugins = ["local_log_stream", "iiop_profile", "giop", "iiop_tls", "csi"];
  event_log:filters = ["IT_CSI=*", "IT_TLS=*", "IT_IIOPE_TLS=*", "IT_ATLI_TLS=*"];  
  binding:server_binding_list = ["CSI"];  
  target_server
  {
    policies:iiop_tls:target_secure_invocation_policy:supports = ["Integrity", "Confidentiality", "DetectReplay", "DetectMisordering", "EstablishTrustInTarget", "EstablishTrustInClient"];  
    policies:iiop_tls:target_secure_invocation_policy:requires = ["Integrity", "Confidentiality", "DetectReplay", "DetectMisordering", "EstablishTrustInClient"];
  
```
principal_sponsor:use_principal_sponsor = "true";
principal_sponsor:auth_method_id = "pkcs12_file";
principal_sponsor:auth_method_data = 
  ["filename=C:\ASPInstallDir\art\6.0\etc\tls\x509\certs\demos\bank_server.p12", "password=bankserverpass"];

policies:csi:attribute_service:target_supports = 
  ["IdentityAssertion"];
};
};
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CORBA Security Programming

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You can customize the behavior of secure CORBA applications by setting policies programmatically.

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Setting Policies

Overview
This section provides a brief overview of how to set CORBA policies by programming. An example, in C++ and Java, is provided that shows how to set a CORBA policy at the ORB level.

How to program CORBA policies is described in more detail in the CORBA Programmer’s Guide.

Client-side policy levels
You can set client-side policies at any of the following levels:
- ORB
- Thread
- Object (for client-side proxies)

Server-side policy levels
You can set server-side policies at any of the following levels:
- ORB
- POA

Policy management
As described in the CORBA Programmer’s Guide, you can set a policy at each level using the appropriate policy management object as listed in Table 25.

Table 25: Policy Management Objects

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C++ Example

The following C++ example shows how to set an SSL/TLS certificate constraints policy at the ORB level:

**Example 42: C++ Example of Setting ORB-Level Policies**

```cpp
//C++
... 
CORBA::Any             any;
CORBA::PolicyList      orb_policies;
orb_policies.length(1);
CORBA::Object_var      object =
global_orb->resolve_initial_references("ORBPolicyManager");
CORBA::PolicyManager_var   policy_mgr =
CORBA::PolicyManager::_narrow(object);

IT_TLS_API::CertConstraints   cert_constraints;
cert_constraints.length(1);
cert_constraints[0] = CORBA::string_dup( 
    "C=US,ST=Massachusetts,O=ABigBank*,OU=Administration"
);
any <<= cert_constraints;
orb_policies[0] = global_orb->create_policy(
    IT_TLS_API::TLS_CERT_CONSTRAINTS_POLICY, any
);
policy_mgr->set_policy_overrides(
    orb_policies, CORBA::ADD_OVERRIDE
);
```

Java Example

The following Java example shows how to set an SSL/TLS certificate constraints policy at the ORB level:

**Example 43: Java Example of Setting ORB-Level Policies**

```java
//Java
PolicyManager pol_manager = null;
pol_manager = (PolicyManager)
    orb.resolve_initial_references("ORBPolicyManager");
Any policy_value = orb.create_any();
String[] constraint = 
    {"C=US,ST=Massachusetts,O=ABigBank*,OU=Administration"};
CertConstraintsHelper.insert(policy_value, constraint);
Policy[] policies = new Policy[1];
```
CHAPTER 18 | Programming Policies

Example 43: Java Example of Setting ORB-Level Policies

4, 5  policies[0] =
        orb.create_policy(TLS_CERT_CONSTRAINTS_POLICY.value,
                           policy_value);
6  pol_manager.set_policy Overrides(policies,
                                SetOverrideType.SET_OVERRIDE);

Setting a Policy at ORB Level

The programming steps in the preceding examples, “C++ Example” on page 457 and “Java Example” on page 457, can be explained as follows:

1. Retrieve the ORB policy manager.
2. Create an instance of the policy that you are to adjust, based on the Orbix IDL (see the CORBA Programmer’s Reference).
3. Set your new values on this policy.
4. Create an ORB policy object using the CORBA::ORB::create_policy() operation and provide your new policy as a parameter.
5. Add the policy to a PolicyList object.
6. Use the PolicyManager::set_policy_overrides() operation to set the new PolicyList on the ORB.
Programmable SSL/TLS Policies

Overview

This section gives a brief overview of the different kinds of programmable SSL/TLS policy and discusses how these policies interact with each other and with policies set in configuration.

For more details of these SSL/TLS policies, consult the relevant sections of the *CORBA Programmer’s Reference*.

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Introduction to SSL/TLS Policies

Configuring or programming policies
You can use policies to govern security behavior in Orbix and most of these policies can be set through the Orbix configuration file (see “policies” on page 582).

However, policies set with the configuration file only apply at the ORB level. If you develop security-aware applications, you can add a finer level of security to objects by programming policies in your application code.

Augmenting minimum levels of security
You can use the CORBA policy IDL and the TLS policy IDL to refine the security features that your objects require. Follow these steps:

1. Consider what are the minimum security levels set for objects in your system.
2. Add to these minimum levels, by adding the available programmable policies to your application code.

What are the minimum security levels for objects?
You can set the minimum levels of security that objects require with secure invocation policies. There are two types of secure invocation policy:

- Security::SecClientSecureInvocation
- Security::SecTargetSecureInvocation

You can apply values for these in the Orbix configuration file, as discussed in “Setting Association Options” on page 336, or by programming policies.

It is important to remember that by programming policies you can only add more security to the minimum required in the configuration; you cannot reduce the minimum required security by programming.

Note: Examples of configuring policies programmatically can be found in the TLS policy demo, in the ASPInstallDir/asp/6.0/demos/tls/policy directory.
Any object, can have the following dispositions to a security feature:

- If the object requires a certain type of security, that requirement must be complied with before a call to the object succeeds.
- If the object supports a certain type of security, that security feature can be used, but does not have to be used.
The QOPPolicy

### IDL definition

The `SecurityLevel2::QOPPolicy` policy provides a way to override the client and target secure invocation policies. You can apply four levels of protection defined by the enumerated type, `Security::QOP`, defined as follows:

```idl
//IDL
define Security {
...
enum QOP {
    SecQOPNoProtection,
    SecQOPIntegrity,
    SecQOPConfidentiality,
    SecQOPIntegrityAndConfidentiality
};
};
```

### Purpose

The `SecurityLevel2::QOPPolicy` is used by security aware applications for two purposes:
- Restricting the types of cipher suites available for consideration.
- Overriding the way in which a specific object is contacted.

### Restricting cipher suites

The values allowed for QOP policies are not specific enough to identify particular cipher suites (the mechanism policy can be used for this). However the QOPPolicy value can render certain cipher suites inapplicable—see “Constraints Imposed on Cipher Suites” on page 355.

If you set a QOP policy to override an existing QOP policy, the applicable list of cipher suites can be extended as a result.

### Over-riding how an object is contacted

When you set a QOP policy override for an object, this results in a new object reference that contains the applicable policies. This means that the QOP policy can conveniently be used to create an insecure object reference (where allowed by the administration policies) that you can use for operations where you wish insecure invocations to take place. The original object reference that contains a higher quality of protection can be used for the more sensitive operations.
The EstablishTrustPolicy

Purpose

You can use the SecurityLevel2::EstablishTrustPolicy to control whether server or client authentication is to be enforced.

Both a client and target object can support this policy, meaning that, for a client, the client is prepared to authenticate its privileges to the target, and the target supports this.

However, you can also set this policy as required for a target policy. This means that a client must authenticate its privileges to the target, before the target will accept the connection.

IDL Definition

The SecurityLevel2::EstablishTrustPolicy policy contains an attribute, trust, of Security::EstablishTrust type that specifies whether trust in client and trust in target is enabled. The Security::EstablishTrust type is defined as follows:

```idl
//IDL
module Security {
  ...
  struct EstablishTrust {
    boolean trust_in_client;
    boolean trust_in_target;
  };
  ...
};
```

Structure members

This structure contains the following members:

- The trust_in_client element stipulates whether the invocation must select credentials and mechanism that allow the client to be authenticated to the target.
- The trust_in_target element stipulates whether the invocation must first establish trust in the target.

Note: Normally, all SSL/TLS cipher suites need to authenticate the target.
# The InvocationCredentialsPolicy

## Purpose

The `SecurityLevel2::InvocationCredentialsPolicy` policy forces a POA to use specific credentials or to use specific credentials on a particular object. When this object is returned by the `get_policy()` operation, it contains the active credentials that will be used for invocations using this target object reference.

## Attribute

The `SecurityLevel2::InvocationCredentialsPolicy` policy has a single attribute, `creds`, that returns a list of `Credentials` objects that are used as invocation credentials for invocations through this object reference.

## Setting the policy at object level

An `InvocationCredentialsPolicy` object can be passed to the `set_policy_overrides()` operation to specify one or more `Credentials` objects to be used when calling this target object, using the object reference returned by `set_policy_overrides()`.
Interaction between Policies

Upgrading security

To upgrade an insecure Orbix application to be fully secure using the QOP and EstablishTrust policies, the application must initially be configured to support the DetectReply and the DetectMisordering association options. This is because it is not possible to specify the DetectReplay and DetectMisordering association options programatically, but these association options are needed for all the SSL/TLS cipher suites. See “Constraints Imposed on Cipher Suites” on page 355.

No downgrading of security

When you specify the client secure invocation policy and the target secure invocation policy, you are providing your application with its minimum security requirements. These minimum requirements must be met by any other specified policies and cannot be weakened. This means that the following policies cannot be specified, if their values would conflict with the corresponding SecureInvocationPolicy value:

- QOPPolicy
- MechanismPolicy
- EstablishTrustPolicy

Compatibility with the mechanism policy value

You cannot specify values for the QOPPolicy, SecureInvocationPolicy (client and target), or EstablishTrustPolicy, if the underlying mechanism policy does not support it. For example, you cannot specify that Confidentiality is required, if only NULL cipher suites are enabled in the MechanismPolicy.
**Programmable CSIv2 Policies**

**Overview**

This section gives a brief overview of the programmable CSIv2 policies. These programmable policies provide functionality equivalent to the CSIv2 configuration variables.

For complete details of the CSIv2 policies, see the description of the IT_CSI module in the *CORBA Programmer’s Reference*.

**CSIv2 policies**

The following CSIv2 policies can be set programmatically:

- Client-side CSIv2 authentication policy.
- Server-side CSIv2 authentication policy.
- Client-side CSIv2 identity assertion policy.
- Server-side CSIv2 identity assertion policy.

**Client-side CSIv2 authentication policy**

You can set the client-side CSIv2 authentication policy to enable an application to send GSSUP username/password credentials over the wire in a GIOP service context. The programmable client-side CSIv2 authentication policy provides functionality equivalent to setting the following configuration variable:

```
policies:csi:auth_over_transport:client_supports
```

To create a client-side CSIv2 authentication policy, use the following IDL data types from the IT_CSI module:

- Policy type constant is `IT_CSI::CSI_CLIENT_AS_POLICY`.
- Policy data is `IT_CSI::AuthenticationService`.

**Server-side CSIv2 authentication policy**

You can set the server-side CSIv2 authentication policy to enable an application to receive and authenticate GSSUP username/password credentials. The programmable server-side CSIv2 authentication policy provides functionality equivalent to setting the following configuration variables:

```
policies:csi:auth_over_transport:target_supports
policies:csi:auth_over_transport:target_requires
policies:csi:auth_over_transport:server_domain_name
policies:csi:auth_over_transport:authentication_service
```

To create a server-side CSIv2 authentication policy, use the following IDL data types from the IT_CSI module:
Programmable CSIv2 Policies

- Policy type constant is `IT_CSI::CSI_SERVER_AS_POLICY`.
- Policy data is `IT_CSI::AuthenticationService`.

**Client-side CSIv2 identity assertion policy**

You can set the client-side CSIv2 identity assertion policy to enable an application to send a CSIv2 asserted identity over the wire in a GIOP service context. The programmable client-side CSIv2 identity assertion policy provides functionality equivalent to setting the following configuration variable:

```
policies:csi:attribute_service:client_supports
```

To create a client-side CSIv2 identity assertion policy, use the following IDL data types from the `IT_CSI` module:

- Policy type constant is `IT_CSI::CSI_CLIENT_SAS_POLICY`.
- Policy data is `IT_CSI::AttributeService`.

**Server-side CSIv2 identity assertion policy**

You can set the server-side CSIv2 identity assertion policy to enable an application to receive a CSIv2 asserted identity. The programmable server-side CSIv2 identity assertion policy provides functionality equivalent to setting the following configuration variable:

```
policies:csi:attribute_service:target_supports
```

To create a server-side CSIv2 identity assertion policy, use the following IDL data types from the `IT_CSI` module:

- Policy type constant is `IT_CSI::CSI_SERVER_SAS_POLICY`.
- Policy data is `IT_CSI::AttributeService`.
The Orbix Security Framework protects your applications by preventing principals from making calls to the system unless they authenticate themselves.

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CHAPTER 19 | Authentication

Using the Principal Authenticator

Overview

The principal authenticator is an object that associates secure identities with a CORBA application. This section explains how to use the principal authenticator to create various kinds of credentials.

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# Introduction to the Principal Authenticator

## Overview
This section describes the role of the principal authenticator object in creating and authenticating an application’s own credentials.

## Creating own credentials
There are two alternative ways to create an application’s own credentials:

- **By configuration**—that is, by setting the principal sponsor configuration variables. See “Specifying an Application’s Own Certificate” on page 371.
- **By programming**—that is, by calling the `SecurityLevel2::PrincipalAuthenticator::authenticate()` operation directly. This alternative is described here.

## Principal
A principal can be any person or code that wants to use your secure system. The principal must be identified, for example by a user name and password, and authenticated. Once authenticated, your system assigns credentials to that principal, that assert the authenticated identity.

## Own credentials
An own credentials object, of `SecurityLevel2::Credentials` type, represents a secure identity under whose authority the context is executing. When an application invokes an operation on a remote server, it sends one or more of its own credentials to the server in order to identify itself to the server.

## Principal authenticator
The principal authenticator is a factory object that creates own credentials and associates them with the current ORB instance. By calling the principal authenticator’s `authenticate()` operation multiple times, you can associate a list of own credentials objects with the current ORB.

**Note:** In terms of the CORBA Security Specification, an ORB object is identified with a security capsule. The list of own credentials created by a principal authenticator is implicitly associated with the enclosing security capsule.
Credentials sharing

Normally, when you specify an own credential using the principal authenticator, the credential is available only to the ORB that created it. By setting the `plugins:security:share_credentials_across_orbs` variable to `true`, however, the own credentials created by one ORB are automatically made available to any other ORBs that are configured to share credentials.

Creating own credentials

To create own credentials and make them available to your application, follow these steps:

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Obtain an initial reference to the <code>SecurityLevel2::SecurityManager</code> object.</td>
</tr>
<tr>
<td>2</td>
<td>Acquire a <code>SecurityLevel2::PrincipleAuthenticator</code> object from the security manager.</td>
</tr>
<tr>
<td>3</td>
<td>Call the <code>PrincipleAuthenticator::authenticate()</code> operation to authenticate the client principal and create a <code>SecurityLevel2::Credentials</code> own credentials object.</td>
</tr>
<tr>
<td>4</td>
<td>If more than one type of own credentials object is needed, call the <code>PrincipleAuthenticator::authenticate()</code> operation again with the appropriate arguments.</td>
</tr>
</tbody>
</table>

Types of credentials

Using the `PrincipalAuthenticator`, you can create the following types of credentials:

- SSL/TLS own credentials.
- CSIV2 own credentials.

SSL/TLS own credentials

An SSL/TLS own credentials contains an X.509 certificate chain and is represented by an object of `IT_TLS_API::TLS Credentials` type.

CSIV2 own credentials

The contents of a CSIV2 own credentials depends on the particular mechanism that is used, as follows:

- Username and password— if the CSIV2 authentication over transport mechanism is used.
• Username only—if the CSIv2 identity assertion mechanism is used.

In both cases, the CSIv2 own credentials is represented by an object of IT_CSI::CSICredentials type.
Creating SSL/TLS Credentials

Overview

The following authentication methods are supported for SSL/TLS:

- `IT_TLS_API::IT_TLS_AUTH_METH_PKCS12_FILE`—enables you to specify the path name of a PKCS#12 file containing an X.509 certificate chain. Not supported by Schannel.

- `IT_TLS_API::IT_TLS_AUTH_METH_PKCS12_DER`—enables you to specify an X.509 certificate chain in DER-encoded PKCS#12 format. The PKCS#12 data is provided in the form of an `IT_Certificate::DERData` object. Not supported by Schannel.

- `IT_TLS_API::IT_TLS_AUTH_METH_CERT_CHAIN`—enables you to specify the private key and certificate chain directly as `IT_Certificate::DERData` and `IT_Certificate::X509CertChain` objects, respectively. Not supported by Schannel.

- `IT_TLS_API::IT_TLS_AUTH_METH_CERT_CHAIN_FILE`—enables you to specify the path name of a file containing a PEM-encoded X.509 certificate chain. Not supported by Schannel.

- `IT_TLS_API::IT_TLS_AUTH_METH_PKCS11`—enables you to specify the provider, slot number and PIN for a PKCS#11 smart card. Not supported by Schannel.

- `IT_TLS_API::IT_TLS_AUTH_METH_LABEL`—enables you to specify the common name (CN) from an application certificate’s subject DN. This method can be used only in combination with the Schannel toolkit (Windows C++ only).

C++ example

In the following C++ example, a client principal passes its identity to the principal authenticator in the form of a PKCS#12 file:

**Example 44: C++ Example of SSL/TLS Authentication**

```cpp
//C++
int pkcs12_login(
   CORBA::ORB_ptr orb,
   const char *pkcs12_filename,
   const char *password
)
```
Example 44: C++ Example of SSL/TLS Authentication

```c++
{
    CORBA::Any    auth_data;
    CORBA::Any*   continuation_data_ign;
    CORBA::Any*   auth_specific_data_ign;
    Security::AttributeList privileges; // Empty
    SecurityLevel2::Credentials_var creds;
    Security::AuthenticationStatus status;
    IT_TLS_API::PKCS12FileAuthData p12_auth_data;
    CORBA::Object_var   obj;
    SecurityLevel2::SecurityManager_var security_manager_obj;
    SecurityLevel2::PrincipalAuthenticator_var
        principal_authenticator_obj;

    obj = orb->resolve_initial_references("SecurityManager");
    security_manager_obj = SecurityLevel2::SecurityManager::
        _narrow(obj);

    principal_authenticator_obj =
        security_manager_obj->principal_authenticator();

    p12_auth_data.filename =
        CORBA::string_dup(pkcs12_filename);
    p12_auth_data.password =
        CORBA::string_dup(password);
    auth_data <<= p12_auth_data;

    status = principal_authenticator_obj->authenticate(
        IT_TLS_API::IT_TLS_AUTH_METH_PKCS12_FILE,
        "", // The mechanism name.
        NULL, // SecurityName (not used for this method).
        auth_data, // The authentication data for this method of
        // authentication.
        privileges, // Empty list, no privileges are supported
        // by SSL.
        creds,
        continuation_data_ign, // These last two paramaters are
        auth_specific_data_ign // not used by this
        // mechanism/method combination.
    );
...
```
The preceding C++ example can be explained as follows:

1. Declare an empty credentials object reference to hold the security attributes of this client if login is successful.
2. Obtain an initial reference to the SecurityManager object.
3. Acquire a PrincipleAuthenticator object from the security manager.
4. Use the PrincipleAuthenticator to authenticate the client principal. If this operation returns a value of Security::SecAuthSuccess, the security attributes of the authenticated object are stored in the credentials object, creds.

In the following Java example, a client principal passes its identity to the principal authenticator in the form of a PKCS#12 file:

Example 45: Java Example of SSL/TLS Authentication

```java
//Java
org.omg.SecurityLevel2.SecurityManager manager =
        orb.resolve_initial_references("SecurityManager");

PrincipalAuthenticator authenticator
        manager.principal_authenticator();

Any auth_data_any = orb.create_any();

PKCS12FileAuthData authentication_data =
        new PKCS12FileAuthData("bankserverpass", certificate);
PKCS12FileAuthDataHelper.insert(auth_data_any, authentication_data);

SecAttribute[] privileges = new SecAttribute[0];

// Holder for the credentials returned from logging in
CredentialsHolder credentials = new CredentialsHolder();

// Holders for continuation_data and auth_specific_data
// are not used
AnyHolder continuation_data = new AnyHolder();
AnyHolder auth_specific_data = new AnyHolder();
AuthenticationStatus authentication_result;
```
Example 45: Java Example of SSL/TLS Authentication

```java
authentication_result = authenticator.authenticate(
    IT_TLS_AUTH_METHOD_PKCS12_FILE.value,
    **, // mechanism empty
    **, // security name empty
    auth_data_any,
    privileges,
    credentials,
    continuation_data,
    auth_specific_data
);
...
```

**Java notes**

The preceding Java example can be explained as follows:

1. Obtain an initial reference to the SecurityManager object.
2. Acquire a PrincipleAuthenticator object from the security manager.
3. Initialize an empty credentials holder object to hold the security attributes of this client if login is successful.
4. Use the PrincipleAuthenticator to authenticate the client principal. If this operation returns a value of Security: : SecAuthSuccess, the security attributes of the authenticated object are stored in the Credentials object.
Creating CSIv2 Credentials

Overview

The following authentication method is supported for CSIv2:

- **IT_CSI::IT_CSI_AUTH_METH_USERNAME_PASSWORD**—enables you to specify a GSSUP username, password, and domain. The GSSUP authentication data is provided in the form of an **IT_CSI::GSSUPAuthData** object.

C++ example

Example 46 shows how to create CSIv2 credentials in C++, by supplying a username, `<user_name>`, password, `<password>`, and authentication domain, `<domain>`, to the principal authenticator's **authenticate()** operation.

**Example 46: C++ Example of CSIv2 Authentication**

```c++
// C++
int set_csiv2_credential(CORBA::ORB_var orb)
{
    IT_CSI::GSSUPAuthData                csi_gssup_auth_data;
    CORBA::Any                           auth_data;
    CORBA::Any*                          continuation_data_ign;
    CORBA::Any*                          auth_specific_data_ign;
    Security::AttributeList              privileges;
    SecurityLevel2::Credentials_var      creds;
    CORBA::String_var                    username;
    Security::AuthenticationStatus       status;
    SecurityLevel2::PrincipalAuthenticator_var authenticator;

    try {
        // Get initial reference of SecurityManager
        SecurityLevel2::SecurityManager_var security_manager_obj;

        try {
            CORBA::Object_var obj;
            obj = orb->resolve_initial_references(
                "SecurityManager"
            );
            security_manager_obj =
                SecurityLevel2::SecurityManager::_narrow(obj);
```
Example 46: C++ Example of CSIv2 Authentication

```cpp
if (CORBA::is_nil(security_manager_obj))
{
    cerr << "Unexpected Error. Failed to initialize "
        "SecurityManager initial reference." << endl;
}

authenticator =
   security_manager_obj->principal_authenticator();
if (CORBA::is_nil(authenticator))
{
// Log error message (not shown) ...
    return -1;
}

username = CORBA::string_dup("<user_name>");
csi_gssup_auth_data.password =
   CORBA::string_dup("<password>");
csi_gssup_auth_data.domain =
   CORBA::string_dup("<domain>");
auth_data <<= csi_gssup_auth_data;
...

status = authenticator->authenticate(
   IT_CSI::IT_CSI_AUTH_METH_USERNAME_PASSWORD,
   "",                               // NOT USED
   username,                          // GSSUP user name
   auth_data,                         // GSSUP auth data in an any
   privileges,                        // NOT USED
   creds,                             // returned credentials
   continuation_data_ign,             // NOT USED
   auth_specific_data_ign             // NOT USED
);

if (status != Security::SecAuthSuccess)
{
    // Log error message (not shown) ...
    return -1;
}
}

// Log error message (not shown) ...
return -1;
}
```
The preceding C++ example can be explained as follows:

1. Obtain an initial reference to the SecurityManager object.
2. Acquire a PrincipleAuthenticator object from the security manager.
3. Create a GSSUPAuthData struct containing the GSSUP password, \(<password>\), and domain, \(<domain>\).
4. Insert the GSSUPAuthData struct, auth_data, into the any, auth_data_any.
5. Call authenticate() on the PrincipleAuthenticator object to authenticate the client principal. If the authenticate() operation returns a value of Security::SecAuthSuccess, the security attributes of the authenticated object are stored in creds.

Example 47 shows how to create CSIv2 credentials in Java, by supplying a username, \(<user\_name>\), password, \(<password>\), and authentication domain, \(<domain>\), to the principal authenticator’s authenticate() operation.

Example 47: Java Example of CSIv2 Authentication

```java
//Java
...
// Given the following prerequisites:
// orb - A reference to an org.omg.CORBA.ORB object.
org.omg.SecurityLevel2.SecurityManager manager = 
    orb.resolve_initial_references("SecurityManager");
org.omg.SecurityLevel2.PrincipalAuthenticator authenticator = 
    manager.principal_authenticator();
org.omg.CORBA.Any auth_data_any = orb.create_any();
```
Example 47: Java Example of CSIv2 Authentication

```java
com.iona.IT_CSI.GSSUPAuthData auth_data =
    new com.iona.IT_CSI.GSSUPAuthData(
        "<password>",
        "<domain>"
    );
com.iona.IT_CSI.GSSUPAuthDataHelper.insert(
    auth_data_any,
    auth_data
);

org.omg.Security.SecAttribute[] privileges
    = new org.omg.Security.SecAttribute[0];

    // Holder for the credentials returned from logging in
    org.omg.SecurityLevel2.CredentialsHolder credentials
        = new org.omg.SecurityLevel2.CredentialsHolder();

    // Holders for continuation_data and auth_specific_data
    // are not used
    org.omg.CORBA.AnyHolder continuation_data
        = new org.omg.CORBA.AnyHolder();
    org.omg.CORBA.AnyHolder auth_specific_data
        = new org.omg.CORBA.AnyHolder();

    org.omg.Security.AuthenticationStatus authentication_result;

authentication_result = principal_authenticator.authenticate(
    com.iona.IT_CSI.IT_CSI_AUTH_METH_USERNAME_PASSWORD.value,
    "",                // NOT USED
    "<user_name>",    // GSSUP user name
    auth_data_any,    // an any containing the
    // IT_CSI::GSSUPAuthData struct
    privileges,        // NOT USED
    credentials,       // returns the CSIv2 user credentials
    continuation_data, // NOT USED
    auth_specific_data // NOT USED
);

    // Returned credentials can be accessed in 'credentials.value'
...
Java notes

The preceding Java example can be explained as follows:

1. Obtain an initial reference to the SecurityManager object.
2. Acquire a PrincipleAuthenticator object from the security manager.
3. Create a GSSUPAuthData struct containing the GSSUP password, \textit{<password>}, and domain, \textit{<domain>}.
4. Insert the GSSUPAuthData struct, auth-data, into the any, auth-data-any.
5. Initialize an empty credentials holder object to hold the security attributes of this client.
6. Call authenticate() on the PrincipleAuthenticator object to authenticate the client principal. If the authenticate() operation returns a value of Security::SecAuthSuccess, the security attributes of the authenticated object are stored in credentials.value.
Using a Credentials Object

**What is a credentials object?**

A `SecurityLevel2::Credentials` object is a locality-constrained object that represents a particular principal’s credential information, specific to the execution context. A `Credentials` object stores security attributes, including authenticated (or unauthenticated) identities, and provides operations to obtain and set the security attributes of the principal it represents.

**Credentials types**

There are three types of credentials:

- *Own credentials*—identifies the principal under whose authority the context is executing. An own credential is represented by an object of `SecurityLevel2::Credentials` type.

- *Target credentials*—identifies a remote target object. A target credential is represented by an object of `SecurityLevel2::TargetCredentials` type.

- *Received credentials*—identifies the principal that last sent a message to the current execution context (for example, the principal that called a currently executing operation). A received credential is represented by an object of `SecurityLevel2::ReceivedCredentials` type.

**How credentials are obtained**

Credentials objects are created or obtained as the result of:

- Authentication.

- Asking for a `Credentials` object from a `SecurityLevel2::Current` object or from a `SecurityLevel2::SecurityManager` object.

**Accessing the credentials attributes**

The security attributes associated with a `Credentials` object can be obtained by calling the `SecurityLevel2::Credentials::get_attributes()` operation, which returns a list of security attributes (of `Security::AttributeList` type).
## Standard credentials attributes

Two security attribute types are supported by Orbix (of `Security::SecurityAttributeType` type), as follows:

- **Security::_Public**—present in every `Credentials` object. The value of this attribute is always empty.

  **Note:** The `_` (underscore) prefix in `_Public` is needed to avoid a clash with the IDL keyword, `public`. The underscore prefix is, however, omitted from the corresponding C++ and Java identifiers.

- **Security::AccessId**—present only if the `Credentials` object represents a valid credential (containing an X.509 certificate chain). In SSL/TLS, the value of this attribute is the string form of the subject DN of the first certificate in the certificate chain.

## Orbix-specific credentials attributes

Orbix also enables you to access the X.509 certificate chain associated with a `Credentials` object by narrowing the `Credentials` object to one of the following interface types: `IT_TLS_API::Credentials`, `IT_TLS_API::ReceivedCredentials`, or `IT_TLS_API::TargetCredentials`.

## Retrieval method summary

The different credentials types can be retrieved in the following ways:

- **Retrieving own credentials**—a client’s own credentials can be retrieved from the `SecurityLevel2::SecurityManager` object.

- **Retrieving target credentials**—a client can retrieve target credentials (if they are available) by passing the target’s object reference to the `SecurityLevel2::SecurityManager::get_target_credentials()` operation.

- **Retrieving received credentials**—a server can retrieve an authenticated client’s credentials from the `SecurityLevel2::Current` object.
Retrieving Own Credentials

Overview

This section describes how to retrieve own credentials from the security manager object and how to access the information contained in the own credentials.

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Retrieving Own Credentials from the Security Manager

Overview
This section describes how to retrieve an application’s list of own credentials from the security manager object.

The security manager object
The SecurityLevel2::SecurityManager object provides access to ORB-specific security information. The attributes and operations of the SecurityManager object apply to the current security capsule (that is, ORB or group of credentials-sharing ORBs) regardless of the thread of execution.

Security manager operations and attributes
The attributes and operations on the SecurityLevel2::SecurityManager object are described in the CORBA Programmer’s Reference.

C++ example
In C++, you can retrieve an application’s own credentials list as shown in Example 48.

Example 48: Retrieving a C++ Application’s Own Credentials List

```c++
// C++
...
1 CORBA::Object_var obj =
   my_orb->resolve_initial_references("SecurityManager");
SecurityLevel2::SecurityManager_var security_manager_obj =
   SecurityLevel2::SecurityManager::_narrow(obj);
if (CORBA::is_nil(security_manager_obj))
{
   // Error! Deal with failed narrow...
}

2 SecurityLevel2::CredentialsList_var creds_list =
   security_manager_obj->own_credentials();
...
```

The preceding code example can be described, as follows:

1. The standard string, SecurityManager, is used to obtain an initial reference to the SecurityLevel2::SecurityManager object.
2. The list of own credentials is obtained from the own_credentials attribute of the security manager object.
In Java, you can retrieve an application’s own credentials list as shown in Example 49.

**Example 49: Retrieving a Java Application’s Own Credentials List**

```java
// Java
... try {
    org.omg.CORBA.Object obj =
        my_orb.resolve_initial_references("SecurityManager");
        = org.omg.SecurityLevel2.SecurityManagerHelper.narrow(obj);
} catch (org.omg.CORBA.ORB.InvalidName e) { ... }
catch (org.omg.CORBA.BAD_PARAM e) {
    // Error! Deal with failed narrow...
}
org.omg.SecurityLevel2.Credentials[] creds_list =
    security_manager_obj.own_credentials();
...```

The preceding code example can be described, as follows:

1. The standard string, `SecurityManager`, is used to obtain an initial reference to the `SecurityLevel2::SecurityManager` object.
2. The list of own credentials is obtained from the `own_credentials` attribute of the security manager object.
Overview

This subsection explains how to access the information stored in an SSL/TLS credentials object. If a credentials object obtained from the security manager is of SSL/TLS type, you can narrow the credentials to the `IT_TLS_API::TLS Credentials` type to gain access to its X.509 certificate chain.

C++ example

In C++, if the own credentials list contains a list of SSL/TLS credentials, you can access the credentials as follows:

```c++
// C++
for (CORBA::ULong i=0; i < creds_list->length(); i++)
{
    // Access the i’th own credentials in the list
    IT_TLS_API::TLS Credentials_var tls_creds =
        IT_TLS_API::TLS Credentials::narrow(creds_list[i]);
    if (CORBA::is_nil(tls_creds))
    {
        // Error! Deal with failed narrow...
    }

    // Get the first X.509 certificate in the chain
    IT_Certificate::X509 Cert_var cert =
        tls_creds->get_x509_cert();

    // Examine the X.509 certificate, etc.
    ...
}
```
In Java, if the own credentials list contains a list of SSL/TLS credentials, you can access the credentials as follows:

```java
// Java
import com.iona.corba.IT_TLS_API.TLSCredentials;
import com.iona.corba.IT_TLS_API.TLSCredentialsHelper;
import com.iona.corba.IT_Certificate.X509Cert;
...
for (int i=0; i < creds_list.length; i++)
{
    // Access the i’th own credentials in the list
    TLSCredentials tls_creds =
        TLSCredentialsHelper.narrow(creds_list[i]);

    // Get the first X.509 certificate in the chain
    X509Cert cert =
        tls_creds.get_x509_cert();

    // Examine the X.509 certificate, etc.
    ...
}
```
Parsing CSIv2 Own Credentials

Overview
This subsection explains how to access the information stored in a CSIv2 credentials object. If a credentials object obtained from the security manager is of CSIv2 type, you can narrow the credentials to the `IT_CSI::CSICredentials` type.

Java example
In Java, if the own credentials list contains a list of CSIv2 credentials, you can access the credentials as follows:

```java
// Java
import com.iona.corba.IT_CSI.CSICredentials;
import com.iona.corba.IT_CSI.CSICredentialsHelper;
import com.iona.corba.IT_CSI.CSICredentialsType;
import com.iona.corba.IT_CSI.CSICredentialsType.GSSUPCredentials;
import com.iona.corba.IT_CSI.CSICredentialsType.PropagatedCredentials;
...
for (int i=0; i < creds_list.length; i++) {
    // Access the i'th own credentials in the list
    CSICredentials csi_creds =
        CSICredentialsHelper.narrow(creds_list[i]);
    CSICredentialsType csi_type = csi_creds.csi_credentials_type()
    if (csi_type == GSSUPCredentials) {
        System.out.println("[" + i + "] = 
            " + "credentials for CSIv2 authentication mechanism");
    }
}
...
Retrieving Target Credentials

Overview
This section describes how to retrieve the target credentials from a particular target object and how to access the information contained in the target credentials.

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Retrieving Target Credentials from an Object Reference

**Availability of target credentials**
Target credentials are available on the client side only if the client is configured to authenticate the remote target object. For almost all SSL/TLS cipher suites and for all SSL/TLS cipher suites currently supported by Orbix E2A ASP this is the case.

When target credentials are available to the client, they are implicitly associated with an object reference.

**The TargetCredentials interface**
The SecurityLevel2::TargetCredentials interface is the standard type used to represent a target credentials object. It is described in the CORBA Programmer's Reference.

**Interaction with rebind policy**
If you are going to retrieve target credentials, you should be aware of the possible interactions with the rebind policy.

**WARNING:** If you want to check the target credentials, you should ensure that transparent rebinding is disabled by setting the policies:rebind_policy configuration variable to NO_REBIND. Otherwise, a secure association could close (for example, if automatic connection management is enabled) and rebind to a different server without the client being aware of this.
In C++, you can retrieve the target credentials associated with a particular object reference, `target_ref`, as shown in Example 50.

**Example 50: C++ Obtaining Target Credentials**

```cpp
// C++
...
// Given the following prerequisites:
// my_orb - a reference to an ORB instance.
// target_ref - an object reference to a remote, secured object.

CORBA::Object_var obj =
    my_orb->resolve_initial_references("SecurityManager");
SecurityLevel2::SecurityManager_var security_manager_obj =
    SecurityLevel2::SecurityManager::_narrow(obj);
if (CORBA::is_nil(security_manager_obj))
{
    // Error! Deal with failed narrow...
}

SecurityLevel2::TargetCredentials_var target_creds =
    security_manager_obj->get_target_credentials(target_ref);
...
In Java, you can retrieve the target credentials associated with a particular object reference, `target_ref`, as shown in Example 51.

**Example 51: Java Obtaining Target Credentials**

```java
// Java
...
// Given the following prerequisites:
// my_orb - a reference to an ORB instance.
// target_ref - an object reference to a remote, secured object.

try {
    org.omg.CORBA.Object obj =
        my_orb.resolve_initial_references("SecurityManager");
        = org.omg.SecurityLevel2.SecurityManagerHelper.narrow(obj);
} catch (org.omg.CORBA.ORB.InvalidName e) {
    ...
} catch (org.omg.CORBA.BAD_PARAM e) {
    // Error! Deal with failed narrow...
}

org.omg.SecurityLevel2.TargetCredentials target_creds =
    security_manager_obj.get_target_credentials(target_ref);
...
Retrieving Target Credentials

Parsing SSL/TLS Target Credentials

Overview

If you want to access the added value Orbix functionality for SSL/TLS target credentials, perform this additional step after obtaining the target credentials (otherwise, you can use the standard SecurityLevel2::Credentials interface).

Narrow the SecurityLevel2::TargetCredentials object to the IT_TLS_API::TLSTargetCredentials type to gain access to its X.509 certificate.

C++ example

In C++, after obtaining a target credentials object, target_creds, as shown in Example 50 on page 493, you can access the SSL/TLS specific data as follows:

```c++
// C++
...
IT_TLS_API::TLSTargetCredentials_var tls_target_creds =
    IT_TLS_API::TLSTargetCredentials::_narrow(target_creds);
if (CORBA::is_nil(tls_target_creds))
{
    // Error! Deal with failed narrow...
}

// Get the first X.509 certificate in the chain
IT_Certificate::X509Cert_var cert =
    tls_target_creds->get_x509_cert();

// Examine the X.509 certificate, etc.
...
```
Java example

In Java, after obtaining a target credentials object, `target_creds`, as shown in Example 51 on page 494, you can access the SSL/TLS specific data as follows (exception handling not shown):

```java
// Java
import com.iona.corba.IT_TLS_API.TLSTargetCredentials;
import com.iona.corba.IT_TLS_API.TLSTargetCredentialsHelper;
import com.iona.corba.IT_Certificate.X509Cert;
...
TLSTargetCredentials tls_target_creds =
    TLSTargetCredentialsHelper.narrow(target_creds);

// Get the first X.509 certificate in the chain
X509Cert cert =
    tls_target_creds.get_x509_cert();

// Examine the X.509 certificate, etc.
...
```
RetrievingReceivedCredentials

Overview
This section describes how to retrieve received credentials from the current object and how to access the information contained in the received credentials.

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<td>Parsing SSL/TLS Received Credentials</td>
<td>500</td>
</tr>
<tr>
<td>Parsing CSIv2 Received Credentials</td>
<td>502</td>
</tr>
</tbody>
</table>
Retrieving Received Credentials from the Current Object

Role of the SecurityLevel2::Current object
A security-aware server application can obtain information about the attributes of the calling principal through the SecurityLevel2::Current object. The SecurityLevel2::Current object contains information about the execution context.

The SecurityLevel2::Current interface
The SecurityLevel2::Current interface is described in detail in the CORBA Programmer’s Reference.

C++ example
In C++, to obtain received credentials, perform the steps shown in Example 52.

Example 52: C++ Retrieving Received Credentials

```c++
// C++
...
// In the context of an operation/attribute implementation

CORBA::Object_var obj =
    my_orb->resolve_initial_references("SecurityCurrent");
SecurityLevel2::Current_var current_obj =
    SecurityLevel2::Current::_narrow(obj);
if (CORBA::is_nil(current_obj))
{
    // Error! Deal with failed narrow...
}

SecurityLevel2::ReceivedCredentials_var recvd_creds =
    current_obj->received_credentials();
...
```
In Java, to obtain received credentials, perform the steps shown in Example 53.

**Example 53: Java Retrieving Received Credentials**

```java
// Java
...
// In the context of an operation/attribute implementation

try {
    org.omg.CORBA.Object obj =
        my_orb.resolve_initial_references("SecurityCurrent");
        = org.omg.SecurityLevel2.CurrentHelper.narrow(obj);
}
catch (org.omg.CORBA.ORB.InvalidName e) {
    ...
}
catch (org.omg.CORBA.BAD_PARAM e) {
    // Error! Deal with failed narrow...
}

org.omg.SecurityLevel2.ReceivedCredentials recvd_creds =
    current_obj.received_credentials();
...```
 Parsing SSL/TLS Received Credentials

Overview

If you want to access the added value Orbix functionality for SSL/TLS received credentials, perform this additional step (otherwise, you can use the standard SecurityLevel2::Credentials interface).

Narrow the SecurityLevel2::ReceivedCredentials object to the IT_TLS_API::TLSReceivedCredentials type to gain access to its X.509 certificate (this step is specific to Orbix).

C++ example

In C++, after obtaining a received credentials object, `recvd_creds`, (see Example 52 on page 498) you can access the SSL/TLS specific data as follows:

```
// C++
...
IT_TLS_API::TLSReceivedCredentials_var tls_recvd_creds =
    IT_TLS_API::TLSReceivedCredentials::_narrow(recvd_creds);
if (CORBA::is_nil(tls_recvd_creds))
{
    // Error! Deal with failed narrow...
}

// Get the first X.509 certificate in the chain
IT_Certificate::X509Cert_var cert =
    tls_recvd_creds->get_x509_cert();

// Examine the X.509 certificate, etc.
...```
In Java, after obtaining a received credentials object, `recvd_creds`, (see Example 53 on page 499) you can access the SSL/TLS specific data as follows (exception handling not shown):

```java
// Java
import com.iona.corba.IT_TLS_API.TLSReceivedCredentials;
import com.iona.corba.IT_TLS_API.TLSReceivedCredentialsHelper;
import com.iona.corba.IT_Certificate.X509Cert;
...
TLSReceivedCredentials tls_recvd_creds =
    TLSReceivedCredentialsHelper.narrow(recvd_creds);

// Get the first X.509 certificate in the chain
X509Cert cert =
    tls_recvd_creds.get_x509_cert();

// Examine the X.509 certificate, etc.
...
```
Parsing CSIv2 Received Credentials

Overview
If you want to access the added value Orbix functionality for CSIv2 received credentials, you need to narrow the generic SecurityLevel2::ReceivedCredentials object to the IT_CSI::CSIReceivedCredentials type. This subsection explains, with the help of examples, how to access the CSIv2 received credentials.

CSIv2 received credentials
The CSIv2 received credentials are a special case, because the CSIv2 specification allows up to three distinct credentials types to be propagated simultaneously. A CSIv2 received credentials can, therefore, include one or more of the following credentials types:

- Propagated identity credentials (through the CSIv2 identity assertion mechanism).
- GSSUP credentials (through the CSIv2 authentication mechanism).
- Transport credentials (through SSL/TLS).

CSIReceivedCredentials interface
Access to each of the credentials types is provided by the following attributes of the IT_CSI::CSIReceivedCredentials interface:

```idl
// IDL
... module IT_CSI {
...

  local interface CSIReceivedCredentials :
    IT_TLS_API::TLSReceivedCredentials, CSICredentials
  {
    readonly attribute CSICredentials gssup_credentials;
    readonly attribute CSICredentials propagated_identity_credentials;
    readonly attribute SecurityLevel2::Credentials transport_credentials;
  };
...}
```
In Java, after obtaining a received credentials object, `recvd_creds` (see Example 53 on page 499), you can access the CSIv2 specific data as shown in Example 54. This example assumes that CSIv2 authentication is enabled, but not CSIv2 identity assertion. Hence, no attempt is made to access the propagated identity credentials.

**Example 54: Java Parsing CSIv2 Received Credentials**

```java
// Java
import org.omg.Security.*;
import org.omg.SecurityLevel2.*;
import com.iona.corba.IT_CSI.CSIReceivedCredentials;
import com.iona.corba.IT_CSI.CSIReceivedCredentialsHelper;
import com.iona.corba.IT_CSI.CSICredentialsType;
import com.iona.corba.IT_CSI.CSI_SERVER_AS_POLICY;
import com.iona.corba.util.OrbServicesUtility;
...

// Get the TLS received credentials
CSIReceivedCredentials csi_rec_creds = CSIReceivedCredentialsHelper.narrow(recvd_creds);
Credentials transport_credentials_rec = csi_rec_creds.transport_credentials();

// Select the org.omg.Security.AccessId SecAttribute type
AttributeType[] attributes_types = {
    new AttributeType(
        new ExtensibleFamily((short)0, (short)1), AccessId.value
    )
};

SecAttribute[] trans_attribute = transport_credentials_rec.get_attributes(attributes_types);
String trans_access_id = new String(
    trans_attribute[0].value, 0, trans_attribute[0].value.length
);

// Get the GSSUP (username/password) credentials
Credentials gssup_creds = csi_rec_creds.gssup_credentials();
SecAttribute[] gssup_attribute
```
Example 54: Java Parsing CSIv2 Received Credentials

```java
String gssup_access_id = new String(
    gssup_attribute[0].value, 0, gssup_attribute[0].value.length
);
```

The preceding Java example can be explained as follows:

1. This line attempts to narrow the generic received credentials object, `recvd_creds`, to the `IT_CSI::CSIReceivedCredentials` type. If the received credentials object is not of this type, the narrow would fail and a `CORBA::BAD_PARAM` exception would be thrown.

2. The `transport_credentials` attribute accessor returns a reference to the received transport credentials (for example, SSL/TLS), which form part of the overall CSI received credentials. If there is no secure transport or if the client is not configured to send transport credentials, the return value would be `null`.

3. This line initializes a `Security::AttributeTypeList` sequence (Java `org.omg.Security.AttributeType[]` array) with a single attribute type for a `Security::AccessId`.

4. The attribute type list created in the previous line is passed to `get_attributes()` to retrieve the `AccessId` attribute from the received transport credentials. The `AccessId` for the transport credentials is the distinguished name of the subject of the X.509 certificate received from the client. In other words, the `AccessId` identifies the invoking client.

5. This line converts the `AccessId` from its native format (an octet sequence) into a string. The result is a distinguished name in string format (see “ASN.1 and Distinguished Names” on page 645).

This step completes the process of identifying the client using the transport credentials portion of the CSI received credentials.
6. The gssup_credentials attribute accessor returns a reference to the received GSSUP credentials. The GSSUP credentials contain an authenticated username sent by the client using the CSIv2 authentication mechanism. If the client is not configured to use the CSIv2 authentication mechanism, the return value would be null.

7. The get_attributes() operation is invoked to retrieve the AccessId attribute from the received GSSUP credentials. The AccessId for the GSSUP credentials is the client’s username.

8. This line converts the AccessId from its native format (an octet sequence) into a string.

   This step completes the process of identifying the client using the GSSUP portion of the CSI received credentials.
Copying CSI Credentials between Threads

Overview

This section considers a three-tier CSI authentication scenario, where the second-tier server (intermediate server) spawns a separate thread to make a follow-on operation invocation on a third-tier server (target server). Because the original invocation context (that is, thread-specific invocation data) is not available in the newly-spawned thread, it is necessary for the intermediate server to copy CSI received credentials from the original thread to the new thread.

Three-tier CSI scenario

Figure 70 shows a three-tier CORBA application, featuring a client, an intermediate server and a target server, where CSI is used to transmit credentials between the tiers.

Figure 70: Three-Tier CSI Scenario with Copying of CSI Credentials

Scenario description

The scenario shown in Figure 70 on page 506 is almost identical to the scenario described in “Securing Three-Tier CORBA Systems with CSI” on page 82. The difference, in this case, is that the intermediate server spawns a separate thread to perform a follow-on invocation on the target server.
The three tiers interact as follows:

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The client invokes an operation on the intermediate server, passing username, password, and domain credentials (also known as GSSUP credentials) over the CSI authentication layer.</td>
</tr>
<tr>
<td>2</td>
<td>The GSP plug-in in the intermediate server automatically authenticates the credentials received from the client, by calling out to the Orbix security service.</td>
</tr>
<tr>
<td>3</td>
<td>The intermediate server spawns a new thread to make a follow-on operation invocation on the target server. It is at this point that the current scenario differs from the one described in “Securing Three-Tier CORBA Systems with CSI” on page 82. Making the follow-on invocation from within a new thread creates complications for the intermediate server, because the new thread lacks the data from the original thread’s invocation context. In particular, the new thread does not automatically have access to the CSI received credentials. To get around this problem, the intermediate server explicitly copies the CSI received credentials from the original thread to the newly-spawned thread.</td>
</tr>
<tr>
<td>4</td>
<td>After the new thread context is initialized with the CSI received credentials, the follow-on invocation is automatically accompanied by an asserted identity (the client’s username), which is transmitted over the CSI identity layer (the GSP plug-in automatically initializes outgoing CSI credentials, based on the CSI received credentials in the current thread context).</td>
</tr>
</tbody>
</table>

**Threading model in the intermediate server**

The intermediate server spawns a thread to make a follow-on operation invocation on the target server. This enables the intermediate server to be more responsive, by returning from the called operation immediately, without having to wait for the follow-on invocation to finish. A difficulty with this threading model, however, is that the new thread, lacking the data from the original invocation context, does not have automatic access to the CSI received credentials. By default, therefore, the follow-on operation invocation would be transmitted to the target without a CSI asserted identity (probably causing the operation to fail).
The solution to this problem is to pass the CSI received credentials explicitly, from the original thread in the intermediate server to the newly spawned thread. In summary, the new thread should be created as follows:

1. In the original thread, obtain the CSI received credentials object from the security current instance.
2. Pass the CSI received credentials object to the new thread.
3. Within the new thread, call the `IT_CSI::CSICurrent2::set_csi_received_credentials()` function to simulate the receipt of CSI credentials in the current thread context.

**set_csi_received_credentials() function**

In order to set CSI received credentials in a newly spawned thread, call the `IT_CSI::CSICurrent2::set_csi_received_credentials()` function, passing in a reference to an `IT_CSI::CSIReceivedCredentials` object. The signature of this function is as follows:

```cpp
// C++
virtual CORBA::Boolean
set_csi_received_credentials(
    IT_CSI::CSIReceivedCredentials_ptr rec_creds
) IT_THROW_DECL((CORBA::SystemException))
```

**C++ example**

Example 55 shows an example of an intermediate server operation, `mid_tier_operation()`, which implements the threading model described previously. That is, the implementation of this operation extracts the CSI received credentials from the current execution context and passes these credentials to a new thread, `MyThreadBody`.

**Example 55: Mid-Tier Operation that Spawns a New Thread**

```cpp
// C++
void
MidTierImpl::mid_tier_operation()
    IT_THROW_DECL((CORBA::SystemException))
{
    // Obtain a reference to the CSI received credentials.
    CORBA::Object_var obj =
        orb->resolve_initial_references("SecurityCurrent");
    SecurityLevel2::Current_var security2_current =
        SecurityLevel2::Current::_narrow(obj);  
```
Example 55: *Mid-Tier Operation that Spawns a New Thread*

```cpp
SecurityLevel2::ReceivedCredentials_var rec_creds =
    security2_current->received_credentials();
IT_CSI::CSIReceivedCredentials_var csi_rec_creds =
    IT_CSI::CSIReceivedCredentials::_narrow(rec_creds);

// Spawn a new thread to make the follow-on invocation:
MyThreadBody thread_body = new MyThreadBody(csi_rec_creds);
// ... run the thread (not shown) ...
...
// Return, without waiting for the sub-thread to finish.
}
```

Example 56 shows the body of a thread that makes a follow-on invocation on the target server. In order to ensure that a CSI asserted identity is transmitted to the target, the `MyThreadBody::run()` function calls `set_csi_received_credentials()` to simulate the receipt of the received credentials within the current thread context.

Example 56: *Body of Thread that Makes a Follow-On Invocation*

```cpp
// C++
#include <it_ts/thread.h>
#include <it_cal/iostream.h>
#include <stdlib.h>
#include <it_cal/strstream.h>

class MyThreadBody : public IT_ThreadBody
{
    public:
        MyThreadBody(
            IT_CSI::CSIReceivedCredentials_ptr csi_rec_creds
        )
            : m_csi_rec_creds(
                IT_CSI::CSIReceivedCredentials::_duplicate(csi_rec_creds)
            )
            { // Complete
            }

        virtual void* run()
        {
            CORBA::Object_var obj =
                orb->resolve_initial_references("SecurityCurrent");
```
Example 56: Body of Thread that Makes a Follow-On Invocation

IT_CSI::CSICurrent2_var it_csi_current =
    IT_CSI::CSICurrent2::_narrow(obj);

    // Set CSI received credentials in the current context
    CORBA::Boolean creds_set =
        it_csi_current->set_csi_received_credentials(
            m_csi_rec_creds
        );

    // Make the follow-on CORBA operation invocation.
    ...

    IT_CurrentThread::yield();
    return 0;
}

private:
    IT_CSI::CSIReceivedCredentials_var m_csi_rec_creds;
Validating Certificates

During secure authentication, Orbix TLS checks the validity of an application’s certificate. This chapter describes how Orbix validates a certificate and how you can use the Orbix API to introduce additional validation to your applications.

In this chapter

This chapter discusses the following topics:

<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overview of Certificate Validation</td>
<td>512</td>
</tr>
<tr>
<td>The Contents of an X.509 Certificate</td>
<td>515</td>
</tr>
<tr>
<td>Parsing an X.509 Certificate</td>
<td>516</td>
</tr>
<tr>
<td>Controlling Certificate Validation</td>
<td>518</td>
</tr>
<tr>
<td>Obtaining an X.509 Certificate</td>
<td>527</td>
</tr>
</tbody>
</table>
Overview of Certificate Validation

Certificate validation

The Orbix API allows you to define a certificate validation policy that implements custom validation of certificates. During authentication, Orbix validates a certificate and then passes it to a certificate validation object, if you have specified a certificate validation policy. This functionality is useful in systems that have application-specific requirements for the contents of each certificate.

Validation process

A server sends its certificate to a client during a TLS handshake, as follows:
1. The server obtains its certificate (for example, by reading it from a local file) and transmits it as part of the handshake.
2. The client reads the certificate from the network, checks the validity of its contents, and either accepts or rejects the certificate.

Figure 71: Validating a Certificate
Default validation

The default certificate validation in Orbix checks the following:

- The certificate is a validly constructed X.509 certificate.
- The signature is correct for the certificate.
- The certificate has not expired and is currently valid.
- The certificate chain is validly constructed, consisting of the peer certificate plus valid issuer certificates up to the maximum allowed chain depth.
- If the `CertConstraintsPolicy` has been set, the DN of the received peer certificate is checked to see if it passes any of the constraints in the policy conditions. This applies only to the application certificate, not the CA certificates in the chain.

Custom validation

For some applications, it is necessary to introduce additional validation. For example, your client programs might check that each server uses a specific, expected certificate (that is, the distinguished name matches an expected value). Using Orbix, you can perform custom validation on certificates by registering an `IT_TLS_API::CertValidatorPolicy` and implementing an associated `IT_TLS::CertValidator` object.

Example of custom validation

For example, Figure 72 shows the steps followed by Orbix to validate a certificate when a `CertValidatorPolicy` has been registered on the client side:

1. The standard validation checks are applied by Orbix.
2. The certificate is then passed to an `IT_TLS::CertValidator` callback object that performs user-specified validation on the certificate.
3. The user-specified `CertValidator` callback object can decide whether to accept or reject the certificate.
4. Orbix accepts or rejects the certificate.

**Figure 72: Using a CertValidator Callback**
## The Contents of an X.509 Certificate

<table>
<thead>
<tr>
<th>Purpose of a certificate</th>
<th>An X.509 certificate contains information about the certificate subject and the certificate issuer (the CA that issued the certificate).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certificate syntax</td>
<td>A certificate is encoded in Abstract Syntax Notation One (ASN.1), a standard syntax for describing messages that can be sent or received on a network.</td>
</tr>
</tbody>
</table>
| Certificate contents     | The role of a certificate is to associate an identity with a public key value. In more detail, a certificate includes:  
  • X.509 version information.  
  • A *serial number* that uniquely identifies the certificate.  
  • A *common name* that identifies the subject.  
  • The *public key* associated with the common name.  
  • The name of the user who created the certificate, which is known as the *subject name*.  
  • Information about the *certificate issuer*.  
  • The signature of the issuer.  
  • Information about the algorithm used to sign the certificate.  
  • Some optional X.509 v3 extensions. For example, an extension exists that distinguishes between CA certificates and end-entity certificates. |
Parsing an X.509 Certificate

Parsing APIs

Two distinct APIs are used to parse an X.509 certificate, depending on whether you program in C++ or Java, as follows:

- **C++ parsing** uses the interfaces defined in the `IT_Certificate` IDL module.
- **Java parsing** uses the `java.security.cert` package and a subset of the interfaces in the `IT_Certificate` IDL module.

C++ parsing

Orbix E2A ASP provides a high-level set of C++ classes that provide the ability to parse X.509 v3 certificates, including X.509 v3 extensions. When writing your certificate validation functions, you use these classes to examine the certificate contents.

The C++ parsing classes are mapped from the interfaces appearing in the `IT_Certificate` IDL module—see the *CORBA Programmer’s Reference*.

Java parsing

Orbix E2A ASP allows you to use the X.509 functionality provided by the JDK. If you develop Java applications, only the following IDL interfaces are relevant:

- `IT_Certificate::Certificate`
- `IT_Certificate::X509Cert`
- `IT_Certificate::X509CertificateFactory`

To access the information in a Java X.509 certificate, perform the following steps:

1. Extract the DER data from the certificate using the `IT_Certificate::Certificate::encoded_form` attribute.
3. Use the `java.security.cert` package to examine the certificate.
Working with distinguished names in C++

An X.509 certificate uses ASN.1 distinguished name structures to store information about the certificate issuer and subject. A distinguished name consists of a series of attribute value assertions (AVAs). Each AVA associates a value with a field from the distinguished name.

For example, the distinguished name for a certificate issuer could be represented in string format as follows:

/C=IE/ST=Co. Dublin/L=Dublin/O=IONA/OU=PD/CN=IONA

In this example, AVAs are separated by the / character. The first field in the distinguished name is C, representing the country of the issuer, and the corresponding value is the country code IE. This example distinguished name contains six AVAs.

Extracting distinguished names from certificates in C++

Once you have acquired a certificate, the IT_Certificate::Certificate interface permits you to retrieve distinguished names using the getissuer_dn_string() and getsubject_dn_string() operations. These operations return an object derived from the IT_Certificate::AVAList interface. The AVAList interface gives you access to the AVA objects contained in the distinguished name. For more information on these interfaces, see the CORBA Programmer’s Reference.

Working with X.509 extensions in C++

Some X.509 v3 certificates include extensions. These extensions can contain several different types of information. You can use the IT_Certificate::ExtensionList and IT_Certificate::Extension interfaces described in the CORBA Programmer’s Reference to retrieve this information.
Controlling Certificate Validation

You can control how your applications handle certificate validation using the following Orbix policies:

- **CertConstraintsPolicy**: Use this policy to apply conditions that peer X.509 certificates must meet to be accepted.
- **CertificateValidatorPolicy**: Use this policy to create customized validations of peer certificate chains.

This section contains the following subsections:

| Certificate Constraints Policy | page 519 |
| Certificate Validation Policy  | page 523 |
Controlling Certificate Validation

Certificate Constraints Policy

Constraints applied to distinguished names

You can impose rules about which peer certificates to accept using certificate constraints. These are conditions imposed on a received certificate subject's distinguished name (DN). Distinguished names are made up of a number of distinct fields, the most common being Organization Unit (OU) and Common Name (CN). Constraints are not applied to all certificates in a received certificate chain, but only to the first in the list, the peer application certificate.

Alternatives ways to set the constraints policy

Use the certificate constraints policy to apply these conditions. You can set this policy in two ways:

By configuration

This allows you to set constraints at the granularity of an ORB. The same constraints are applied to both client and server peer certificates.

By programming

This allows you to set constraints by ORB, thread, POA, or object reference. You can also differentiate between client and server certificates when specifying constraints.

Setting the CertConstraintsPolicy by configuration

You can set the CertConstraintsPolicy in the configuration file. For example:
"C=US,ST=Massachusetts,O=ABigBank*,OU=Administration"

In this case, the same constraints string applies to all POAs. If you need different constraints for different POAs then you must supply the policy at POA creation time. For more details, see “Applying Constraints to Certificates” on page 384.

Setting the CertConstraintsPolicy by programming

When you specify a CertConstraintsPolicy object on an ORB programmatically, objects created by that ORB apply the certificate constraints to all applications that connect to it.

In the following example, the certificate constraints string specified only allows clients from the Administration Organization unit to connect. The administration user is the only client that has a certificate that satisfies this constraint.

Note: This certificate constraints policy is only relevant if the target object supports client authentication.
The following C++ example shows how to set the `CertConstraintsPolicy` programmatically:

**Example 57: C++ Example of Setting the CertConstraintsPolicy**

```cpp
//C++
...
1   CORBA::PolicyList orb_policies;
   orb_policies.length(1);
2   CORBA::Object_var object =
       global_orb->resolve_initial_references("ORBPolicyManager");
   CORBA::PolicyManager_var policy_mgr = CORBA::PolicyManager::
       _narrow(object);
3   IT_TLS_API::CertConstraints cert_constraints;
   cert_constraints.length(1);
   cert_constraints[0] =
       CORBA::string_dup("C=US,ST=Massachusetts,
                                   O=ABigBank*,OU=Administration");
   any <<= cert_constraints;
4   orb_policies[0] = global_orb->create_policy(IT_TLS_API::
       TLS_CERT_CONSTRAINTS_POLICY, any);
5   policy_mgr->set_policy_overrides(orb_policies, CORBA::
       ADD_OVERRIDE);
```

The preceding C++ example can be explained as follows:

1. Create a `PolicyList` object.
2. Retrieve the `PolicyManager` object.
3. Instantiate a `CertConstraints` data instance (string array).
4. Create a policy using the `CORBA::ORB::create_policy()` operation. The first parameter to this operation sets the policy type to `TLS_CERT_CONSTRAINTS_POLICY`, and the second is an `Any` containing the custom policy.
5. Use the `PolicyManager` to add the new policy override to the Orb scope.
Java example

The following Java example shows how to set the CertConstraintsPolicy programmatically:

**Example 58: Java Example of Setting the CertConstraintsPolicy (Sheet 1 of 2)**

```java
// Java
...
// OMG imports
import org.omg.CORBA.ORBPackage.InvalidName;
import org.omg.CORBA.Policy;
import org.omg.CORBA.PolicyManager;
import org.omg.CORBA.PolicyManagerHelper;
import org.omg.CORBA.SetOverrideType;
...
// Orbix specific security imports
import com.iona.corba.IT_TLS_API.CertConstraintsHelper;
import com.iona.corba.IT_TLS_API.TLS_CERT_CONSTRAINTS_POLICY;

public class Server
{
    public static void main(String args[])
    {
        try
        {
            ...
            PolicyManager pol_manager = null;
            try
            {
                pol_manager = PolicyManagerHelper.narrow(
                        orb.resolve_initial_references("ORBPolicyManager")
                );
            }
            catch(InvalidName invalid_name)
            {
                System.err.println(
                        "x509 initial reference not set. Check plugin list"
                );
                System.exit(1);
            }
            catch(org.omg.CORBA.BAD_PARAM exc)
            {
                System.err.println("narrow to PolicyManager failed.");
                System.exit(1);
            }
            org.omg.CORBA.Any policy_value = orb.create_any();
        }
```
Java example description

The preceding Java example can be explained as follows:

1. Retrieve the PolicyManager object.
2. Instantiate a CertConstraints data instance (string array).
3. Insert the constraint into policy_value (an Any).
4. Create a policy using the CORBA::ORB::create_policy() operation. The first parameter to this operation sets the policy type to TLS_CERT_CONSTRAINTS_POLICY, and the second is an Any containing the custom policy.
5. Use the PolicyManager to add the new policy override to the ORB scope.

```java
String[] constraint = 
    {"C=US,ST=Massachusetts,O=ABigBank*,OU=Administration"};
CertConstraintsHelper.insert(policy_value, constraint);
Policy[] policies = new Policy[1];
policies[0] = orb.create_policy(
    TLS_CERT_CONSTRAINTS_POLICY.value,
    policy_value
);
pol_manager.set_policy_overrides(
    policies,
    SetOverrideType.SET_OVERRIDE
);
```
Certificate Validation Policy

Certificate validation
Your applications can perform customized validation of peer certificate chains. This enables them, for example, to perform special validation on x.509 v3 extensions or do automatic database lookups to validate subject DNs.

Restrictions on custom certificate validation
The customized certificate validation policy cannot make Orbix accept a certificate that the system has already decided is invalid. It can only reject a certificate that would otherwise have been accepted.

Customizing your applications
To customize your applications, perform the following steps:

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Derive a class from the CertValidator signature class.</td>
</tr>
<tr>
<td>2</td>
<td>Override the validate_cert_chain() operation.</td>
</tr>
<tr>
<td>3</td>
<td>Specify the CertValidatorPolicy on the ORB.</td>
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Your customized policy is used in addition to the default CertValidatorPolicy.

Derive a class from the CertValidator signature class
In the following example, an implementation class is derived from the IT_TLS::CertValidator interface:

```c++
//C++
class CustomCertValidatorImpl :
  public virtual IT_TLS::CertValidator,
  public virtual CORBA::LocalObject
{
  public:

  CORBA::Boolean
  validate_cert_chain(
    CORBA::Boolean chain_is_valid,
    const IT_Certificate::X509CertChain& cert_chain,
    const IT_TLS::CertChainErrorInfo& error_info
```
The class contains your custom version of the `validate_cert_chain()` function.

**Override the `validate_cert_chain()` operation**

The following an example custom validation function simply retrieves a name from a certificate:

**Example 59: C++ Example of Overriding `validate_cert_chain()`**

```
//C++
CORBA::Boolean
CustomCertValidatorImpl::validate_cert_chain(
    CORBA::Boolean chain_is_valid,
    const IT_Certificate::X509CertChain& cert_chain,
    const IT_TLS::CertChainErrorInfo& error_info
) {
    if (chain_is_valid)
    {
        CORBA::String_var CN;
        IT_Certificate::X509Cert_var cert = cert_chain[0];

        IT_Certificate::AVAList_var subject =
            cert->get_subject_avalist();

        IT_Certificate::Bytes* subject_string_name;
        subject_string_name = subject->convert(IT_Certificate::
            IT_FMT_STRING);

        int len = subject_string_name->length();
        char *str_name = new char[len];
        for (int i = 0; i < len; i++){
            str_name[i] = (char)((*subject_string_name)[i]);
        }
        return chain_is_valid;
    }
```
The preceding C++ example can be explained as follows:
1. The certificate is retrieved from the certificate chain.
2. An AVAList (see “Working with distinguished names in C++” on page 517) containing the distinguished name is retrieved from the certificate.
3. The distinguished name is converted to string format.

Specify the CertValidatorPolicy on the ORB

Once you have devised your custom validation class, create an instance of it and apply it as a policy to the Orb with the policy manager, as shown in the following example:

**Example 60: C++ Example of Setting the CertValidatorPolicy**

```cpp
//C++
int main(int argc, char* argv[])
{
    CORBA::PolicyTypeSeq types;
    CORBA::PolicyList policies(1);
    CORBA::Any policy_any;
    CORBA::Object_var object;
    CORBA::PolicyManager_var policy_mgr;
    IT_TLS::CertValidator_ptr custom_cert_val_obj;

    policies.length(1);
    types.length(1);
    types[0] = IT_TLS_API::TLS_CERT_VALIDATOR_POLICY;

    CORBA::ORB_var orb = CORBA::ORB_init(argc, argv);
    object = orb->resolve_initial_references("ORBPolicyManager");
    policy_mgr = CORBA::PolicyManager::_narrow(object);

    // set cert validator policy at ORB scope
    custom_cert_val_obj = new CustomCertValidatorImpl;
    policy_any <<= custom_cert_val_obj;

    policies[0] = orb->create_policy(IT_TLS_API::TLS_CERT_VALIDATOR_POLICY, policy_any);

    policy_mgr->set_policy_overrides(
        policies,
        CORBA::ADD_OVERRIDE
    );
}
As can be seen from the above example, you can apply the new CertValidator policy to the Orb in the same manner as any other Orbix2000 policy:

1. Create a CORBA::PolicyList object.
2. Set the type of the appropriate policy slot in the PolicyList to TLS_CERT_VALIDATOR_POLICY. In this example, the first slot is chosen.
3. Retrieve the CORBA::PolicyManager object.
4. Instantiate the custom IT_TLS::CertValidator policy object.
5. Create a policy using the CORBA::ORB::create_policy() operation. The first parameter to this operation sets the policy type to TLS_CERT_VALIDATOR_POLICY, and the second is a CORBA::Any containing the custom policy.
6. Use the PolicyManager to add the new policy override to the ORB scope.
Obtaining an X.509 Certificate

Alternative ways of obtaining certificates

You can obtain a certificate in the following ways:

- Using the `IT_TLS_API::TLSCredentials` interface, which enables you to retrieve X.509 certificates from a credentials object—see “Retrieving Own Credentials” on page 485.

- The `IT_Certificate::X509CertChain` object that Orbix passes to the `IT_TLS::CertValidator::validate_cert_chain()` operation.

- Using the `IT_Certificate::X509CertificateFactory` interface, which creates an `IT_Certificate::X509Cert` object from DER data.

The certificate can be accessed through the `IT_Certificate::X509Cert` interface. For more information on this interface, see the CORBA Programmer’s Reference.
Part VI

iSF Programming

In this part

This part contains the following chapters:

| Developing an iSF Adapter | page 531 |
Developing an iSF Adapter

An iSF adapter is a replaceable component of the iSF server module that enables you to integrate iSF with any third-party enterprise security service. This chapter explains how to develop and configure a custom iSF adapter implementation.

In this chapter

This chapter discusses the following topics:

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iSF Security Architecture

Overview

This section introduces the basic components and concepts of the iSF security architecture, as follows:

- Architecture.
- iSF client.
- iSF client SDK.
- Orbix Security Service.
- iSF adapter SDK.
- iSF adapter.
- Example adapters.
**Architecture**

Figure 73 gives an overview of the Orbix Security Service, showing how it fits into the overall context of a secure system.

**iSF client**

An iSF client is an application that communicates with the Orbix Security Service to perform authentication and authorization operations. The following are possible examples of iSF client applications:

- CORBA servers.
- Artix servers.
- Any server that has a requirement to authenticate its clients.

Hence, an iSF client can also be a server. It is a client only with respect to the Orbix Security Service.
iSF client SDK

The *iSF client SDK* is the programming interface that enables the iSF clients to communicate (usually remotely) with the Orbix Security Service.

**Note:** The iSF client SDK is only used internally. It is currently not available as a public programming interface.

Orbix Security Service

The Orbix Security Service is a standalone process that acts a thin wrapper layer around the iSF server module. On its own, the iSF server module is a Java library which could be accessed only through local calls. By embedding the iSF server module within the Orbix Security Service, however, it becomes possible to access the security service remotely.

iSF server module

The *iSF server module* is a broker that mediates between iSF clients, which request the security service to perform security operations, and a third-party security service, which is the ultimate repository for security data.

The *iSF server module* has the following special features:

- A replaceable iSF adapter component that enables integration with a third-party enterprise security service.
- A single sign-on feature with user session caching.

iSF adapter SDK

The *iSF adapter SDK* is the Java API that enables a developer to create a custom iSF adapter that plugs into the iSF server module.

iSF adapter

An *iSF adapter* is a replaceable component of the iSF server module that enables you to integrate with any third-party enterprise security service. An iSF adapter implementation provides access to a repository of authentication data and (optionally) authorization data as well.
Example adapters

The following standard adapters are provided with Orbix:

- File—a simple adapter implementation that stores authentication and authorization data in a flat file.

**WARNING:** The file adapter is intended for demonstration purposes only. It is not industrial strength and is *not* meant to be used in a production environment.
iSF Server Module Deployment Options

Overview
The iSF server module, which is fundamentally implemented as a Java library, can be deployed in one of the following ways:
- CORBA service.

CORBA service
The iSF server module can be deployed as a CORBA service (Orbix Security Service), as shown in Figure 74. This is the default deployment model for the iSF server module in Orbix. This deployment option has the advantage that any number of distributed iSF clients can communicate with the iSF server module over IIOP/TLS.

With this type of deployment, the iSF server module is packaged as an application plug-in to the Orbix generic server (just like any of the other standard Orbix services). The Orbix Security Service can be launched by the itsecurity executable and basic configuration is set in the iona_services.security scope of the Orbix configuration file.

Figure 74: iSF Server Module Deployed as a CORBA Service
I5SF Adapter Overview

Overview
This section provides an overview of the iSF adapter architecture. The modularity of the iSF server module design makes it relatively straightforward to implement a custom iSF adapter written in Java.

Standard iSF adapters
Orbix provides several ready-made adapters that are implemented with the iSF adapter API. The following standard adapters are currently available:

• File adapter.
• LDAP adapter.

Custom iSF adapters
The iSF server module architecture also allows you to implement your own custom iSF adapter and use it instead of a standard adapter.

Main elements of a custom iSF adapter
The main elements of a custom iSF adapter are, as follows:

• Implementation of the ISF Adapter Java interface.
• Configuration of the ISF adapter using the iSF properties file.

Implementation of the ISF Adapter Java interface
The only code that needs to be written to implement an iSF adapter is a class to implement the IS2Adapter Java interface. The adapter implementation class should respond to authentication requests either by checking a repository of user data or by forwarding the requests to a third-party enterprise security service.

Configuration of the ISF adapter using the iSF properties file
The iSF adapter is configured by setting Java properties in the is2.properties file. The is2.properties file stores two kinds of configuration data for the iSF adapter:

• Configuration of the iSF server module to load the adapter—see “Configuring iSF to Load the Adapter” on page 549.
• Configuration of the adapter itself—see “Setting the Adapter Properties” on page 550.
Implementing the IS2Adapter Interface

Overview

The `com.iona.security.is2adapter` package defines an `IS2Adapter` Java interface, which a developer must implement to create a custom iSF adapter. The methods defined on the `ISFAdapter` class are called by the iSF server module in response to requests received from iSF clients.

This section describes a simple example implementation of the `IS2Adapter` interface, which is capable of authenticating a single test user with hard-coded authorization properties.

Test user

The example adapter implementation described here permits authentication of just a single user, `test_user`. The test user has the following authentication data:

Username: test_user
Password: test_password

and the following authorization data:

- The user’s global realm contains the `GuestRole` role.
- The user’s `EngRealm` realm contains the `EngineerRole` role.
- The user’s `FinanceRealm` realm contains the `AccountantRole` role.

iSF adapter example

Example 61 shows a sample implementation of an iSF adapter class, `ExampleAdapter`, that permits authentication of a single user. The user’s username, password, and authorization are hard-coded. In a realistic system, however, the user data would probably be retrieved from a database or from a third-party enterprise security system.

Example 61: Sample ISF Adapter Implementation

```java
import com.iona.security.azmgr.AuthorizationManager;
import com.iona.security.common.AuthenticatedPrincipal;
import com.iona.security.common.Realm;
import com.iona.security.common.Role;
import com.iona.security.is2adapter.IS2Adapter;
import com.iona.security.is2adapter.IS2AdapterException;
import java.util.Properties;
import java.util.ArrayList;
import java.security.cert.X509Certificate;
```
Example 61: Sample ISF Adapter Implementation

```java
import org.apache.log4j.*;
import java.util.ResourceBundle;

import java.util.MissingResourceException;

public class ExampleAdapter implements IS2Adapter {

    public final static String EXAMPLE_PROPERTY = "example_property";

    public final static String ADAPTER_NAME = "ExampleAdapter";

    private final static String MSG_EXAMPLE_ADAPTER_INITIALIZED = "initialized";
    private final static String MSG_EXAMPLE_ADAPTER_CLOSED = "closed";
    private final static String MSG_EXAMPLE_ADAPTER_AUTHENTICATE = "authenticate";
    private final static String MSG_EXAMPLE_ADAPTER_AUTHENTICATE_REALM = "authenticate_realm";
    private final static String MSG_EXAMPLE_ADAPTER_AUTHENTICATE_OK = "authenticateok";
    private final static String MSG_EXAMPLE_ADAPTER_GETAUTHINFO = "getauthinfo";
    private final static String MSG_EXAMPLE_ADAPTER_GETAUTHINFO_OK = "getauthinfook";

    private ResourceBundle _res_bundle = null;

    private static Logger LOG = Logger.getLogger(ExampleAdapter.class.getName());

    public ExampleAdapter() {
        _res_bundle = ResourceBundle.getBundle("ExampleAdapter");
        LOG.setResourceBundle(_res_bundle);
    }

    public void initialize(Properties props) throws IS2AdapterException {
        LOG.debug(Priority.INFO, ADAPTER_NAME + "." + MSG_EXAMPLE_ADAPTER_INITIALIZED, null);
```
Example 61: Sample ISF Adapter Implementation

```java
// example property
String propVal = props.getProperty(EXAMPLE_PROPERTY);
LOG.info(propVal);
}

public void close() throws IS2AdapterException {
    LOG.l7dlog(Priority.INFO, ADAPTER_NAME + "." +
    MSG_EXAMPLE_ADAPTER_CLOSED, null);
}

public AuthenticatedPrincipal authenticate(String username,
String password)
throws IS2AdapterException {
    LOG.l7dlog(Priority.INFO, ADAPTER_NAME + "." +
    MSG_EXAMPLE_ADAPTER_AUTHENTICATE,new
    Object[]{username,password},null);
    AuthenticatedPrincipal ap = null;
    try{
        if (username.equals("test_user")
            && password.equals("test_password")) {
            ap = getAuthorizationInfo(new
            AuthenticatedPrincipal(username));
        }
    } catch (Exception e) {
        LOG.l7dlog(Priority.WARN, ADAPTER_NAME + "." +
        IS2AdapterException.AUTH_FAILED,e);
        throw new IS2AdapterException(_res_bundle,this,
        IS2AdapterException.AUTH_FAILED, new Object[]{username}, e);
    }
    LOG.l7dlog(Priority.WARN, ADAPTER_NAME + "." +
    MSG_EXAMPLE_ADAPTER_AUTHENTICATE_OK,null);
    return ap;
```
Example 61: Sample ISF Adapter Implementation

```java
public AuthenticatedPrincipal authenticate(String realmname,
String username, String password)
throws IS2AdapterException {
    LOG.message(Priority.INFO, ADAPTER_NAME + "." +
    MSG_EXAMPLE_ADAPTER_AUTHENTICATE_REALM,new
Object[]{realmname,username,password},null);

    AuthenticatedPrincipal ap = null;
    try{
        if (username.equals("test_user")
        && password.equals("test_password")){
            AuthenticatedPrincipal principal = new
AuthenticatedPrincipal(username);
            principal.setCurrentRealm(realmname);
            ap = getAuthorizationInfo(principal);
        } else {
            LOG.message(Priority.WARN, ADAPTER_NAME + "." +
IS2AdapterException.WRONG_NAME_PASSWORD,null);
            throw new IS2AdapterException(_res_bundle, this,
IS2AdapterException.WRONG_NAME_PASSWORD, new
Object[]{username});
        }
    } catch (Exception e) {
        LOG.message(Priority.WARN, ADAPTER_NAME + "." +
IS2AdapterException.AUTH_FAILED,e);
        throw new IS2AdapterException(_res_bundle, this,
IS2AdapterException.AUTH_FAILED, new Object[]{username}, e);
    }

    LOG.message(Priority.WARN, ADAPTER_NAME + "." +
MSG_EXAMPLE_ADAPTER_AUTHENTICATE_OK,null);
    return ap;
}
```

```java
public AuthenticatedPrincipal authenticate(X509Certificate certificate)
throws IS2AdapterException {
    throw new IS2AdapterException(_res_bundle, this,
IS2AdapterException.NOT_IMPLEMENTED
```
Example 61: Sample ISF Adapter Implementation

```java
public AuthenticatedPrincipal authenticate(String realm, X509Certificate certificate) throws IS2AdapterException {
    throw new IS2AdapterException(_res_bundle, this, IS2AdapterException.NOT_IMPLEMENTED);
}

public AuthenticatedPrincipal getAuthorizationInfo(AuthenticatedPrincipal principal) throws IS2AdapterException {
    LOG.17dlog(Priority.INFO, ADAPTER_NAME + "." + MSG_EXAMPLE_ADAPTER_GETAUTHINFO, new Object[] {principal.getUserID()}, null);

    AuthenticatedPrincipal ap = null;
    String username = principal.getUserID();
    String realmname = principal.getCurrentRealm();
    try {
        if (username.equals("test_user")) {
            ap = new AuthenticatedPrincipal(username);
            ap.addRole(new Role("GuestRole", ""));
        }
        if (realmname == null || (realmname != null && realmname.equals("EngRealm"))) {
            ap.addRealm(new Realm("EngRealm", ""));
            ap.addRole("EngRealm", new Role("EngineerRole", ""));
        }
        if (realmname == null || (realmname != null && realmname.equals("FinanceRealm"))) {
            ap.addRealm(new Realm("FinanceRealm", ""));
            ap.addRole("FinanceRealm", new Role("AccountantRole", ""));
        }
    }
}```
Example 61: Sample ISF Adapter Implementation

```java
else {
    LOG.log(Priority.WARN, ADAPTER_NAME + "." +
    IS2AdapterException.USER_NOT_EXIST, new Object[]{username},
    null);
    throw new IS2AdapterException(_res_bundle, this,
    IS2AdapterException.USER_NOT_EXIST, new Object[]{username});
}

} catch (Exception e) {
    LOG.log(Priority.WARN, ADAPTER_NAME + "." +
    IS2AdapterException.AUTH_FAILED, e);
    throw new IS2AdapterException(_res_bundle, this,
    IS2AdapterException.AUTH_FAILED, new Object[]{username}, e);
}

LOG.log(Priority.WARN, ADAPTER_NAME + "." +
MSG_EXAMPLE_ADAPTER_GETAUTHINFO_OK,null);
return ap;
}

public AuthenticatedPrincipal getAuthorizationInfo(String
username) throws IS2AdapterException{
    // this method has been deprecated
    throw new IS2AdapterException(
    _res_bundle, this,
    IS2AdapterException.NOT_IMPLEMENTED
    );
}

public AuthenticatedPrincipal getAuthorizationInfo(String
realmname, String username) throws IS2AdapterException{
    // this method has been deprecated
    throw new IS2AdapterException(
    _res_bundle, this,
    IS2AdapterException.NOT_IMPLEMENTED
    );
}

public ArrayList getAllUsers()
throws IS2AdapterException {
```
The preceding iSF adapter code can be explained as follows:

1. These lines list the keys to the messages from the adapter’s resource bundle. The resource bundle stores messages used by the Log4J logger and exceptions thrown in the adapter.

2. This line creates a Log4J logger.

3. This line loads the resource bundle for the adapter.

4. The `initialize()` method is called just after the adapter is loaded. The properties passed to the `initialize()` method, `props`, are the adapter properties that the iSF server module has read from the `is2.properties` file.

   See “Setting the Adapter Properties” on page 550 for more details.

5. The `close()` method is called to shut down the adapter. This gives you an opportunity to clean up and free resources used by the adapter.

6. This variant of the `IS2Adapter.authenticate()` method is called whenever an iSF client calls `AuthManager.authenticate()` with username and password parameters.

   In this simple demonstration implementation, the `authenticate()` method recognizes only one user, `test_user`, with password, `test_password`.

7. This line calls a Log4J method in order to log a localized and parametrized message to indicate that the authenticate method has been called with the specified username and password values. Since all the keys in the resource bundle begin with the adapter name, the adapter name is prepended to the
8. If authentication is successful; that is, if the name and password passed in match \texttt{test\_user} and \texttt{test\_password}, the \texttt{getAuthorizationInfo()} method is called to obtain an \texttt{AuthenticatedPrincipal} object populated with all of the user’s realms and role.

9. If authentication fails, an \texttt{IS2AdapterException} is raised with minor code \texttt{IS2AdapterException.WRONG\_NAME\_PASSWORD}. The resource bundle is passed to the exception as it accesses the exception message from the bundle using the key, \texttt{ExampleAdapter.wrongUsernamePassword}.

10. This variant of the \texttt{IS2Adapter.authenticate()} method is called whenever an iSF client calls \texttt{AuthManager.authenticate()} with realm name, username and password parameters. This method differs from the preceding username/password authenticate() method in that only the authorization data for the specified realm and the global realm are included in the return value.

11. If authentication is successful, the \texttt{getAuthorizationInfo()} method is called to obtain an \texttt{AuthenticatedPrincipal} object populated with the authorization data from the specified realm and the global realm.

12. This variant of the \texttt{IS2Adapter.authenticate()} method is called whenever an iSF client calls \texttt{AuthManager.authenticate()} with an X.509 certificate parameter.

13. This variant of the \texttt{IS2Adapter.authenticate()} method is called whenever an iSF client calls \texttt{AuthManager.authenticate()} with a realm name and an X.509 certificate parameter. This method differs from the preceding certificate authenticate() method in that only the authorization data for the specified realm and the global realm are included in the return value.

14. This method should create an \texttt{AuthenticatedPrincipal} object for the username user. If a realm is not specified in the principal, the \texttt{AuthenticatedPrincipal} is populated with all realms and roles for this
user. If a realm is specified in the principal, the AuthenticatedPrincipal is populated with authorization data from the specified realm and the global realm only.

15. This line creates a new AuthenticatedPrincipal object for the username user to hold the user’s authorization data.

16. This line adds a GuestRole role to the global realm, IONAGlobalRealm, using the single-argument form of addRole(). Roles added to the global realm implicitly belong to every named realm as well.

17. This line checks if no realm is specified in the principal or if the realm, EngRealm, is specified. If either of these is true, the following lines add the authorization realm, EngRealm, to the AuthenticatedPrincipal object and add the EngineerRole role to the EngRealm authorization realm.

18. This line checks if no realm is specified in the principal or if the realm, FinanceRealm, is specified. If either of these is true, the following lines add the authorization realm, FinanceRealm, to the AuthenticatedPrincipal object and add the AccountantRole role to the FinanceRealm authorization realm.

19. Since SSO was introduced to Orbix, this variant of the IS2Adapter.getAuthorizationInfo() method has been deprecated. The method

   IS2Adapter.getAuthorizationInfo(AuthenticatedPrincipal principal)

   should be used instead

20. Since SSO was introduced to Orbix, this variant of the IS2Adapter.getAuthorizationInfo() method has also been deprecated. The method

   IS2Adapter.getAuthorizationInfo(AuthenticatedPrincipal principal)

   should be used instead

21. The getAllUsers() method is currently not used by the iSF server module during runtime. Hence, there is no need to implement this method currently.

22. When the logout() method is called, you can perform cleanup and release any resources associated with the specified user principal. The iSF server module calls back on IS2Adapter.logout() either in response to a user calling AuthManager.logout() explicitly or after an SSO session has timed out.
Deploying the Adapter

Overview
This section explains how to deploy a custom iSF adapter.

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## Configuring iSF to Load the Adapter

### Overview
You can configure the iSF server module to load a custom adapter by setting the following properties in the iSF server module’s `is2.properties` file:

- **Adapter name.**
- **Adapter class.**

### Adapter name
The iSF server module loads the adapter identified by the `com.iona.isp.adapters` property. Hence, to load a custom adapter, `AdapterFactoryName`, set the property as follows:

```
com.iona.isp.adapters=AdapterFactoryName
```

**Note:** In the current implementation, the iSF server module can load only a single adapter at a time.

### Adapter class
The name of the adapter class to be loaded is specified by the following property setting:

```
com.iona.isp.adapter.AdapterName.class=AdapterClass
```

### Example adapter
For example, the example adapter provided shown previously can be configured to load by setting the following properties:

```
com.iona.isp.adapters=example
com.iona.isp.adapter.example.class=isfadapter.ExampleAdapter
```
## Setting the Adapter Properties

### Overview
This subsection explains how you can set properties for a specific custom adapter in the `is2.properties` file.

### Adapter property name format
All configurable properties for a custom file adapter, `AdapterName`, should have the following format:

```java
com.iona.isp.adapter.AdapterName.param.PropertyName
```

### Truncation of property names
Adapter property names are truncated before being passed to the iSF adapter. That is, the `com.iona.ispadapter.AdapterName.param` prefix is stripped from each property name.

### Example
For example, given an adapter named `ExampleAdapter` which has two properties, `host` and `port`, these properties would be set as follows in the `is2.properties` file:

```java
com.iona.isp.adapter.example.param.example_property="This is an example property"
```

Before these properties are passed to the iSF adapter, the property names are truncated as if they had been set as follows:

```java
example_property="This is an example property"
```

### Accessing properties from within an iSF adapter
The adapter properties are passed to the iSF adapter through the `com.iona.security.is2adapter.IS2Adapter.initialize()` callback method. For example:

```java
... public void initialize(java.util.Properties props) throws IS2AdapterException {
    // Access a property through its truncated name.
    String propVal = props.getProperty("PropertyName")
    ... }...```
Loading the Adapter Class and Associated Resource Files

Overview
You need to make appropriate modifications to your CLASSPATH to ensure that
the iSF server module can find your custom adapter class.
In all cases, the location of the file used to configure Log4j logging can be set
using the log4j.configuration property in the is2.properties file.

CORBA service
By default, the Orbix Security Service uses the iona_services.security scope
in your Orbix configuration file (or configuration repository service). Modify the
plugins:java_server:classpath variable to include the directory containing
the compiled adapter class and the adapter’s resource bundle. The
plugins:java_server:classpath variable uses the value of the
SECURITY_CLASSPATH variable.
For example, if the adapter class and adapter resource bundle are located in the
OrbixInstallDir\ExampleAdapter directory, you should set the
SECURITY_CLASSPATH variable as follows:

```
# Orbix configuration file
SECURITY_CLASSPATH =
  "OrbixInstallDir\ExampleAdapter;OrbixInstallDir\etc\domains;OrbixInstallDir\etc\domains\DomainName;OrbixInstallDir\asp\Version\lib\security.jar";
```

The Orbix Security Service launches a Java process which uses the classpath
defined in the securityserver_ce.xml file which is located in the
OrbixInstallDir/etc/domains/DomainName/resources directory. This
classpath also needs to be modified.
In this case, you must also modify the `<ce:loader>` element of `securityserver_ce.xml` file, as shown in the following example:

```
# securityserver_ce.xml file
...
<ce:loader>
    <ce:location>OrbixInstallDir\ExampleAdapter</ce:location>
    <ce:location>${java.home}/../lib/tools.jar</ce:location>
    <ce:location>OrbixInstallDir\etc\domains</ce:location>
    <ce:location>OrbixInstallDir\asp\Version\bin\.\lib\security.jar</ce:location>
</ce:loader>
...
```
Security

This appendix describes variables used by the Orbix Security Framework. The Orbix security infrastructure is highly configurable.

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Applying Constraints to Certificates

Certificate constraints policy
You can use the `CertConstraintsPolicy` to apply constraints to peer X.509 certificates by the default `CertificateValidatorPolicy`. These conditions are applied to the owner’s distinguished name (DN) on the first certificate (peer certificate) of the received certificate chain. Distinguished names are made up of a number of distinct fields, the most common being Organization Unit (OU) and Common Name (CN).

Configuration variable
You can specify a list of constraints to be used by `CertConstraintsPolicy` through the `policies:iiop_tls:certificate_constraints_policy` or `policies:https:certificate_constraints_policy` configuration variables. For example:

```
policies:iiop_tls:certificate_constraints_policy = [
"CN=Johnny*,OU=[unit1|IT_SSL],O=IONA,C=Ireland,ST=Dublin,L=Earth", 
"CN=Paul*,OU=SSLTEAM,O=IONA,C=Ireland,ST=Dublin,L=Earth", 
"CN=TheOmnipotentOne"];
```

Constraint language
These are the special characters and their meanings in the constraint list:

- `*` Matches any text. For example:
  - `an*` matches `ant` and `anger`, but not `aunt`

- `[]` Grouping symbols.

- `|` Choice symbol. For example:
  - `OU=[unit1|IT_SSL]` signifies that if the OU is `unit1` or `IT_SSL`, the certificate is acceptable.

- `=, !=` Signify equality and inequality respectively.

Example
This is an example list of constraints:

```
policies:iiop_tls:certificate_constraints_policy = [
  "OU=[unit1|IT_SSL],CN=Steve*,L=Dublin",
  "OU=IT_ART*,OU!=IT_ART testers,CN=[Jan|Donal],ST=Boston* 
];
```
This constraint list specifies that a certificate is deemed acceptable if and only if it satisfies one or more of the constraint patterns:

If
   The OU is unit1 or IT_SSL
   And
   The CN begins with the text Steve
   And
   The location is Dublin
Then the certificate is acceptable
Else (moving on to the second constraint)
If
   The OU begins with the text IT_ART but isn't IT_ARTtesters
   And
   The common name is either Donal or Jan
   And
   The State is Boston
Then the certificate is acceptable
Otherwise the certificate is unacceptable.

The language is like a boolean OR, trying the constraints defined in each line until the certificate satisfies one of the constraints. Only if the certificate fails all constraints is the certificate deemed invalid.

Note that this setting can be sensitive about white space used within it. For example, "CN=" might not be recognized, where "CN=" is recognized.

Distinguished names

For more information on distinguished names, see the Security Guide.
The following configuration variables are defined in the root namespace:

- **itadmin_x509_cert_root**

**itadmin_x509_cert_root**

This configuration variable specifies the directory containing administrator certificates for the `itadmin` utility. The administrator certificates are used specifically for performing KDM administration tasks.

For example, if you choose the directory, `X509Deploy/certs/admin`, for your `itadmin` certificates, you would set `itadmin_x509_cert_root` as follows:

```
# Orbix Configuration File
itadmin_x509_cert_root = "X509Deploy/certs/admin";
...
```

To administer the KDM, you must override the ordinary certificate with an administrator certificate, using the `itadmin admin_logon` subcommand. See “KDM Administration” on page 397 for details.
The `initial_references` namespace contains the following configuration variables:

- `IT_TLS_Toolkit:plugin`

### IT_TLS_Toolkit:plugin

This configuration variable enables you to specify the underlying SSL/TLS toolkit to be used by Orbix. It is used in conjunction with the `plugins:baltimore_toolkit:shlib_name`, `plugins:openssl_toolkit:shlib_name`, `plugins:schannel_toolkit:shlib_name` (Windows only) and `plugins:systemssl_toolkit:shlib_name` (z/OS only) configuration variables to implement SSL/TLS toolkit replaceability.

The default is the Baltimore toolkit.

For example, to specify that an application should use the Schannel SSL/TLS toolkit, you would set configuration variables as follows:

```ini
initial_references:IT_TLS_Toolkit:plugin = "schannel_toolkit";
plugins:schannel_toolkit:shlib_name = "it_tls_schannel";
```
password_retrieval_mechanism

The configuration variables in the `password_retrieval_mechanism` namespace are intended to be used only by the Orbix services. The following variables are defined in this namespace:

- **inherit_from_parent**
- **use_my_password_as_kdm_password**

**inherit_from_parent**

If an application forks a child process and this variable is set to `true`, the child process inherits the parent’s password through the environment.

**use_my_password_as_kdm_password**

This variable should be set to `true` only in the scope of the KDM plug-ins container. From a security perspective it is dangerous to do otherwise as the password could be left in cleartext within the process.

The KDM is a locator plug-in and so it is natural that it should use the locator’s identity as its identity. However, it requires a password to encrypt its security information. By default the KDM requests such a password from the user during locator startup and this is separate from the locator password. The locator password would be used if this variable is set to `true`.
plugins:atli2_tls

The plugins:atli2_tls namespace contains the following variables:

- cert_store_protocol
- cert_store_provider
- kmf_algorithm
- tmf_algorithm
- use_jsse_tk

cert_store_protocol

*(Java only)* This variable is used in conjunction with policies:tls:use_external_cert_store to configure Orbix to use an external certificate store. Orbix passes the value of this variable as the protocol argument to the javax.net.ssl.SSLContext.getInstance() method. To obtain a list of possible values for this variable, consult the documentation for your third-party JSSE/JCS security provider.

For example, if your application is using the Sun JSSE security provider, you can configure the certificate store to use the SSLv3 protocol as follows:

```java
plugins:atli2_tls:cert_store_protocol = "SSLv3";
```

cert_store_provider

*(Java only)* This variable is used in conjunction with policies:tls:use_external_cert_store to configure Orbix to use an external certificate store. Orbix passes the value of this variable as the provider argument to the javax.net.ssl.SSLContext.getInstance() method. To obtain a list of possible values for this variable, consult the documentation for your third-party JSSE/JCS security provider.

For example, if your application is using the Sun JSSE security provider, you can configure the certificate store provider as follows:

```java
plugins:atli2_tls:cert_store_provider = "SunJSSE";
```
**kmf_algorithm**

*(Java only)*  This variable is used in conjunction with `policies:tls:use_external_cert_store` to configure Orbix to use an external certificate store. Orbix passes the value of this variable as the `algorithm` argument to the `javax.net.ssl.KeyManagerFactory.getInstance()` method, overriding the value of the `ssl.KeyManagerFactory.algorithm` property set in the `java.security` file. To obtain a list of possible values for this variable, consult the documentation for your third-party JSSE/JCS security provider.

For example, if your application is using the Sun JSSE security provider, you can configure the key manager factory to use the following algorithm:

```java
plugins:atli2_tls:kmf_algorithm = "SunX509";
```

**tmf_algorithm**

*(Java only)*  This variable is used in conjunction with `policies:tls:use_external_cert_store` to configure Orbix to use an external certificate store. Orbix passes the value of this variable as the `algorithm` argument to the `javax.net.ssl.TrustManagerFactory.getInstance()` method, overriding the value of the `ssl.TrustManagerFactory.algorithm` property set in the `java.security` file. To obtain a list of possible values for this variable, consult the documentation for your third-party JSSE/JCS security provider.

For example, if your application is using the Sun JSSE security provider, you can configure the trust manager factory to use the following algorithm:

```java
plugins:atli2_tls:tmf_algorithm = "SunX509";
```

**use_jsse_tk**

*(Java only)*  Specifies whether or not to use the JSSE/JCE architecture with Orbix Java applications. If `true`, Orbix uses the JSSE/JCE architecture to implement SSL/TLS security; if `false`, Orbix uses the Baltimore SSL/TLS toolkit.

The default is `false`. 
plugins:csi

The plugins:csi namespace includes variables that specify settings for Common Secure Interoperability version 2 (CSIv2):

• allow_csi_reply_without_service_context.
• ClassName.
• shlib_name.
• use_legacy_policies.

allow_csi_reply_without_service_context

(Java only) Boolean variable that specifies whether a CSIv2 client enforces strict checking for the presence of a CSIv2 service context in the reply it receives from the server.

Up until Orbix 6.2 SP1, the Java implementation of the CSIv2 protocol permitted replies from a CSIv2 enabled server even if the server did not send a CSIv2 response. From Orbix 6.2 SP1 onwards, this variable determines whether or not the client checks for a CSIv2 response.

If the variable is set to false, the client enforces strict checking on the server reply. If there is no CSIv2 service context in the reply, a NO_PERMISSION exception with the minor code, BAD_SASSERVICECONTEXT, is thrown by the client.

If the variable is set to true, the client does not enforce strict checking on the reply. If there is no CSIv2 service context in the reply, the client does not raise an exception.

Default is true.

ClassName

ClassName specifies the Java class that implements the csi plugin. The default setting is:

plugins:csi:ClassName = "com.iona.corba.security.csi.CSIPlugin";
This configuration setting makes it possible for the Orbix core to load the plugin on demand. Internally, the Orbix core uses a Java class loader to load and instantiate the `csi` class. Plugin loading can be initiated either by including the `csi` in the `orb_plugins` list, or by associating the plugin with an initial reference.

---

**shlib_name**

`shlib_name` identifies the shared library (or DLL in Windows) containing the `csi` plugin implementation.

```ini
plugins:csi:shlib_name = "it_csi_prot";
```

The `csi` plug-in becomes associated with the `it_csi_prot` shared library, where `it_csi_prot` is the base name of the library. The library base name, `it_csi_prot`, is expanded in a platform-dependent manner to obtain the full name of the library file.

---

**use_legacy_policies**

Boolean variable that specifies whether the application can be programmed using the new CSIv2 policy types or the older (legacy) CSIv2 policy types. If `plugins:csi:use_legacy_policies` is set to `true`, you can program CSIv2 using the following policies:

- `IT_CSI::AuthenticationServicePolicy`
- `IT_CSI::AttributeServicePolicy`

If `plugins:csi:use_legacy_policies` is set to `false`, you can program CSIv2 using the following policies:

- `IT_CSI::AttributeServiceProtocolClient`
- `IT_CSI::AttributeServiceProtocolServer`

Default is `false`. 
The `plugins:gsp` namespace includes variables that specify settings for the Generic Security Plugin (GSP). This provides authorization by checking a user’s roles against the permissions stored in an action-role mapping file. It includes the following:

- `accept_asserted_authorization_info`
- `action_role_mapping_file`
- `assert_authorization_info`
- `authentication_cache_size`
- `authentication_cache_timeout`
- `authorization_policy_enforcement_point`
- `authorization_policy_store_type`
- `authorization_realms`
- `ClassName`
- `enable_authorization`
- `enable_gssup_sso`
- `enable_user_id_logging`
- `enable_x509_sso`
- `enforce_secure_comms_to_sso_server`
- `enable_security_service_cert_authentication`
- `retrieve_isf_auth_principal_info_for_all_realms`
- `sso_server_certificate_constraints`
- `use_client_load_balancing`

**accept_asserted_authorization_info**

If `false`, SAML data is not read from incoming connections. Default is `true`.

**action_role_mapping_file**

Specifies the action-role mapping file URL. For example:
plugins: gsp

plugins:gsp:action_role_mapping_file =
   "file:///my/action/role/mapping";

assert_authorization_info

If false, SAML data is not sent on outgoing connections. Default is true.

authentication_cache_size

The maximum number of credentials stored in the authentication cache. If this size is exceeded the oldest credential in the cache is removed. A value of -1 (the default) means unlimited size. A value of 0 means disable the cache.

authentication_cache_timeout

The time (in seconds) after which a credential is considered stale. Stale credentials are removed from the cache and the server must re-authenticate with the Orbix security service on the next call from that user. The cache timeout should be configured to be smaller than the timeout set in the is2.properties file (by default, that setting is is2.sso.session.timeout=600). A value of -1 (the default) means an infinite time-out. A value of 0 means disable the cache.

authorization_policy_enforcement_point

Specifies whether access decisions should be made locally (based on cached ACL data) or delegated to the Orbix security service. This variable is meaningful only when the authorization_policy_store_type is set to centralized. This configuration variable can have the following values:

- local—after retrieving and caching ACL data from the Orbix security service, the GSP plug-in consults only the local cache when making access decisions.
• centralized—this option is currently not implemented. If you set this option, the application will throw a CORBA::NO_IMPLEMENT system exception.

The default is local.

authorization_policy_store_type

Specifies whether ACL data should be stored locally (on the same host as the Orbix application) or centrally (on the same host as the Orbix security server). This configuration variable can have the following values:

• local—retrieves ACL data from the local file specified by the plugins:gsp:action_role_mapping_file configuration variable.
• centralized—retrieves ACL data from the Orbix security service. The Orbix security service must be configured to support centralized ACLs by editing the relevant properties in its is2.properties file.

The default is local.

authorization_realm

authorization_realm specifies the iSF authorization realm to which a server belongs. The value of this variable determines which of a user's roles are considered when making an access control decision.

For example, consider a user that belongs to the ejb-developer and corba-developer roles within the Engineering realm, and to the ordinary role within the Sales realm. If you set plugins:gsp:authorization_realm to Sales for a particular server, only the ordinary role is considered when making access control decisions (using the action-role mapping file).

ClassName

ClassName specifies the Java class that implements the gsp plugin. This configuration setting makes it possible for the Orbix core to load the plugin on demand. Internally, the Orbix core uses a Java class loader to load
instantiate the `gsp` class. Plugin loading can be initiated either by including the `csi` in the `orb_plugins` list, or by associating the plugin with an initial reference.

---

**enable_authorization**

A boolean GSP policy that, when `true`, enables authorization using action-role mapping ACLs in server.

Default is `true`.

---

**enable_gssup_sso**

Enables SSO with a username and a password (that is, GSSUP) when set to `true`.

---

**enable_user_id_logging**

A boolean variable that enables logging of user IDs on the server side. Default is `false`.

Up until the release of Orbix 6.1 SP1, the GSP plug-in would log messages containing user IDs. For example:

```
   (IT_CSI:205) I - User alice authenticated successfully.
```

In some cases, however, it might not be appropriate to expose user IDs in the Orbix log. From Orbix 6.2 onward, the default behavior of the GSP plug-in is changed, so that user IDs are `not` logged by default. To restore the pre-Orbix 6.2 behavior and log user IDs, set this variable to `true`.

---

**enable_x509_sso**

Enables certificate-based SSO when set to `true`. 
**enforce_secure_comms_to_sso_server**

Enforces a secure SSL/TLS link between a client and the login service when set to true. When this setting is true, the value of the SSL/TLS client secure invocation policy does not affect the connection between the client and the login service.

Default is true.

**enable_security_service_cert_authentication**

A boolean GSP setting that enables X.509 certificate-based authentication on the server side using the Orbix security service.

Default is false.

**retrieve_isf_auth_principal_info_for_all_realms**

A boolean setting that determines whether the GSP plug-in retrieves role and realm data for all realms, when authenticating user credentials. If true, the GSP plug-in retrieves the user’s role and realm data for all realms; if false, the GSP plug-in retrieves the user’s role and realm data only for the realm specified by plugins:gsp:authorization_realm.

Setting this variable to false can provide a useful performance optimization in some applications. But you must take special care to configure the application correctly for making operation invocations between different realms.

Default is true.

**sso_server_certificate_constraints**

A special certificate constraints policy that applies only to the SSL/TLS connection between the client and the SSO login server. For details of the pattern constraint language, see “Applying Constraints to Certificates” on page 555.
use_client_load_balancing

A boolean variable that enables load balancing over a cluster of security services. If an application is deployed in a domain that uses security service clustering, the application should be configured to use client load balancing (in this context, client means a client of the Orbix security service). See also policies:iiop_tls:load_balancing_mechanism.

Default is true.
plugins:https

The plugins:https namespace contains the following variable:

- ClassName

(Java only) This variable specifies the class name of the https plug-in implementation. For example:

plugins:https:ClassName = "com.iona.corba.https.HTTPSPlugIn";
plugins:iiop_tls

The plugins:iiop_tls namespace contains the following variables:

- buffer_pool:recycle_segments
- buffer_pool:segment_preallocation
- buffer_pools:max_incoming_buffers_in_pool
- buffer_pools:max_outgoing_buffers_in_pool
- cert_expiration_warning_days
- delay_credential_gathering_until_handshake
- enable_iiop_1_0_client_support
- enable_warning_for_approaching_cert_expiration
- incoming_connections:hard_limit
- incoming_connections:soft_limit
- outgoing_connections:hard_limit
- outgoing_connections:soft_limit
- own_credentials_warning_cert_constraints
- tcp_listener:reincarnate_attempts
- tcp_listener:reincarnation_retry_backoff_ratio
- tcp_listener:reincarnation_retry_delay

buffer_pool:recycle_segments

(Java only) When this variable is set, the iiop_tls plug-in reads this variable’s value instead of the plugins:iiop:buffer_pool:recycle_segments variable’s value.

buffer_pool:segment_preallocation

(Java only) When this variable is set, the iiop_tls plug-in reads this variable’s value instead of the plugins:iiop:buffer_pool:segment_preallocation variable’s value.
buffer_pools:max_incoming_buffers_in_pool

(C++ only) When this variable is set, the iiop_tls plug-in reads this variable’s value instead of the plugins:iiop:buffer_pools:max_incomingBuffers_in_pool variable’s value.

buffer_pools:max_outgoingBuffers_in_pool

(C++ only) When this variable is set, the iiop_tls plug-in reads this variable’s value instead of the plugins:iiop:buffer_pools:max_outgoingBuffers_in_pool variable’s value.

cert_expiration_warning_days

(Since Orbix 6.2 SP1) Specifies the threshold for the number of days left to certificate expiration, before Orbix issues a warning. If the application’s own certificate is due to expire in less than the specified number of days, Orbix issues a warning message to the log.

Default is 31 days.

See also the following related configuration variables:

plugins:iiop_tls:enable_warning_for_approaching_cert_expiration
plugins:iiop_tls:own_credentials_warning_cert_constraints

delay_credential_gathering_until_handshake

(Windows and Schannel only) This client configuration variable provides an alternative to using the principal_sponsor variables to specify an application’s own certificate. When this variable is set to true and principal_sponsor:use_principal_sponsor is set to false, the client delays sending its certificate to a server. The client will wait until the server explicitly requests the client to send its credentials during the SSL/TLS handshake.

This configuration variable can be used in conjunction with the plugins:schannel:prompt_with_credential_choice configuration variable.
enable_iiopt_1_0_client_support

This variable enables client-side interoperability of Orbix SSL/TLS applications with legacy IIOP 1.0 SSL/TLS servers, which do not support IIOP 1.1.

The default value is false. When set to true, Orbix SSL/TLS searches secure target IIOP 1.0 object references for legacy IIOP 1.0 SSL/TLS tagged component data, and attempts to connect on the specified port.

Note: This variable will not be necessary for most users.

enable_warning_for_approaching_cert_expiration

(Since Orbix 6.2 SP1) Enables warnings to be sent to the log, if an application’s own certificate is imminently about to expire. The boolean value can have the following values: true, enables the warning feature; false, disables the warning feature.

Default is true.

See also the following related configuration variables:
plugins:iiop_tls:cert_expiration_warning_days
plugins:iiop_tls:own_credentials_warning_cert_constraints

incoming_connections:hard_limit

Specifies the maximum number of incoming (server-side) connections permitted to IIOP. IIOP does not accept new connections above this limit. Defaults to -1 (disabled).

When this variable is set, the iiop_tls plug-in reads this variable’s value instead of the plugins:iiop:incoming_connections:hard_limit variable’s value.

Please see the chapter on ACM in the CORBA Programmer’s Guide for further details.
incoming_connections:soft_limit

Specifies the number of connections at which IIOP should begin closing incoming (server-side) connections. Defaults to -1 (disabled).

When this variable is set, the iiop_tls plug-in reads this variable’s value instead of the plugins:iiop:incoming_connections:soft_limit variable’s value.

Please see the chapter on ACM in the CORBA Programmer’s Guide for further details.

outgoing_connections:hard_limit

When this variable is set, the iiop_tls plug-in reads this variable’s value instead of the plugins:iiop:outgoing_connections:hard_limit variable’s value.

outgoing_connections:soft_limit

When this variable is set, the iiop_tls plug-in reads this variable’s value instead of the plugins:iiop:outgoing_connections:soft_limit variable’s value.

own_credentials_warning_cert_constraints

(Since Orbix 6.2 SP1) Set this certificate constraints variable, if you would like to avoid deploying certain certificates as an own certificate. A warning is issued, if the own certificate’s subject DN matches the constraints specified by this variable (see “Applying Constraints to Certificates” on page 555 for details of the constraint language). For example, you might want to generate a warning in case you accidentally deployed an Orbix demonstration certificate.

Default is an empty list, [].

Note: This warning is not related to certificate expiration and works independently of the certificate expiration warning.
tcp_listener:reincarnate_attempts

(Windows only)

plugins:iiop_tls:tcp_listener:reincarnate_attempts specifies the number of times that a Listener recreates its listener socket after receiving a SocketException.

Sometimes a network error may occur, which results in a listening socket being closed. On Windows, you can configure the listener to attempt a reincarnation, which enables new connections to be established. This variable only affects Java and C++ applications on Windows. Defaults to 0 (no attempts).

tcp_listener:reincarnation_retry_backoff_ratio

(Windows only)

plugins:iiop_tls:tcp_listener:reincarnation_retry_delay specifies a delay between reincarnation attempts. Data type is long. Defaults to 0 (no delay).

tcp_listener:reincarnation_retry_delay

(Windows only)

plugins:iiop_tls:tcp_listener:reincarnation_retry_backoff_ratiospecifies the degree to which delays between retries increase from one retry to the next. Datatype is long. Defaults to 1.
plugins:kdm

The plugins:kdm namespace contains the following variables:

- cert_constraints
- iiop_tls:port
- checksums_optional

cert_constraints

Specifies the list of certificate constraints for principals attempting to open a connection to the KDM server plug-in. See “Applying Constraints to Certificates” on page 555 for a description of the certificate constraint syntax.

To protect the sensitive data stored within it, the KDM applies restrictions on which entities are allowed talk to it. A security administrator should choose certificate constraints that restrict access to the following principals:

- The locator service (requires read-only access).
- The kdm_adm plug-in, which is normally loaded into the itadmin utility (requires read-write access).

All other principals should be blocked from access. For example, you might define certificate constraints similar to the following:

```plaintext
plugins:kdm:cert_constraints =
    
    ["C=US,ST=Massachusetts,O=ABigBank*,CN=Secure admin*",
     "C=US,ST=Boston,O=ABigBank*,CN=Orbix2000 Locator Service*"]
```

Your choice of certificate constraints will depend on the naming scheme for your subject names.
**iiop_tls:port**

Specifies the well known IP port on which the KDM server listens for incoming calls.

**checksums_optional**

When equal to `false`, the secure information associated with a server must include a checksum; when equal to `true`, the presence of a checksum is optional. Default is `false`.
plugins:kdm_adm

The plugins:kdm_adm namespace contains the following variable:

- cert_constraints

cert_constraints

Specifies the list of certificate constraints that are applied when the KDM administration plug-in authenticates the KDM server. See “Applying Constraints to Certificates” on page 555 for a description of the certificate constraint syntax.

The KDM administration plug-in requires protection against attack from applications that try to impersonate the KDM server. A security administrator should, therefore, choose certificate constraints that restrict access to trusted KDM servers only. For example, you might define certificate constraints similar to the following:

plugins:kdm_adm:cert_constraints =
    ["C=US,ST=Massachusetts,O=ABigBank*,CN=IT_KDM*"];

Your choice of certificate constraints will depend on the naming scheme for your subject names.
plugins:locator namespace contains the following variable:

- iiop_tls:port

Specifies the IP port number where the Orbix locator service listens for secure connections.

**Note:** This is only useful for applications that have a single TLS listener. For applications that have multiple TLS listeners, you need to programmatically specify the well-known addressing policy.
The `plugins:schannel` namespace contains the following variable:

- `prompt_with_credential_choice`

`prompt_with_credential_choice` (Windows and Schannel only) Setting both this variable and the `plugins:iiop_tls:delay_credential_gathering_until_handshake` variable to `true` on the client side allows the user to choose which credentials to use for the server connection. The choice of credentials offered to the user is based on the trusted CAs sent to the client in an SSL/TLS handshake message.

If `prompt_with_credential_choice` is set to `false`, runtime chooses the first certificate it finds in the certificate store that meets the applicable constraints.

The certificate prompt can be replaced by implementing an IDL interface and registering it with the ORB.
plugins:security

The plugins:security namespace contains the following variable:

- share_credentials_across_orbs

share_credentials_across_orbs

Enables own security credentials to be shared across ORBs. Normally, when you specify an own SSL/TLS credential (using the principal sponsor or the principal authenticator), the credential is available only to the ORB that created it. By setting the plugins:security:share_credentials_across_orbs variable to true, however, the own SSL/TLS credentials created by one ORB are automatically made available to any other ORBs that are configured to share credentials.

See also principal_sponsor:csi:use_existing_credentials for details of how to enable sharing of CSI credentials.

Default is false.
The **policies** namespace defines the default CORBA policies for an ORB. Many of these policies can also be set programmatically from within an application. SSL/TLS-specific variables in the **policies** namespace include:

- `allow_unauthenticated_clients_policy`
- `certificate_constraints_policy`
- `client_secure_invocation_policy:requires`
- `client_secure_invocation_policy:supports`
- `max_chain_length_policy`
- `mechanism_policy:accept_v2_hellos`
- `mechanism_policy:ciphersuites`
- `mechanism_policy:protocol_version`
- `session_caching_policy`
- `target_secure_invocation_policy:requires`
- `target_secure_invocation_policy:supports`
- `trusted_ca_list_policy`

---

**allow_unauthenticated_clients_policy**

(See also `policies:iiop_tls:allow_unauthenticated_clients_policy`.)

A generic variable that sets the policy for `iiop_tls`. The variable prefixed by `policies:iiop_tls` takes precedence over this generic variable.
certificate_constraints_policy

(See also policies:iiop_tls:certificate_constraints_policy and policies:https:certificate_constraints_policy.)

A generic variable that sets this policy both for iiop_tls and https. The variables prefixed by policies:iiop_tls and policies:https take precedence over this generic variable.

client_secure_invocation_policy:requires

(See also policies:iiop_tls:client_secure_invocation_policy:requires and policies:https:client_secure_invocation_policy:requires.)

A generic variable that sets this policy both for iiop_tls and https. The variables prefixed by policies:iiop_tls and policies:https take precedence over this generic variable.

client_secure_invocation_policy:supports

(See also policies:iiop_tls:client_secure_invocation_policy:supports and policies:https:client_secure_invocation_policy:supports.)

A generic variable that sets this policy both for iiop_tls and https. The variables prefixed by policies:iiop_tls and policies:https take precedence over this generic variable.
max_chain_length_policy

(See also policies:iiop_tls:max_chain_length_policy and policies:https:max_chain_length_policy.)

max_chain_length_policy specifies the maximum certificate chain length that an ORB will accept. The policy can also be set programmatically using the IT_TLS_API::MaxChainLengthPolicy CORBA policy. Default is 2.

Note: The max_chain_length_policy is not currently supported on the z/OS platform.

mechanism_policy:accept_v2_hellos

(See also policies:iiop_tls:mechanism_policy:accept_v2_hellos and policies:https:mechanism_policy:accept_v2_hellos.)

The accept_v2_hellos policy is a special setting that facilitates interoperability with an Orbix application deployed on the z/OS platform. When true, the Orbix application accepts V2 client hellos, but continues the handshake using either the SSL_V3 or TLS_V1 protocol. When false, the Orbix application throws an error, if it receives a V2 client hello. The default is false.

For example:

policies:mechanism_policy:accept_v2_hellos = "true";

mechanism_policy:ciphersuites

(See also policies:iiop_tls:mechanism_policy:ciphersuites and policies:https:mechanism_policy:ciphersuites.)

mechanism_policy:ciphersuites specifies a list of cipher suites for the default mechanism policy. One or more of the cipher suites shown in Table 26 can be specified in this list.

Table 26: Mechanism Policy Cipher Suites

<table>
<thead>
<tr>
<th>Null Encryption, Integrity and Authentication Ciphers</th>
<th>Standard Ciphers</th>
</tr>
</thead>
<tbody>
<tr>
<td>RSA_WITH_NULL_MD5</td>
<td>RSA_EXPORT_WITH_RC4_40_MD5</td>
</tr>
</tbody>
</table>
If you do not specify the list of cipher suites explicitly, all of the null encryption ciphers are disabled and all of the non-export strength ciphers are supported by default.

Table 26: Mechanism Policy Cipher Suites

<table>
<thead>
<tr>
<th>Null Encryption, Integrity and Authentication Ciphers</th>
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</thead>
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</tr>
<tr>
<td>RSA_WITH_RC4_128_SHA</td>
<td></td>
</tr>
<tr>
<td>RSA_EXPORT_WITH_DES40_CBC_SHA</td>
<td></td>
</tr>
<tr>
<td>RSA_WITH_DES_CBC_SHA</td>
<td></td>
</tr>
<tr>
<td>RSA_WITH_3DES_EDE_CBC_SHA</td>
<td></td>
</tr>
</tbody>
</table>

If you do not specify the list of cipher suites explicitly, all of the null encryption ciphers are disabled and all of the non-export strength ciphers are supported by default.

**mechanism_policy:protocol_version**

(See also policies:iiop_tls:mechanism_policy:protocol_version and policies:https:mechanism_policy:protocol_version.)

mechanism_policy:protocol_version specifies the list of protocol versions used by a security capsule (ORB instance). The list can include one or more of the values SSL_V3 and TLS_V1. For example:

```
policies:mechanism_policy:protocol_version=["TLS_V1", "SSL_V3"];```

**session_caching_policy**

session_caching_policy specifies whether an ORB caches the session information for secure associations when acting in a client role, a server role, or both. The purpose of session caching is to enable closed connections to be re-established quickly. The following values are supported:

- CACHE_NONE (default)
- CACHE_CLIENT
- CACHE_SERVER
- CACHE_SERVER_AND_CLIENT
The policy can also be set programmatically using the IT_TLS_API::SessionCachingPolicy CORBA policy.

target_secure_invocation_policy:requires

(See also policies:iiop_tls:target_secure_invocation_policy:requires and policies:https:target_secure_invocation_policy:requires.)

target_secure_invocation_policy:requires specifies the minimum level of security required by a server. The value of this variable is specified as a list of association options.

Note: In accordance with CORBA security, this policy cannot be downgraded programmatically by the application.

target_secure_invocation_policy:supports

(See also policies:iiop_tls:target_secure_invocation_policy:supports and policies:https:target_secure_invocation_policy:supports.)

supports specifies the maximum level of security supported by a server. The value of this variable is specified as a list of association options. This policy can be upgraded programmatically using either the QOP or the EstablishTrust policies.
trusted_ca_list_policy

(See also policies:iiop_tls:trusted_ca_list_policy and policies:https:trusted_ca_list_policy.)

trusted_ca_list_policy specifies a list of filenames, each of which contains a concatenated list of CA certificates in PEM format. The aggregate of the CAs in all of the listed files is the set of trusted CAs.

For example, you might specify two files containing CA lists as follows:

```java
policies:trusted_ca_list_policy =
    ["install_dir/asp/version/etc/tls/x509/ca/ca_list1.pem",
     "install_dir/asp/version/etc/tls/x509/ca/ca_list_extra.pem"];```

The purpose of having more than one file containing a CA list is for administrative convenience. It enables you to group CAs into different lists and to select a particular set of CAs for a security domain by choosing the appropriate CA lists.
**policies:csi**

The `policies:csi` namespace includes variables that specify settings for Common Secure Interoperability version 2 (CSIv2):

- `attribute_service:backward_trust:enabled`
- `attribute_service:client_supports`
- `attribute_service:target_supports`
- `auth_over_transport:authentication_service`
- `auth_over_transport:client_supports`
- `auth_over_transport:server_domain_name`
- `auth_over_transport:target_requires`
- `auth_over_transport:target_supports`

---

**attribute_service:backward_trust:enabled**

(Obsolete)

---

**attribute_service:client_supports**

`attribute_service:client_supports` is a client-side policy that specifies the association options supported by the CSIv2 attribute service (principal propagation). The only association option that can be specified is `IdentityAssertion`. This policy is normally specified in an intermediate server so that it propagates CSIv2 identity tokens to a target server. For example:

```
policies:csi:attribute_service:client_supports = [
  "IdentityAssertion"
];
```
attribute_service:target_supports

attribute_service:target_supports is a server-side policy that specifies the association options supported by the CSIv2 attribute service (principal propagation). The only association option that can be specified is IdentityAssertion. For example:

```
policies:csi:attribute_service:target_supports = ["IdentityAssertion"];```

auth_over_transport:authentication_service

(Java CSI plug-in only) The name of a Java class that implements the `IT_CSI::AuthenticateGSSUPCredentials` IDL interface. The authentication service is implemented as a callback object that plugs into the CSIv2 framework on the server side. By replacing this class with a custom implementation, you could potentially implement a new security technology domain for CSIv2.

By default, if no value for this variable is specified, the Java CSI plug-in uses a default authentication object that always returns `false` when the `authenticate()` operation is called.

auth_over_transport:client_supports

auth_over_transport:client_supports is a client-side policy that specifies the association options supported by CSIv2 authentication over transport. The only association option that can be specified is EstablishTrustInClient. For example:

```
policies:csi:auth_over_transport:client_supports = ["EstablishTrustInClient"];```
The iSF security domain (CSIv2 authentication domain) to which this server application belongs. The iSF security domains are administered within an overall security technology domain.

The value of the server_domain_name variable will be embedded in the IORs generated by the server. A CSIv2 client about to open a connection to this server would check that the domain name in its own CSIv2 credentials matches the domain name embedded in the IOR.

auth_over_transport:targetRequires

auth_over_transport:targetRequires is a server-side policy that specifies the association options required for CSIv2 authentication over transport. The only association option that can be specified is EstablishTrustInClient. For example:

```text
policies:csi:auth_over_transport:targetRequires =
   ["EstablishTrustInClient"];
```

auth_over_transport:targetSupports

auth_over_transport:targetSupports is a server-side policy that specifies the association options supported by CSIv2 authentication over transport. The only association option that can be specified is EstablishTrustInClient. For example:

```text
policies:csi:auth_over_transport:targetSupports =
   ["EstablishTrustInClient"];
```
The `policies:https` namespace contains variables used to configure the `https` plugin.

**Note:** In Orbix 6.1 SP1 and Orbix 6.2, the `policies:https` configuration variables are available only in the Java implementation of the `https` plug-in.

The `policies:https` namespace contains the following variables:

- `certificate_constraints_policy`
- `client_secure_invocation_policy:requires`
- `client_secure_invocation_policy:supports`
- `max_chain_length_policy`
- `mechanism_policy:accept_v2_HELLOS`
- `mechanism_policy:ciphersuites`
- `mechanism_policy:protocol_version`
- `session_caching_policy`
- `target_secure_invocation_policy:requires`
- `target_secure_invocation_policy:supports`
- `trusted_ca_list_policy`

---

**certificate_constraints_policy**

*(Java only)* A list of constraints applied to peer certificates—see “Applying Constraints to Certificates” on page 555 for the syntax of the pattern constraint language. If a peer certificate fails to match any of the constraints, the certificate validation step will fail.

The policy can also be set programmatically using the `IT_TLS_API::CertConstraintsPolicy` CORBA policy. Default is no constraints.
**client_secure_invocation_policy:requires**

*(Java only)* Specifies the minimum level of security required by a client. The value of this variable is specified as a list of association options—see the *Orbix Security Guide* for details on how to set SSL/TLS association options.

*Note:* In accordance with CORBA security, this policy cannot be downgraded programmatically by the application.

**client_secure_invocation_policy:supports**

*(Java only)* Specifies the initial maximum level of security supported by a client. The value of this variable is specified as a list of association options—see the *Orbix Security Guide* for details on how to set SSL/TLS association options.

*Note:* This policy can be upgraded programmatically using either the QOP or the EstablishTrust policies.

**max_chain_length_policy**

*(Java only)* The maximum certificate chain length that an ORB will accept (see the discussion of certificate chaining in the *Orbix Security Guide*). The policy can also be set programmatically using the IT_TLS_API::MaxChainLengthPolicy CORBA policy. Default is 2.

*Note:* The max_chain_length_policy is not currently supported on the z/OS platform.

**mechanism_policy:accept_v2_hellos**

*(Java only)* This HTTPS-specific policy overrides the generic policies:mechanism_policy:accept_v2_hellos policy. The accept_v2_hellos policy is a special setting that facilitates HTTPS interoperability with certain Web browsers. Many Web browsers send SSL V2 client hellos, because they do not know what SSL version the server supports.
When `true`, the Orbix server accepts V2 client hellos, but continues the handshake using either the SSL_V3 or TLS_V1 protocol. When `false`, the Orbix server throws an error, if it receives a V2 client hello. The default is `true`.

**Note:** This default value is deliberately different from the `policies:iiop_tls:mechanism_policy:accept_v2_hellos` default value.

For example:

```plaintext
policies:https:mechanism_policy:accept_v2_hellos = "true";
```

### mechanism_policy:ciphersuites

*(Java only)* Specifies a list of cipher suites for the default mechanism policy. One or more of the following cipher suites can be specified in this list:

**Table 27: Mechanism Policy Cipher Suites**

<table>
<thead>
<tr>
<th>Null Encryption, Integrity and Authentication Ciphers</th>
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</tr>
<tr>
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</tr>
<tr>
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</tr>
<tr>
<td></td>
<td>RSA_WITH_3DES_EDE_CBC_SHA</td>
</tr>
</tbody>
</table>

If you do not specify the list of cipher suites explicitly, all of the null encryption ciphers are disabled and all of the non-export strength ciphers are supported by default.

### mechanism_policy:protocol_version

*(Java only)* This HTTPS-specific policy overides the generic `policies:mechanism_policy:protocol_version` policy.
Specifies the list of protocol versions used by a security capsule (ORB instance). Can include one or more of the following values:

- TLS_V1
- SSL_V3

The default setting is SSL_V3 and TLS_V1.

For example:

```plaintext
policies:https:mechanism_policy:protocol_version = ["TLS_V1", "SSL_V3"];
```

### session_caching_policy

*(Java only)* When this policy is set, the https plug-in reads this policy’s value instead of the policies:session_caching policy’s value (C++) or policies:session_caching_policy policy’s value (Java).

### target_secure_invocation_policy:requires

*(Java only)* Specifies the minimum level of security required by a server. The value of this variable is specified as a list of association options—see the Orbix Security Guide for more details about association options.

In accordance with CORBA security, this policy cannot be downgraded programmatically by the application.

### target_secure_invocation_policy:supports

*(Java only)* Specifies the maximum level of security supported by a server. The value of this variable is specified as a list of association options—see the Orbix Security Guide for more details about association options.

This policy can be upgraded programmatically using either the QOP or the EstablishTrust policies.
trusted_ca_list_policy

(Java only) Contains a list of filenames (or a single filename), each of which contains a concatenated list of CA certificates in PEM format. The aggregate of the CAs in all of the listed files is the set of trusted CAs.

For example, you might specify two files containing CA lists as follows:

```
policies:trusted_ca_list_policy =
    ["ASPInstallDir/asp/6.0/etc/tls/x509/ca/ca_list1.pem",
     "ASPInstallDir/asp/6.0/etc/tls/x509/ca/ca_list_extra.pem"];
```

The purpose of having more than one file containing a CA list is for administrative convenience. It enables you to group CAs into different lists and to select a particular set of CAs for a security domain by choosing the appropriate CA lists.
The policies:iiop_tls namespace contains variables used to set IIOP-related policies for a secure environment. These settings affect the iiop_tls plugin. It contains the following variables:

- allow_unauthenticated_clients_policy
- buffer_sizes_policy:default_buffer_size
- buffer_sizes_policy:max_buffer_size
- certificate_constraints_policy
- client_secure_invocation_policy:requires
- client_secure_invocation_policy:supports
- client_version_policy
- connection_attempts
- connection_retry_delay
- load_balancing_mechanism
- max_chain_length_policy
- mechanism_policy:accept_v2_hellos
- mechanism_policy:ciphersuites
- mechanism_policy:protocol_version
- server_address_mode_policy:local_domain
- server_address_mode_policy:local_hostname
- server_address_mode_policy:port_range
- server_address_mode_policy:publish_hostname
- server_version_policy
- session_caching_policy
- target_secure_invocation_policy:requires
- target_secure_invocation_policy:supports
- tcp_options_policy:no_delay
- tcp_options_policy:recv_buffer_size
- tcp_options_policy:send_buffer_size
- trusted_ca_list_policy
allow_unauthenticated_clients_policy

A boolean variable that specifies whether a server will allow a client to establish a secure connection without sending a certificate. Default is false.

This configuration variable is applicable only in the special case where the target secure invocation policy is set to require NoProtection (a semi-secure server).

buffer_sizes_policy:default_buffer_size

When this policy is set, the iiop_tls plug-in reads this policy’s value instead of the policies:iiop:buffer_sizes_policy:default_buffer_size policy’s value.

buffer_sizes_policy:default_buffer_size specifies, in bytes, the initial size of the buffers allocated by IIOP. Defaults to 16000. This value must be greater than 80 bytes, and must be evenly divisible by 8.

buffer_sizes_policy:max_buffer_size

When this policy is set, the iiop_tls plug-in reads this policy’s value instead of the policies:iiop:buffer_sizes_policy:max_buffer_size policy’s value.

buffer_sizes_policy:max_buffer_size specifies the maximum buffer size permitted by IIOP, in kilobytes. Defaults to 512. A value of -1 indicates unlimited size. If not unlimited, this value must be greater than 80.

certificate_constraints_policy

A list of constraints applied to peer certificates—see the discussion of certificate constraints in the Orbix security guide for the syntax of the pattern constraint language. If a peer certificate fails to match any of the constraints, the certificate validation step will fail.

The policy can also be set programmatically using the IT_TLS_API::CertConstraintsPolicy CORBA policy. Default is no constraints.
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---

**client_secure_invocation_policy:**requires

Specifies the minimum level of security required by a client. The value of this variable is specified as a list of association options—see the *Orbix Security Guide* for more details about association options.

In accordance with CORBA security, this policy cannot be downgraded programmatically by the application.

---

**client_secure_invocation_policy:**supports

Specifies the initial maximum level of security supported by a client. The value of this variable is specified as a list of association options—see the *Orbix Security Guide* for more details about association options.

This policy can be upgraded programmatically using either the QOP or the EstablishTrust policies.

---

**client_version_policy**

client_version_policy specifies the highest IIOP version used by clients. A client uses the version of IIOP specified by this variable, or the version specified in the IOR profile, whichever is lower. Valid values for this variable are: 1.0, 1.1, and 1.2.

For example, the following file-based configuration entry sets the server IIOP version to 1.1.

```
policies:iiop:server_version_policy="1.1";
```

The following itadmin command set this variable:

```
itadmin variable modify -type string -value "1.1" policies:iiop:server_version_policy
```

---

**connection_attempts**

connection_attempts specifies the number of connection attempts used when creating a connected socket using a Java application. Defaults to 5.
connection_retry_delay

connection_retry_delay specifies the delay, in seconds, between connection attempts when using a Java application. Defaults to 2.

load_balancing_mechanism

Specifies the load balancing mechanism for the client of a security service cluster (see also plugins:gsp:use_client_load_balancing). In this context, a client can also be an Orbix server. This policy only affects connections made using IORs that contain multiple addresses. The iiop_tls plug-in load balances over the addresses embedded in the IOR.

The following mechanisms are supported:

- random—choose one of the addresses embedded in the IOR at random (this is the default).
- sequential—choose the first address embedded in the IOR, moving on to the next address in the list only if the previous address could not be reached.

max_chain_length_policy

This policy overrides policies:max_chain_length_policy for the iiop_tls plugin.

The maximum certificate chain length that an ORB will accept.

The policy can also be set programmatically using the IT_TLS_API::MaxChainLengthPolicy CORBA policy. Default is 2.

Note: The max_chain_length_policy is not currently supported on the z/OS platform.

mechanism_policy:accept_v2_hellos

This IIOP/TLS-specific policy overrides the generic policies:mechanism_policy:accept_v2_hellos policy.
The `accept_v2_hellos` policy is a special setting that facilitates interoperability with an Orbix application deployed on the z/OS platform. Orbix security on the z/OS platform is based on IBM’s System/SSL toolkit, which implements SSL version 3, but does so by using SSL version 2 hellos as part of the handshake. This form of handshake causes interoperability problems, because applications on other platforms identify the handshake as an SSL version 2 handshake. The misidentification of the SSL protocol version can be avoided by setting the `accept_v2_hellos` policy to `true` in the non-z/OS application (this bug also affects some old versions of Microsoft Internet Explorer).

When `true`, the Orbix application accepts V2 client hellos, but continues the handshake using either the SSL_V3 or TLS_V1 protocol. When `false`, the Orbix application throws an error, if it receives a V2 client hello. The default is `false`.

**Note:** This default value is deliberately different from the `policies:https:mechanism_policy:accept_v2_hellos` default value.

For example:

```plaintext
policies:iiop_tls:mechanism_policy:accept_v2_hellos = "true";
```

**mechanism_policy:ciphersuites**

This policy overrides `policies:mechanism_policy:ciphersuites` for the `iiop_tls` plugin.

Specifies a list of cipher suites for the default mechanism policy. One or more of the following cipher suites can be specified in this list:

**Table 28: Mechanism Policy Cipher Suites**

<table>
<thead>
<tr>
<th>Null Encryption, Integrity and Authentication Ciphers</th>
<th>Standard Ciphers</th>
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</tr>
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<td></td>
<td>RSA_EXPORT_WITH_DES40_CBC_SHA</td>
</tr>
<tr>
<td></td>
<td>RSA_WITH_DES_CBC_SHA</td>
</tr>
</tbody>
</table>
If you do not specify the list of cipher suites explicitly, all of the null encryption ciphers are disabled and all of the non-export strength ciphers are supported by default.

**mechanism_policy:protocol_version**

This IIOP/TLS-specific policy overrides the generic policies:mechanism_policy:protocol_version policy.

Specifies the list of protocol versions used by a security capsule (ORB instance). Can include one or more of the following values:

- **TLS_V1**
- **SSL_V3**
- **SSL_V2V3** *(Deprecated)*

The default setting is **SSL_V3** and **TLS_V1**.

For example:

```plaintext
policies:iiop_tls:mechanism_policy:protocol_version = ["TLS_V1", "SSL_V3"];
```

The **SSL_V2V3** value is now deprecated. It was previously used to facilitate interoperability with Orbix applications deployed on the z/OS platform. If you have any legacy configuration that uses **SSL_V2V3**, you should replace it with the following combination of settings:

```plaintext
policies:iiop_tls:mechanism_policy:protocol_version = ["SSL_V3", "TLS_V1"];
policies:iiop_tls:mechanism_policy:accept_v2_hellos = "true";
```

**server_address_mode_policy:local_domain**

(Java only) When this policy is set, the **iiop_tls** plug-in reads this policy’s value instead of the policies:iiop:server_address_mode_policy:local_domain policy’s value.

---

**Table 28: Mechanism Policy Cipher Suites**

<table>
<thead>
<tr>
<th>Null Encryption, Integrity and Authentication Ciphers</th>
<th>Standard Ciphers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RSA_WITH_3DES_EDE_CBC_SHA</td>
</tr>
</tbody>
</table>

---
server_address_mode_policy:local_hostname

(Java only) When this policy is set, the iiop_tls plug-in reads this policy’s value instead of the
policies:iiop:server_address_mode_policy:local_hostname policy’s value.

server_address_mode_policy:local_hostname specifies the hostname advertised by the locator daemon/configuration repository, and listened on by server-side IIOP.

Some machines have multiple hostnames or IP addresses (for example, those using multiple DNS aliases or multiple network cards). These machines are often termed multi-homed hosts. The local_hostname variable supports these type of machines by enabling you to explicitly specify the host that servers listen on and publish in their IORs.

For example, if you have a machine with two network addresses (207.45.52.34 and 207.45.52.35), you can explicitly set this variable to either address:

```
policies:iiop:server_address_mode_policy:local_hostname = "207.45.52.34";
```

By default, the local_hostname variable is unspecified. Servers use the default hostname configured for the machine with the Orbix configuration tool.

---

server_address_mode_policy:port_range

(Java only) When this policy is set, the iiop_tls plug-in reads this policy’s value instead of the
policies:iiop:server_address_mode_policy:port_range policy’s value.

server_address_mode_policy:port_range specifies the range of ports that a server uses when there is no well-known addressing policy specified for the port.

---

server_address_mode_policy:publish_hostname

When this policy is set, the iiop_tls plug-in reads this policy’s value instead of the
policies:iiop:server_address_mode_policy:publish_hostname policy’s value.
server_address_mode-policy:publish_hostname specifies whether IIOP exports hostnames or IP addresses in published profiles. Defaults to false (exports IP addresses, and does not export hostnames). To use hostnames in object references, set this variable to true, as in the following file-based configuration entry:

```
policies:iiop:server_address_mode_policy:publish_hostname=true
```

The following itadmin command is equivalent:

```
itadmin variable create -type bool -value true policies:iiop:server_address_mode_policy:publish_hostname
```

---

**server_version_policy**

When this policy is set, the iiop_tls plug-in reads this policy’s value instead of the policies:iiop:server_version_policy policy’s value.

server_version_policy specifies the GIOP version published in IIOP profiles. This variable takes a value of either 1.1 or 1.2. Orbix servers do not publish IIOP 1.0 profiles. The default value is 1.2.

---

**session_caching_policy**

This policy overrides policies:session_caching_policy for the iiop_tls plugin.

---

**target_secure_invocation_policy:requires**

This policy overrides policies:target_secure_invocation_policy:requires for the iiop_tls plugin.

Specifies the minimum level of security required by a server. The value of this variable is specified as a list of association options—see the Orbitx Security Guide for more details about association options.

In accordance with CORBA security, this policy cannot be downgraded programmatically by the application.
**target_secure_invocation_policy:supports**

This policy overrides `policies:target_secure_invocation_policy:supports` for the `iiop_tls` plug-in.

Specifies the maximum level of security supported by a server. The value of this variable is specified as a list of association options—see the *Orbix Security Guide* for more details about association options.

This policy can be upgraded programmatically using either the QOP or the EstablishTrust policies.

**tcp_options_policy:no_delay**

When this policy is set, the `iiop_tls` plug-in reads this policy’s value instead of the `policies:iiop:tcp_options_policy:no_delay` policy’s value.

`tcp_options_policy:no_delay` specifies whether the TCP_NODELAY option should be set on connections. Defaults to false.
tcp_options_policy:recv_buffer_size

When this policy is set, the iiop_tls plug-in reads this policy’s value instead of the policies:iiop:tcp_options_policy:recv_buffer_size policy’s value. tcp_options_policy:recv_buffer_size specifies the size of the TCP receive buffer. This variable can only be set to 0, which corresponds to using the default size defined by the operating system.

tcp_options_policy:send_buffer_size

When this policy is set, the iiop_tls plug-in reads this policy’s value instead of the policies:iiop:tcp_options_policy:send_buffer_size policy’s value. tcp_options_policy:send_buffer_size specifies the size of the TCP send buffer. This variable can only be set to 0, which corresponds to using the default size defined by the operating system.

trusted_ca_list_policy

This policy overrides the policies:trusted_ca_list_policy for the iiop_tls plugin.

Contains a list of filenames (or a single filename), each of which contains a concatenated list of CA certificates in PEM format. The aggregate of the CAs in all of the listed files is the set of trusted CAs.

For example, you might specify two files containing CA lists as follows:

    policies:trusted_ca_list_policy =
        ["ASPIInstallDir/asp/6.0/etc/tls/x509/ca/ca_list1.pem",
         "ASPIInstallDir/asp/6.0/etc/tls/x509/ca/ca_list_extra.pem"];

The purpose of having more than one file containing a CA list is for administrative convenience. It enables you to group CAs into different lists and to select a particular set of CAs for a security domain by choosing the appropriate CA lists.
The `policies:security_server` namespace contains the following variables:

- `client_certificate_constraints`

---

### `client_certificate_constraints`

Restricts access to the Orbix security server, allowing only clients that match the specified certificate constraints to open a connection to the security service. For details of how to specify certificate constraints, see “Applying Constraints to Certificates” on page 555.

For example, by inserting the following setting into the `iona_services.security` configuration scope in the Orbix configuration file, you can allow access by clients presenting the `administrator.p12` and `iona_utilities.p12` certificates (demonstration certificates).

```
# Allow access by demonstration client certificates.
# WARNING: These settings are NOT secure and must be customized
# before deploying in a real system.
#
# policies:security_server:client_certificate_constraints =
#   ["C=US,ST=Massachusetts,O=ABigBank*,CN=Orbix2000 IONA Services (demo cert), OU=Demonstration Section -- no warranty --", "C=US,ST=Massachusetts,O=ABigBank*,CN=Abigbank Accounts Server", "C=US,ST=Massachusetts,O=ABigBank*,CN=Iona utilities - demo purposes" ];
```

**WARNING:** The default setting generated by the `itconfigure` utility allows demonstration certificates to be used. This value is **not** secure, because the same demonstration certificates are provided with all installations of Orbix.

The effect of setting this configuration variable is slightly different to the effect of setting `policies:iiop_tls:certificate_constraints_policy`. Whereas `policies:iiop_tls:certificate_constraints_policy` affects all services deployed in the current process, the `policies:security_server:client_certificate_constraints` variable affects only the Orbix security service. This distinction is significant when the login server is deployed into the same process as the security server. In this case,
you would typically want to configure the login server such that it does \textit{not} require clients to present an X.509 certificate (this is the default), while the security server \textit{does} require clients to present an X.509 certificate.

This configuration variable must be set in the security server’s configuration scope, otherwise the security server will not start.
policies:tls

The following variables are in this namespace:

- use_external_cert_store

use_external_cert_store

*(Java only)* A binary variable that configures Orbix to check for the presence of a third-party certificate store. The possible values are: *true*, to check for the presence of an external certificate store, and *false*, to use the built-in certificate store (that is, certificate location specified by the principal sponsor).

The default is *false*.

This variable has no effect unless you also configure your Java application to use an external security provider—see the description of the plugins:atli2_tls:use_jsse_tk configuration variable for more details.

This policy variable must be used in conjunction with the following configuration variables:

- plugins:atli2_tls:cert_store_provider
- plugins:atli2_tls:cert_store_protocol

You can also optionally set the following configuration variables (which override the corresponding properties in the *java.security* file):

- plugins:atli2_tls:kmf_algorithm
- plugins:atli2_tls:tmf_algorithm
The principal_sponsor namespace stores configuration information to be used when obtaining credentials. Orbix provides an implementation of a principal sponsor that creates credentials for applications automatically. The principal sponsor automatically calls the authenticate() operation on the PrincipalAuthenticator object after determining the data to supply.

Use of the PrincipalSponsor is disabled by default and can only be enabled through configuration.

The PrincipalSponsor represents an entry point into the secure system. It must be activated and authenticate the user, before any application-specific logic executes. This allows unmodified, security-unaware applications to have Credentials established transparently, prior to making invocations.

In this section

The following variables are in this namespace:

- use_principal_sponsor
- auth_method_id
- auth_method_data
- callback_handler:ClassName
- login_attempts

use_principal_sponsor specifies whether an attempt is made to obtain credentials automatically. Defaults to false. If set to true, the following principal_sponsor variables must contain data in order for anything to actually happen.
**auth_method_id**

`auth_method_id` specifies the authentication method to be used. The following authentication methods are available:

- **pkcs12_file**: The authentication method uses a PKCS#12 file.
- **keystore**: The authentication method uses a Java keystore file.
- **pkcs11**: Java only. The authentication data is provided by a smart card.
- **security_label**: Windows and Schannel only. The authentication data is specified by supplying the common name (CN) from an application certificate’s subject DN.

For example, you can select the `pkcs12_file` authentication method as follows:

```java
principal_sponsor:auth_method_id = "pkcs12_file";
```

---

**auth_method_data**

`auth_method_data` is a string array containing information to be interpreted by the authentication method represented by the `auth_method_id`.

For the `pkcs12_file` authentication method, the following authentication data can be provided in `auth_method_data`:

- **filename**: A PKCS#12 file that contains a certificate chain and private key—*required*.
- **password**: A password for the private key—*optional*.
  
  It is bad practice to supply the password from configuration for deployed systems. If the password is not supplied, the user is prompted for it.
- **password_file**: The name of a file containing the password for the private key—*optional*. 
For the `keystore` authentication method, the following authentication data can be provided in `auth_method_data`:

- **filename**: A Java keystore file containing a key entry that consists of a certificate chain and a private key—required.
- **password**: A password for the keystore (used both for the store password and for the key password)—optional.
  
  It is bad practice to supply the password from configuration for deployed systems. If the password is not supplied, the user is prompted for it.
- **password_file**: The name of a file containing the password for the keystore—optional.

For the `pkcs11` (smart card) authentication method, the following authentication data can be provided in `auth_method_data`:

- **provider**: A name that identifies the underlying PKCS #11 toolkit used by Orbix to communicate with the smart card.
  
  The toolkit currently used by Orbix has the provider name `dkccl32.dll` (from Baltimore).
- **slot**: The number of a particular slot on the smart card (for example, 0) containing the user’s credentials.
- **pin**: A PIN to gain access to the smart card—optional.
  
  It is bad practice to supply the PIN from configuration for deployed systems. If the PIN is not supplied, the user is prompted for it.

For the `security_label` authentication method on Windows, the following authentication data can be provided in `auth_method_data`:

- **label**: (Windows and Schannel only.) The common name (CN) from an application certificate’s subject DN

For example, to configure an application on Windows to use a certificate, `bob.p12`, whose private key is encrypted with the `bobpass` password, set the `auth_method_data` as follows:

```plaintext
principal_sponsor:auth_method_data =
["filename='c:\users\bob\bob.p12', "password=bobpass"];
```

The following points apply to Java implementations:
• If the file specified by `filename=` is not found, it is searched for on the classpath.
• The file specified by `filename=` can be supplied with a URL instead of an absolute file location.
• The mechanism for prompting for the password if the password is supplied through `password=` can be replaced with a custom mechanism, as demonstrated by the `login demo`. 
There are two extra configuration variables available as part of the principal_sponsor namespace, namely principal_sponsor:callback_handler and principal_sponsor:login_attempts. These are described below.

- These Java-specific features are available subject to change in future releases; any changes that can arise probably come from customer feedback on this area.

---

**callback_handler:ClassName**

callback_handler:ClassName specifies the class name of an interface that implements the interface com.iona.corba.tls.auth.CallbackHandler. This variable is only used for Java clients.

---

**login_attempts**

login_attempts specifies how many times a user is prompted for authentication data (usually a password). It applies for both internal and custom CallbackHandlers; if a CallbackHandler is supplied, it is invoked upon up to login_attempts times as long as the PrincipalAuthenticator returns SecAuthFailure. This variable is only used by Java clients.
**principal_sponsor:csi**

The `principal_sponsor:csi` namespace stores configuration information to be used when obtaining CSI (Common Secure Interoperability) credentials. It includes the following:

- **use_existing_credentials**
- **use_principal_sponsor**
- **auth_method_data**
- **auth_method_id**

---

**use_existing_credentials**

A boolean value that specifies whether ORBs that share credentials can also share CSI credentials. If `true`, any CSI credentials loaded by one credential-sharing ORB can be used by other credential-sharing ORBs loaded after it; if `false`, CSI credentials are not shared.

This variable has no effect, unless the `plugins:security:share_credentials_across_orbs` variable is also `true`. Default is `false`.

---

**use_principal_sponsor**

`use_principal_sponsor` is a boolean value that switches the CSI principal sponsor on or off.

If set to `true`, the CSI principal sponsor is enabled; if `false`, the CSI principal sponsor is disabled and the remaining `principal_sponsor:csi` variables are ignored. Defaults to `false`.

If no CSI credentials are set on the client side, the client might still send an authentication token containing null credentials. If you want to completely disable the sending of CSI credentials (so that no client authentication token is sent), use the following setting on the client side:

```
policies:csi:auth_over_transport:client_supports = [ ];
```
auth_method_data

auth_method_data is a string array containing information to be interpreted by the authentication method represented by the auth_method_id.

For the GSSUPMech authentication method, the following authentication data can be provided in auth_method_data:

username
The username for CSIv2 authorization. This is optional. Authentication of CSIv2 usernames and passwords is performed on the server side. The administration of usernames depends on the particular security mechanism that is plugged into the server side see auth_over_transport:authentication_service.

password
The password associated with username. This is optional. It is bad practice to supply the password from configuration for deployed systems. If the password is not supplied, the user is prompted for it.

domain
The CSIv2 authentication domain in which the username/password pair is authenticated.

When the client is about to open a new connection, this domain name is compared with the domain name embedded in the relevant IOR (see policies:csi:auth_over_transport:server_domain_name). The domain names must match.

Note: If domain is an empty string, it matches any target domain. That is, an empty domain string is equivalent to a wildcard.

If any of the preceding data are omitted, the user is prompted to enter authentication data when the application starts up.

For example, to log on to a CSIv2 application as the administrator user in the US-SantaClara domain:

principal_sponsor:csi:auth_method_data =
["username=administrator", "domain=US-SantaClara"];


When the application is started, the user is prompted for the administrator password.

**Note:** It is currently not possible to customize the login prompt associated with the CSIv2 principal sponsor. As an alternative, you could implement your own login GUI by programming and pass the user input directly to the principal authenticator.

---

**auth_method_id**

`auth_method_id` specifies a string that selects the authentication method to be used by the CSI application. The following authentication method is available:

- **GSSUPMech**  
The Generic Security Service Username/Password (GSSUP) mechanism.

For example, you can select the GSSUPMech authentication method as follows:

```plaintext
principal_sponsor:csi:auth_method_id = "GSSUPMech";
```
The `principal_sponsor:https` namespace provides configuration variables that enable you to specify the own credentials used with the HTTPS transport. The variables in the `principal_sponsor:https` namespace (which are specific to the HTTPS protocol) have precedence over the analogous variables in the `principal_sponsor` namespace.

**Note:** In Orbix 6.1 SP1 and Orbix 6.2, the `principal_sponsor:https` configuration variables are available only in the Java implementation of the `https` plug-in.

Use of the `PrincipalSponsor` is disabled by default and can only be enabled through configuration.

The `PrincipalSponsor` represents an entry point into the secure system. It must be activated and authenticate the user, before any application-specific logic executes. This allows unmodified, security-unaware applications to have Credentials established transparently, prior to making invocations.

### In this section

The following variables are in this namespace:

- `use_principal_sponsor`
- `auth_method_id`
- `auth_method_data`

### use_principal_sponsor

*(Java only)* `use_principal_sponsor` specifies whether an attempt is made to obtain credentials automatically. Defaults to `false`. If set to `true`, the following `principal_sponsor:https` variables must contain data in order for anything to actually happen:

- `auth_method_id`
- `auth_method_data`
auth_method_id

(Java only) auth_method_id specifies the authentication method to be used. The following authentication methods are available:

pkcs12_file    The authentication method uses a PKCS#12 file

For example, you can select the pkcs12_file authentication method as follows:

```
principal_sponsor:auth_method_id = "pkcs12_file";
```

auth_method_data

(Java only) auth_method_data is a string array containing information to be interpreted by the authentication method represented by the auth_method_id. For the pkcs12_file authentication method, the following authentication data can be provided in auth_method_data:

- filename: A PKCS#12 file that contains a certificate chain and private key—required.
- password: A password for the private key—optional.
  It is bad practice to supply the password from configuration for deployed systems. If the password is not supplied, the user is prompted for it.
- password_file: The name of a file containing the password for the private key—optional.
  This option is not recommended for deployed systems.

For example, to configure an application on Windows to use a certificate, bob.p12, whose private key is encrypted with the bobpass password, set the auth_method_data as follows:

```
principal_sponsor:auth_method_data = [
    "filename=c:\users\bob\bob.p12", "password=\bobpass"
];
```
The `principal_sponsor:iiop_tls` namespace provides configuration variables that enable you to specify the own credentials used with the IIOP/TLS transport.

The IIOP/TLS principal sponsor is disabled by default.

### In this section

The following variables are in this namespace:

- `use_principal_sponsor`
- `auth_method_id`
- `auth_method_data`

---

**use_principal_sponsor**

`use_principal_sponsor` specifies whether an attempt is made to obtain credentials automatically. Defaults to `false`. If set to `true`, the following `principal_sponsor:iiop_tls` variables must contain data in order for anything to actually happen:

- `auth_method_id`
- `auth_method_data`
**auth_method_id**

auth_method_id specifies the authentication method to be used. The following authentication methods are available:

- **pkcs12_file**  
  The authentication method uses a PKCS#12 file

For example, you can select the **pkcs12_file** authentication method as follows:

```plaintext
principal_sponsor:iiop_tls:auth_method_id = "pkcs12_file";
```

**auth_method_data**

auth_method_data is a string array containing information to be interpreted by the authentication method represented by the auth_method_id.

For the **pkcs12_file** authentication method, the following authentication data can be provided in auth_method_data:

- **filename**  
  A PKCS#12 file that contains a certificate chain and private key—required.

- **password**  
  A password for the private key.
  
  It is bad practice to supply the password from configuration for deployed systems. If the password is not supplied, the user is prompted for it.

- **password_file**  
  The name of a file containing the password for the private key.
  
  The password file must be read and write protected to prevent tampering.

For example, to configure an application on Windows to use a certificate, `bob.p12`, whose private key is encrypted with the `bobpass` password, set the auth_method_data as follows:

```plaintext
principal_sponsor:iiop_tls:auth_method_data = [
"filename=c:\users\bob\bob.p12", "password=bobpass"];
```
iSF Configuration

This appendix provides details of how to configure the Orbix security server.

In this appendix

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# Properties File Syntax

## Overview
The Orbix security service uses standard Java property files for its configuration. Some aspects of the Java properties file syntax are summarized here for your convenience.

## Property definitions
A property is defined with the following syntax:

\[ <\text{PropertyName}>=\langle\text{PropertyValue} \rangle \]

The `<PropertyName>` is a compound identifier, with each component delimited by the . (period) character. For example, `is2.current.server.id`. The `<PropertyValue>` is an arbitrary string, including all of the characters up to the end of the line (embedded spaces are allowed).

## Specifying full pathnames
When setting a property equal to a filename, you normally specify a full pathname, as follows:

**UNIX**

`/home/data/securityInfo.xml`

**Windows**

`D:/iona/securityInfo.xml`

or, if using the backslash as a delimiter, it must be escaped as follows:

`D:\\iona\\securityInfo.xml`

## Specifying relative pathnames
If you specify a relative pathname when setting a property, the root directory for this path must be added to the Orbix security service’s classpath. For example, if you specify a relative pathname as follows:

**UNIX**

`securityInfo.xml`

The security service’s classpath must include the file’s parent directory:

`CLASSPATH = /home/data/:<rest_of_classpath>`
An iSF properties file is used to store the properties that configure a specific Orbix security service instance. Generally, every Orbix security service instance should have its own iSF properties file. This section provides descriptions of all the properties that can be specified in an iSF properties file.

The default location of the iSF properties file is the following:

```
OrbixInstallDir/etc/domains/DomainName/server_Host/is2.properties
```

In general, the iSF properties file location is specified in the Orbix configuration by setting the `is2.properties` property in the `plugins:java_server:system_properties` property list.

For example, on UNIX the security server’s property list is normally initialized in the `iona_services.security` configuration scope as follows:

```
# Orbix configuration file
...
iona_services {
  ...
  security {
    ...
    plugins:java_server:system_properties =
      ["org.omg.CORBA.ORBClass=com.iona.corba.art.artimpl.ORBImpl",
       "org.omg.CORBA.ORBSingletonClass=com.iona.corba.art.artimpl.ORBSingleton",
       "is2.properties=ASPInstallDir/etc/domains/DomainName/is2.properties"];
    ...
  };
}
```
List of properties

The following properties can be specified in the iSF properties file:

check.kdc.running

A boolean property that specifies whether or not the Artix security service should check whether the Kerberos KDC server is running. Default is false.

check.kdc.principal

(Used in combination with the check.kdc.running property.) Specifies the dummy KDC principal that is used for connecting to the KDC server, in order to check whether it is running or not.

com.iona.isp.adapters

Specifies the iSF adapter type to be loaded by the Orbix security service at runtime. Choosing a particular adapter type is equivalent to choosing an Artix security domain. Currently, you can specify one of the following adapter types:

- file
- LDAP

For example, you can select the LDAP adapter as follows:

com.iona.isp.adapters=LDAP

Note: The file adapter is intended for demonstration purposes only. Use of the file adapter is not supported in production systems.

com.iona.isp.adapter.file.class

Specifies the Java class that implements the file adapter.

For example, the default implementation of the file adapter provided with Orbix is selected as follows:

com.iona.isp.adapter.file.class=com.iona.security.is2adapter.file.FileAuthAdapter
**com.iona.isp.adapter.file.param.filename**

Specifies the name and location of a file that is used by the file adapter to store user authentication data.

For example, you can specify the file, `C:/is2_config/security_info.xml`, as follows:

```
com.iona.isp.adapter.file.param.filename=C:/is2_config/security_info.xml
```

**com.iona.isp.adapter.file.params**

*Obsolete.* This property was needed by earlier versions of the Orbix security service, but is now ignored.

**com.iona.isp.adapter.LDAP.class**

Specifies the Java class that implements the LDAP adapter.

For example, the default implementation of the LDAP adapter provided with Orbix is selected as follows:

```
com.iona.isp.adapter.LDAP.class=com.iona.security.is2adapter.ldap.LdapAdapter
```

**com.iona.isp.adapter.LDAP.param.CacheSize**

Specifies the maximum LDAP cache size in units of bytes. This maximum applies to the *total* LDAP cache size, including all LDAP connections opened by this Orbix security service instance.

Internally, the Orbix security service uses a third-party toolkit (currently the *iPlanet SDK*) to communicate with an LDAP server. The cache referred to here is one that is maintained by the LDAP third-party toolkit. Data retrieved from the LDAP server is temporarily stored in the cache in order to optimize subsequent queries.

For example, you can specify a cache size of 1000 as follows:

```
com.iona.isp.adapter.LDAP.param.CacheSize=1000
```
**com.iona.isp.adapter.LDAP.param.CacheTimeToLive**

Specifies the LDAP cache time to-live in units of seconds. For example, you can specify a cache time to-live of one minute as follows:

```java
com.iona.isp.adapter.LDAP.param.CacheTimeToLive=60
```

**com.iona.isp.adapter.LDAP.param.GroupBaseDN**

Specifies the base DN of the tree in the LDAP directory that stores user groups. For example, you could use the RDN sequence, `dc=iona,dc=com`, as a base DN by setting this property as follows:

```java
com.iona.isp.adapter.LDAP.param.GroupBaseDN=dc=iona,dc=com
```

**Note:** The order of the RDNs is significant. The order should be based on the LDAP schema configuration.

**com.iona.isp.adapter.LDAP.param.GroupNameAttr**

Specifies the attribute type whose corresponding attribute value gives the name of the user group. The default is `cn`.

For example, you can use the common name, `cn`, attribute type to store the user group’s name by setting this property as follows:

```java
com.iona.isp.adapter.LDAP.param.GroupNameAttr=cn
```

**com.iona.isp.adapter.LDAP.param.GroupObjectClass**

Specifies the object class that applies to user group entries in the LDAP directory structure. An object class defines the required and allowed attributes of an entry. The default is `groupOfUniqueNames`.

For example, to specify that all user group entries belong to the `groupOfUniqueNames` object class:

```java
com.iona.isp.adapter.LDAP.param.GroupObjectClass=groupofuniqueNames
```
**com.iona.isp.adapter.LDAP.param.GroupSearchScope**

Specifies the group search scope. The search scope is the starting point of a search and the depth from the base DN to which the search should occur. This property can be set to one of the following values:

- **BASE**—Search a single entry (the base object).
- **ONE**—Search all entries immediately below the base DN.
- **SUB**—Search all entries from a whole subtree of entries.

Default is **SUB**.

For example:

```
com.iona.isp.adapter.LDAP.param.GroupSearchScope=SUB
```

**com.iona.isp.adapter.LDAP.param.host.<ServerID>**

For the `<ServerID>` LDAP server replica, specify the IP hostname where the LDAP server is running. The `<ServerID>` can be any string that uniquely identifies the server replica.

For example, you could specify that the primary LDAP server is running on host 10.81.1.100 as follows:

```
com.iona.isp.adapter.LDAP.param.host.primary=10.81.1.100
```

**com.iona.isp.adapter.LDAP.param.MaxConnectionPoolSize**

Specifies the maximum LDAP connection pool size for the Orbix security service (a strictly positive integer). The maximum connection pool size is the maximum number of LDAP connections that would be opened and cached by the Orbix security service. The default is **1**.

For example, to limit the Orbix security service to open a maximum of 50 LDAP connections at a time:

```
com.iona.isp.adapter.LDAP.param.MaxConnectionPoolSize=50
```
com.iona.isp.adapter.LDAP.param.MemberDNAttr

Specifies which LDAP attribute is used to retrieve group members. The LDAP adapter uses the MemberDNAttr property to construct a query to find out which groups a user belongs to.

The list of the user’s groups is needed to determine the complete set of roles assigned to the user. The LDAP adapter determines the complete set of roles assigned to a user as follows:

1. The adapter retrieves the roles assigned directly to the user.
2. The adapter finds out which groups the user belongs to, and retrieves all the roles assigned to those groups.

Default is uniqueMember.

For example, you can select the uniqueMember attribute as follows:


com.iona.isp.adapter.LDAP.param.MemberFilter

Specifies how to search for members in a group. The value specified for this property must be an LDAP search filter (can be a custom filter).

com.iona.isp.adapter.LDAP.param.MinConnectionPoolSize

Specifies the minimum LDAP connection pool size for the Orbix security service. The minimum connection pool size specifies the number of LDAP connections that are opened during initialization of the Orbix security service. The default is 1.

For example, to specify a minimum of 10 LDAP connections at a time:


**com.iona.isp.adapter.LDAP.param.port.<ServerID>**

For the `<ServerID>` LDAP server replica, specifies the IP port where the LDAP server is listening. The `<ServerID>` can be any string that uniquely identifies the server replica. The default port is 389.

For example, you could specify that the primary LDAP server is listening on port 636 as follows:

```
com.iona.isp.adapter.LDAP.param.port.primary=636
```

**com.iona.isp.adapter.LDAP.param.PrincipalUserDN.<ServerID>**

For the `<ServerID>` LDAP server replica, specifies the username that is used to login to the LDAP server (in distinguished name format). This property need only be set if the LDAP server is configured to require username/password authentication.

No default.

**com.iona.isp.adapter.LDAP.param.PrincipalUserPassword.<ServerID>**

For the `<ServerID>` LDAP server replica, specifies the password that is used to login to the LDAP server. This property need only be set if the LDAP server is configured to require username/password authentication.

No default.

**WARNING:** Because the password is stored in plaintext, you must ensure that the `is2.properties` file is readable and writable only by users with administrator privileges.

**com.iona.isp.adapter.LDAP.param.RetrieveAuthInfo**

Specifies whether or not the Orbix security service retrieves authorization information from the LDAP server. This property selects one of the following alternatives:
• **yes**—the Orbix security service retrieves authorization information from the LDAP server.

• **no**—the Orbix security service retrieves authorization information from the iS2 authorization manager.

Default is **no**.

For example, to use the LDAP server’s authorization information:

```java
com.iona.isp.adapter.LDAP.param.RetrieveAuthInfo=yes
```

**com.iona.isp.adapter.LDAP.param.RoleNameAttr**

Specifies the attribute type that the LDAP server uses to store the role name. The default is **CN**.

For example, you can specify the common name, **CN**, attribute type as follows:

```java
com.iona.isp.adapter.LDAP.param.RoleNameAttr=cn
```

**com.iona.isp.adapter.LDAP.param.SSLCACertDir.<ServerID>**

For the `<ServerID>` LDAP server replica, specifies the directory name for trusted CA certificates. All certificate files in this directory are loaded and set as trusted CA certificates, for the purpose of opening an SSL connection to the LDAP server. The CA certificates can either be in DER-encoded X.509 format or in PEM-encoded X.509 format.

No default.

For example, to specify that the primary LDAP server uses the `d:/certs/test` directory to store CA certificates:

```java
com.iona.isp.adapter.LDAP.param.SSLCACertDir.primary=d:/certs/test
```
com.iona.isp.adapter.LDAP.param.SSLClientCertFile.<ServerID>

Specifies the client certificate file that is used to identify the Orbix security service to the `<ServerID>` LDAP server replica. This property is needed only if the LDAP server requires SSL/TLS mutual authentication. The certificate must be in PKCS#12 format.

No default.

com.iona.isp.adapter.LDAP.param.SSLClientCertPassword.<ServerID>

Specifies the password for the client certificate that identifies the Orbix security service to the `<ServerID>` LDAP server replica. This property is needed only if the LDAP server requires SSL/TLS mutual authentication.

**WARNING:** Because the password is stored in plaintext, you must ensure that the `is2.properties` file is readable and writable only by users with administrator privileges.

com.iona.isp.adapter.LDAP.param.SSLEnabled.<ServerID>

Enables SSL/TLS security for the connection between the Orbix security service and the `<ServerID>` LDAP server replica. The possible values are `yes` or `no`. Default is `no`.

For example, to enable an SSL/TLS connection to the primary LDAP server:

```java
com.iona.isp.adapter.LDAP.param.SSLEnabled.primary=yes
```

com.iona.isp.adapter.LDAP.param.UseGroupAsRole

Specifies whether a user’s groups should be treated as roles. The following alternatives are available:

- **yes**—each group name is interpreted as a role name.
- **no**—for each of the user’s groups, retrieve all roles assigned to the group.

This option is useful for some older versions of LDAP, such as iPlanet 4.0, that do not have the role concept.
Default is no.
For example:

```
com.iona.isp.adapter.LDAP.param.UseGroupAsRole=no
```

**com.iona.isp.adapter.LDAP.param.UserBaseDN**

Specifies the base DN (an ordered sequence of RDNs) of the tree in the LDAP directory that stores user object class instances.

For example, you could use the RDN sequence, `dc=iona,dc=com`, as a base DN by setting this property as follows:

```
com.iona.isp.adapter.LDAP.param.UserBaseDN=dc=iona,dc=com
```

**com.iona.isp.adapter.LDAP.param.UserCertAttrName**

Specifies the attribute type that stores a user certificate. The default is `userCertificate`.

For example, you can explicitly specify the attribute type for storing user certificates to be `userCertificate` as follows:

```
com.iona.isp.adapter.LDAP.param.UserCertAttrName=userCertificate
```

**com.iona.isp.adapter.LDAP.param.UserNameAttr=uid**

Specifies the attribute type whose corresponding value uniquely identifies the user. This is the attribute used as the user’s login ID. The default is `uid`.

For example:

```
com.iona.isp.adapter.LDAP.param.UserNameAttr=uid
```

**com.iona.isp.adapter.LDAP.param.UserObjectClass**

Specifies the attribute type for the object class that stores users. The default is `organizationalPerson`. 
For example:

```java
com.iona.isp.adapter.LDAP.param.UserObjectClass=organizationalPerson
```

**com.iona.isp.adapter.LDAP.paramUserRoleDNAttr**

Specifies the attribute type that stores a user’s role DN. The default is `nsRoleDn` (from the Netscape LDAP directory schema).

For example:

```java
com.iona.isp.adapter.LDAP.paramUserRoleDNAttr=nsRoleDn
```

**com.iona.isp.adapter.LDAP.param.UserSearchFilter**

Custom filter for retrieving users. In the current version, `$USER_NAME$` is the only replaceable parameter supported. This parameter would be replaced during runtime by the LDAP adapter with the current User's login ID. This property uses the standard LDAP search filter syntax.

For example:

```java
&(uid=$USER_NAME$)(objectclass=organizationalPerson)
```

**com.iona.isp.adapter.LDAP.param.UserSearchScope**

Specifies the user search scope. This property can be set to one of the following values:

- **BASE**—Search a single entry (the base object).
- **ONE**—Search all entries immediately below the base DN.
- **SUB**—Search all entries from a whole subtree of entries.

Default is **SUB**.

For example:

```java
com.iona.isp.adapter.LDAP.param.UserSearchScope=SUB
```
com.iona.isp.adapter.LDAP.param.version

Specifies the LDAP protocol version that the Orbix security service uses to communicate with LDAP servers. The only supported version is 3 (for LDAP v3, http://www.ietf.org/rfc/rfc2251.txt). The default is 3.

For example, to select the LDAP protocol version 3:

```
com.iona.isp.adapter.LDAP.param.version=3
```

com.iona.isp.adapter.LDAP.params

Obsolete. This property was needed by earlier versions of the Orbix security service, but is now ignored.

com.iona.isp.authz.adapters

Specifies the name of the adapter that is loaded to perform authorization. The adapter name is an arbitrary identifier, AdapterName, which is used to construct the names of the properties that configure the adapter—that is, com.iona.isp.authz.adapter.AdapterName.class and com.iona.isp.authz.adapter.AdapterName.param.filelist. For example:

```
com.iona.isp.authz.adapters=file
com.iona.isp.authz.adapter.file.class=com.iona.security.is2AzAdapter.multifile.MultiFileAzAdapter
com.iona.isp.authz.adapter.file.param.filelist=ACLFileListFile;
```

com.iona.isp.authz.adapter.AdapterName.class

Selects the authorization adapter class for the AdapterName adapter. The following adapter implementations are provided by Orbix:

- com.iona.security.is2AzAdapter.multifile.MultiFileAzAdapter—an authorization adapter that enables you to specify multiple ACL files. It is used in conjunction with the
  com.iona.isp.authz.adapter.file.param.filelist property.
For example:

```properties
com.iona.isp.authz.adapters = file
com.iona.isp.authz.adapter.file.class=com.iona.security.is2AzAdapter.multifile.MultiFileAzAdapter
```

### com.iona.isp.authz.adapter.

Specifies the absolute pathname of a file containing a list of ACL files for the `AdapterName` adapter. Each line of the specified file has the following format:

```
[ACLKey]=ACLFileName
```

A file name can optionally be preceded by an ACL key and an equals sign, `ACLKey=`, if you want to select the file by ACL key. The ACL file, `ACLFileName`, is specified using an absolute pathname in the local file format.

For example, on Windows you could specify a list of ACL files as follows:

```
U:/orbix_security/etc/acl_files/server_A.xml
U:/orbix_security/etc/acl_files/server_B.xml
U:/orbix_security/etc/acl_files/server_C.xml
```

### is2.current.server.id

The server ID is an alphanumeric string (excluding spaces) that specifies the current Orbix security service’s ID. The server ID is needed for clustering. When a secure application obtains a single sign-on (SSO) token from this Orbix security service, the server ID is embedded into the SSO token. Subsequently, if the SSO token is passed to a second Orbix security service instance, the second Orbix security service recognizes that the SSO token originates from the first Orbix security service and delegates security operations to the first Orbix security service.

The server ID is also used to identify replicas in the `cluster.properties` file.

For example, to assign a server ID of `primary` to the current Orbix security service:

```
is2.current.server.id=primary
```
is2.cluster.properties.filename

Specifies the file that stores the configuration properties for clustering. For example:

```
is2.cluster.properties.filename=C:/is2_config/cluster.properties
```

is2.replication.required

Enables the replication feature of the Orbix security service, which can be used in the context of security service clustering. The possible values are true (enabled) and false (disabled). When replication is enabled, the security service pushes its cache of SSO data to other servers in the cluster at regular intervals. Default is false.

For example:

```
is2.replication.required=true
```

is2.replication.interval

Specifies the time interval between replication updates to other servers in the security service cluster. The value is specified in units of a second. Default is 30 seconds.

For example:

```
is2.replication.interval=10
```

is2.replica.selector.classname

If replication is enabled (see is2.replication.required), you must set this variable equal to com.iona.security.replicate.StaticReplicaSelector.

For example:

```
is2.replica.selector.classname=com.iona.security.replicate.StaticReplicaSelector
```
**is2.sso.cache.size**

Specifies the maximum cache size (number of user sessions) associated with single sign-on (SSO) feature. The SSO caches user information, including the user’s group and role information. If the maximum cache size is reached, the oldest sessions are deleted from the session cache.

No default.

For example:

```
is2.sso.cache.size=1000
```

**is2.sso.enabled**

Enables the single sign-on (SSO) feature of the Orbix security service. The possible values are `yes` (enabled) and `no` (disabled).

Default is `yes`.

For example:

```
is2.sso.enabled=yes
```

**is2.sso.remote.token.cached**

In a federated scenario, this variable enables caching of token data for tokens that originate from another security service in the federated cluster. When this variable is set to `true`, a security service need contact another security service in the cluster, only when the remote token is authenticated for the first time. For subsequent token authentications, the token data for the remote token can be retrieved from the local cache.

Default is `false`.

**is2.sso.session.idle.timeout**

Sets the session idle time-out in units of seconds for the single sign-on (SSO) feature of the Orbix security service. A zero value implies no time-out.
If a user logs on to the Orbix Security Framework (supplying username and password) with SSO enabled, the Orbix security service returns an SSO token for the user. The next time the user needs to access a resource, there is no need to log on again because the SSO token can be used instead. However, if no secure operations are performed using the SSO token for the length of time specified in the idle time-out, the SSO token expires and the user must log on again.

Default is 0 (no time-out).

For example:

```
is2.sso.session.idle.timeout=0
```

### is2.sso.session.timeout

Sets the absolute session time-out in units of seconds for the single sign-on (SSO) feature of the Orbix security service. A zero value implies no time-out. This is the maximum length of time since the time of the original user login for which an SSO token remains valid. After this time interval elapses, the session expires irrespective of whether the session has been active or idle. The user must then login again.

Default is 0 (no time-out).

For example:

```
is2.sso.session.timeout=0
```

### log4j.configuration

Specifies the log4j configuration filename. You can use the properties in this file to customize the level of debugging output from the Orbix security service. See also “log4j Properties File” on page 641.

For example:

```
log4j.configuration=d:/temp/myconfig.txt
```
Cluster Properties File

Overview
The cluster properties file is used to store properties common to a group of Orbix security service instances that operate as a cluster or federation. This section provides descriptions of all the properties that can be specified in a cluster file.

File location
The location of the cluster properties file is specified by the is2.cluster.properties.filename property in the iSF properties file. All of the Orbix security service instances in a cluster or federation must share the same cluster properties file.

List of properties
The following properties can be specified in the cluster properties file:

com.iona.security.common.securityInstanceURL.<ServerID>
Specifies the server URL for the <ServerID> Orbix security service instance. When single sign-on (SSO) is enabled together with clustering or federation, the Orbix security service instances use the specified instance URLs to communicate with each other. Because the Orbix security service instances share the same cluster file, they can read each other’s URLs and open connections to each other.

The connections between Orbix security service instances are made using the IIOP protocol combined with SSL/TLS. The detailed configuration of the IIOP/TLS endpoint is specified in the Orbix configuration file for each security service in the cluster. Hence, you can discover the host and port used by a particular security service by inspecting the values of the plugins:security:iiop_tls:host and plugins:security:iiop_tls:port variables from its Orbix configuration. You can use the host and port values to construct the value of the security instance URL.
For example, consider a cluster of three security services, where the first security service (ID=1) is configured as follows:

```java
plugins:security_cluster:iiop_tls:addr_list = ['+security01:5001', '+security02:5002', '+security03:5003'];
plugins:security:iiop_tls:host = "5001";
plugins:security:iiop_tls:port = "security01";
```

The `plugins:security:iiop_tls:host` and `plugins:security:iiop_tls:port` variables give the host and port of the first service, server01:5001. Assuming the host and port for the second and third services are server02:5002 and server03:5003 respectively, you would configure the security instance URLs as follows:

```java
# Advertise the locations of the security services in the cluster.
com.iona.security.common.securityInstanceURL.1=corbaloc:it_iiops:1.2@security01:5001/IT_SecurityService
com.iona.security.common.securityInstanceURL.2=corbaloc:it_iiops:1.2@security02:5002/IT_SecurityService
com.iona.security.common.securityInstanceURL.3=corbaloc:it_iiops:1.2@security03:5003/IT_SecurityService
```

**com.iona.security.common.replicaURL.<ServerID>**

A comma-separated list of URLs for the other security services to which this service replicates its SSO token data. In Orbix, the URLs for the other security services are normally specified in a `corbaloc` format.

For example, to configure the first service in a cluster (ID=1) to replicate its SSO token data to the second service (with address, server02:5002) and the third service (with address, server02:5002) in the cluster, you would add the following line to the `cluster.properties` file:

```java
# Configure replication between security services.
com.iona.security.common.replicaURL.1=corbaloc:it_iiops:1.2@security02:5002/IT_SecurityService,
corbaloc:it_iiops:1.2@security03:5003/IT_SecurityService
```
# log4j Properties File

## Overview

The log4j properties file configures log4j logging for your Orbix security service. This section describes a minimal set of log4j properties that can be used to configure basic logging.

## log4j documentation

For complete log4j documentation, see the following Web page:

http://jakarta.apache.org/log4j/docs/documentation.html

## File location

The location of the log4j properties file is specified by the `log4j.configuration` property in the iSF properties file. For ease of administration, different Orbix security service instances can optionally share a common log4j properties file.

## List of properties

To give you some idea of the capabilities of log4j, the following is an incomplete list of properties that can be specified in a log4j properties file:

### log4j.appender.<AppenderHandle>

This property specifies a log4j appender class that directs `<AppenderHandle>` logging messages to a particular destination. For example, one of the following standard log4j appender classes could be specified:

- org.apache.log4j.ConsoleAppender
- org.apache.log4j.FileAppender
- org.apache.log4j.RollingFileAppender
- org.apache.log4j.DailyRollingFileAppender
- org.apache.log4j.AsynchAppender
- org.apache.log4j.WriterAppender

For example, to log messages to the console screen for the `A1` appender handle:

```
```
log4j.appender.<AppenderHandle>.layout

This property specifies a log4j layout class that is used to format <AppenderHandle> logging messages. One of the following standard log4j layout classes could be specified:

- org.apache.log4j.PatternLayout
- org.apache.log4j.HTMLLayout
- org.apache.log4j.SimpleLayout
- org.apache.log4j.TTCCLayout

For example, to use the pattern layout class for log messages processed by the A1 appender:

```
```

log4j.appender.<AppenderHandle>.layout.ConversionPattern

This property is used only in conjunction with the org.apache.log4j.PatternLayout class (when specified by the log4j.appender.<AppenderHandle>.layout property) to define the format of a log message.

For example, you can specify a basic conversion pattern for the A1 appender as follows:

```
log4j.appender.A1.layout.ConversionPattern=%-4r [%t] %-5p %c %x - %m%n
```

log4j.rootCategory

This property is used to specify the logging level of the root logger and to associate the root logger with one or more appenders. The value of this property is specified as a comma separated list as follows:

```
<LogLevel>, <AppenderHandle01>, <AppenderHandle02>, ...
```

The logging level, `<LogLevel>`, can have one of the following values:

- DEBUG
- INFO
- WARN
- ERROR
• FATAL
An appender handle is an arbitrary identifier that associates a logger with a particular logging destination.
For example, to select all messages at the DEBUG level and direct them to the A1 appender, you can set the property as follows:

```
log4j.rootCategory=DEBUG, A1
```
ASN.1 and Distinguished Names

The OSI Abstract Syntax Notation One (ASN.1) and X.500 Distinguished Names play an important role in the security standards that define X.509 certificates and LDAP directories.

In this appendix

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</table>
ASN.1

Overview
The Abstract Syntax Notation One (ASN.1) was defined by the OSI standards body in the early 1980s to provide a way of defining data types and structures that is independent of any particular machine hardware or programming language. In many ways, ASN.1 can be considered a forerunner of the OMG’s IDL, because both languages are concerned with defining platform-independent data types.

ASN.1 is important, because it is widely used in the definition of standards (for example, SNMP, X.509, and LDAP). In particular, ASN.1 is ubiquitous in the field of security standards—the formal definitions of X.509 certificates and distinguished names are described using ASN.1 syntax. You do not require detailed knowledge of ASN.1 syntax to use these security standards, but you need to be aware that ASN.1 is used for the basic definitions of most security-related data types.

BER
The OSI’s Basic Encoding Rules (BER) define how to translate an ASN.1 data type into a sequence of octets (binary representation). The role played by BER with respect to ASN.1 is, therefore, similar to the role played by GIOP with respect to the OMG IDL.

DER
The OSI’s Distinguished Encoding Rules (DER) are a specialization of the BER. The DER consists of the BER plus some additional rules to ensure that the encoding is unique (BER encodings are not).

References
You can read more about ASN.1 in the following standards documents:

- ASN.1 is defined in X.208.
- BER is defined in X.209.
Distinguished Names

Overview
Historically, distinguished names (DN) were defined as the primary keys in an X.500 directory structure. In the meantime, however, DNs have come to be used in many other contexts as general purpose identifiers. In the Orbix Security Framework, DNs occur in the following contexts:

• X.509 certificates—for example, one of the DNs in a certificate identifies the owner of the certificate (the security principal).
• LDAP—DNs are used to locate objects in an LDAP directory tree.

String representation of DN
Although a DN is formally defined in ASN.1, there is also an LDAP standard that defines a UTF-8 string representation of a DN (see RFC 2253). The string representation provides a convenient basis for describing the structure of a DN.

Note: The string representation of a DN does not provide a unique representation of DER-encoded DN. Hence, a DN that is converted from string format back to DER format does not always recover the original DER encoding.

DN string example
The following string is a typical example of a DN:

C=US,O=IONA Technologies,OU=Engineering,CN=A. N. Other

Structure of a DN string
A DN string is built up from the following basic elements:

• OID.
• Attribute types.
• AVA.
• RDN.

OID
An OBJECT IDENTIFIER (OID) is a sequence of bytes that uniquely identifies a grammatical construct in ASN.1.
Attribute types

The variety of attribute types that could appear in a DN is theoretically open-ended, but in practice only a small subset of attribute types are used. Table 29 shows a selection of the attribute types that you are most likely to encounter:

Table 29:  Commonly Used Attribute Types

<table>
<thead>
<tr>
<th>String Representation</th>
<th>X.500 Attribute Type</th>
<th>Size of Data</th>
<th>Equivalent OID</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>countryName</td>
<td>2</td>
<td>2.5.4.6</td>
</tr>
<tr>
<td>O</td>
<td>organizationName</td>
<td>1...64</td>
<td>2.5.4.10</td>
</tr>
<tr>
<td>OU</td>
<td>organizationalUnitName</td>
<td>1...64</td>
<td>2.5.4.11</td>
</tr>
<tr>
<td>CN</td>
<td>commonName</td>
<td>1...64</td>
<td>2.5.4.3</td>
</tr>
<tr>
<td>ST</td>
<td>stateOrProvinceName</td>
<td>1...64</td>
<td>2.5.4.8</td>
</tr>
<tr>
<td>L</td>
<td>localityName</td>
<td>1...64</td>
<td>2.5.4.7</td>
</tr>
<tr>
<td>STREET</td>
<td>streetAddress</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC</td>
<td>domainComponent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UID</td>
<td>userid</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

AVA

An attribute value assertion (AVA) assigns an attribute value to an attribute type. In the string representation, it has the following syntax:

<attr-type>=<attr-value>

For example:

CN=A. N. Other

Alternatively, you can use the equivalent OID to identify the attribute type in the string representation (see Table 29). For example:

2.5.4.3=A. N. Other
A relative distinguished name (RDN) represents a single node of a DN (the bit that appears between the commas in the string representation). Technically, an RDN might contain more than one AVA (it is formally defined as a set of AVAs); in practice, however, this almost never occurs. In the string representation, an RDN has the following syntax:

\(<\text{attr-type}>=\text{attr-value}\>[+\text{attr-type}>=\text{attr-value} \ldots]\)

Here is an example of a (very unlikely) multiple-value RDN:

\(\text{OU=Eng1+OU=Eng2+OU=Eng3}\)

Here is an example of a single-value RDN:

\(\text{OU=Engineering}\)
Association Options

This appendix describes the semantics of all the association options that are supported by Orbix.

In this appendix

This appendix contains the following section:

| Association Option Semantics | page 652 |
Association Option Semantics

Overview
This appendix defines how AssociationOptions are used with SecClientInvocation and SecTargetInvocation policies.

IDL Definitions
AssociationOptions are enumerated in the CORBA security specification as follows:

```idl
typedef unsigned short AssociationOptions;
const AssociationOptions NoProtection = 1;
const AssociationOptions Integrity = 2;
const AssociationOptions Confidentiality = 4;
const AssociationOptions DetectReplay = 8;
const AssociationOptions DetectMisordering = 16;
const AssociationOptions EstablishTrustInTarget = 32;
const AssociationOptions EstablishTrustInClient = 64;
// Unsupported option: NoDelegation
// Unsupported option: SimpleDelegation
// Unsupported option: CompositeDelegation
```

Table of association options
Table 30 shows how the options affect client and target policies:

<table>
<thead>
<tr>
<th>Association Options</th>
<th>client_supports</th>
<th>client Requires</th>
<th>target_supports</th>
<th>target Requires</th>
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</thead>
<tbody>
<tr>
<td>NoProtection</td>
<td>Client supports unprotected messages.</td>
<td>The client’s minimal protection requirement is unprotected messages.</td>
<td>Target supports unprotected messages.</td>
<td>The target’s minimal protection requirement is unprotected messages.</td>
</tr>
<tr>
<td>Integrity</td>
<td>The client supports integrity protected messages.</td>
<td>The client requires integrity messages to be integrity protected.</td>
<td>The target supports integrity protected messages.</td>
<td>The target requires messages to be integrity protected.</td>
</tr>
</tbody>
</table>
### Table 30: Association Options for Client and Target

<table>
<thead>
<tr>
<th>Association Options</th>
<th>client_supports</th>
<th>client_requires</th>
<th>target_supports</th>
<th>target_requires</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confidentiality</td>
<td>The client supports confidentiality protected messages.</td>
<td>The client requires messages to be confidentiality protected.</td>
<td>The target supports confidentiality protected messages.</td>
<td>The target requires messages to be confidentiality protected.</td>
</tr>
<tr>
<td>DetectReplay</td>
<td>The client can detect replay of requests (and request fragments).</td>
<td>The client requires detection of message replay.</td>
<td>The target can detect replay of requests (and request fragments).</td>
<td>The target requires detection of message replay.</td>
</tr>
<tr>
<td>DetectMisordering</td>
<td>The client can detect sequence errors of requests (and request fragments).</td>
<td>The client requires detection of message mis-sequencing.</td>
<td>The target can detect sequence errors of requests (and request fragments).</td>
<td>The target requires detection of message mis-sequencing.</td>
</tr>
<tr>
<td>EstablishTrustInTarget</td>
<td>The client is capable of authenticating the target.</td>
<td>The client requires establishment of trust in the target’s identity.</td>
<td>The target is prepared to authenticate its identity to the client.</td>
<td>(This option is invalid).</td>
</tr>
<tr>
<td>EstablishTrustInClient</td>
<td>The client is prepared to authenticate its identity to the target.</td>
<td>(This option is invalid).</td>
<td>The target is capable of authenticating the client.</td>
<td>The target requires establishment of trust in the client’s identity.</td>
</tr>
</tbody>
</table>
This appendix presents the document type definition (DTD) for the action-role mapping XML file.

The action-role mapping DTD is shown in **Example 62**.

**Example 62:**

```xml
<?xml version="1.0" encoding="UTF-8"?>
<!ELEMENT action-name (#PCDATA)>
<!ELEMENT role-name (#PCDATA)>
<!ELEMENT server-name (#PCDATA)>
<!ELEMENT action-role-mapping (server-name, interface+)>  
<!ELEMENT name (#PCDATA)>
<!ELEMENT interface (name, action-role+)>  
<!ELEMENT parameter EMPTY>
<!ATTLIST parameter
  name CDATA #REQUIRED
  value CDATA #REQUIRED>

<!ELEMENT parameter-control (parameter+, role-name+)>  
<!ELEMENT action-role (action-name, parameter-control*, 
  role-name+)>
<!ELEMENT allow-unlisted-interfaces (#PCDATA)>
<!ELEMENT secure-system (allow-unlisted-interfaces*, 
  action-role-mapping+)> 
```
The elements of the action-role mapping DTD can be described as follows:

```
<!ELEMENT action-name (#PCDATA)>
```

Specifies the action name to which permissions are assigned. The interpretation of the action name depends on the type of application:

- **CORBA server**—for IDL operations, the action name corresponds to the GIOP on-the-wire format of the operation name (usually the same as it appears in IDL).
  For IDL attributes, the accessor or modifier action name corresponds to the GIOP on-the-wire format of the attribute accessor or modifier. For example, an IDL attribute, `foo`, would have an accessor, `_get_foo`, and a modifier, `_set_foo`.

- **Artix server**—for WSDL operations, the action name is equivalent to a WSDL operation name; that is, the `OperationName` from a tag, `<operation name="OperationName">`.

The `action-name` element supports a wildcard mechanism, where the special character, `*`, can be used to match any number of contiguous characters in an action name. For example, the following `action-name` element matches any action:

```
<action-name>*</action-name>
```

```
<!ELEMENT action-role (action-name, parameter-control*, role-name+)>
```

Groups together a particular action and all of the roles permitted to perform that action.

```
<!ELEMENT action-role-mapping (server-name, interface+)> 
```

Contains all of the permissions that apply to a particular server application.
<!ELEMENT allow-unlisted-interfaces (#PCDATA)>

Specifies the default access permissions that apply to interfaces not explicitly listed in the action-role mapping file. The element contents can have the following values:

- **true**—for any interfaces not listed, access to all of the interfaces’ actions is allowed for all roles. If the remote user is unauthenticated (in the sense that no credentials are sent by the client), access is also allowed.

- **false**—for any interfaces not listed, access to all of the interfaces’ actions is denied for all roles. Unauthenticated users are also denied access.

Default is **false**.

<!ELEMENT interface (name, action-role+)>

In the case of a CORBA server, the **interface** element contains all of the access permissions for one particular IDL interface.

In the case of an Artix server, the **interface** element contains all of the access permissions for one particular WSDL port type.

You can also use the wildcard, *, to match any number of contiguous characters in an interface name.

<!ELEMENT name (#PCDATA)>

Within the scope of an **interface** element, identifies the interface (IDL interface or WSDL port type) with which permissions are being associated. The format of the interface name depends on the type of application, as follows:

- **CORBA server**—the **name** element identifies the IDL interface using the interface’s OMG repository ID. The repository ID normally consists of the characters IDL: followed by the fully scoped name of the interface (using / instead of :: as the scoping character).
followed by the characters :1.0. Hence, the Simple::SimpleObject IDL interface is identified by the IDL:Simple/SimpleObject:1.0 repository ID.

Note: The form of the repository ID can also be affected by various #pragma directives appearing in the IDL file. A commonly used directive is #pragma prefix.

For example, the CosNaming::NamingContext interface in the naming service module, which uses the omg.org prefix, has the following repository ID: IDL:omg.org/CosNaming/NamingContext:1.0

♦ Artix server—the name element contains a WSDL port type name, specified in the following format:

NamespaceURI:PortTypeName

The PortTypeName comes from a tag, <portType name="PortTypeName">, defined in the NamespaceURI namespace.
The NamespaceURI is usually defined in the <definitions targetNamespace="NamespaceURI" ...> tag of the WSDL contract.

<!ELEMENT parameter EMPTY>
<!ATTLIST parameter
    name CDATA #REQUIRED
    value CDATA #REQUIRED
>

The <parameter> element is used in conjunction with the action-role mapping feature to restrict user access to an action. A user role is allowed to access an action only if the parameter specified by the name attribute has the value specified by the value attribute.

Note: By default, the <parameter> and <parameter-control> tags only have an effect for the CFR service. Extending this feature to work with other services requires the Orbix ART plug-in development kit.

<!ELEMENT parameter-control (parameter+, role-name+)>

Specifies access control based on the values of certain parameters of the associated action. The role names listed within the <parameter-control> element are granted access to the enclosing action only if the parameters take the values specified by the <parameter> tags.

<!ELEMENT role-name (#PCDATA)>
Specifies a role to which permission is granted. The role name can be any role that belongs to the server’s Artix authorization realm (for CORBA bindings, the realm name is specified by the plugins:gsp:authorization_realm configuration variable; for SOAP bindings, the realm name is specified by the plugins:asp:authorization_realm configuration variable) or to the IONAGlobalRealm realm. The roles themselves are defined in the security server backend; for example, in a file adapter file or in an LDAP backend.

```
<!ELEMENT secure-system (allow-unlisted-interfaces*,
  action-role-mapping+)>  
The outermost scope of an action-role mapping file groups together a
collection of action-role-mapping elements.
```

```
<!ELEMENT server-name (#PCDATA)>  
The server-name element specifies the configuration scope (that is, the
ORB name) used by the server in question. This is normally the value of
the -ORBname parameter passed to the server executable on the command
line.
You can also use the wildcard, *, to match any number of contiguous
characters in a configuration scope name.
```
OpenSSL Utilities

The `openssl` program consists of a large number of utilities that have been combined into one program. This appendix describes how you use the `openssl` program with Orbix when managing X.509 certificates and private keys.

In this appendix

This appendix contains the following sections:

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<th>page 662</th>
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</thead>
<tbody>
<tr>
<td>The OpenSSL Configuration File</td>
<td>page 671</td>
</tr>
</tbody>
</table>
Using OpenSSL Utilities

The OpenSSL package

Orbix ships a version of the OpenSSL program that is available with Eric Young’s openssl package. OpenSSL is a publicly available implementation of the SSL protocol. Consult “License Issues” on page 687 for information about the copyright terms of OpenSSL.

Note: For complete documentation of the OpenSSL utilities, consult the documentation at the OpenSSL web site http://www.openssl.org/docs.

Command syntax

An openssl command line takes the following form:

openssl utility arguments

For example:

openssl x509 -in OrbixCA -text

The openssl utilities

This appendix describes four openssl utilities:

- x509 Manipulates X.509 certificates.
- req Creates and manipulates certificate signing requests, and self-signed certificates.
- rsa Manipulates RSA private keys.
- ca Implements a Certification Authority (CA).

The -help option

To get a list of the arguments associated with a particular command, use the -help option as follows:

openssl utility -help

For example:

openssl x509 -help
The x509 Utility

Purpose of the x509 utility

In Orbix the x509 utility is mainly used for:

• Printing text details of certificates you wish to examine.
• Converting certificates to different formats.

Options

The options supported by the openssl x509 utility are as follows:

- **inform arg** - input format - default PEM
  (one of DER, NET or PEM)
- **outform arg** - output format - default PEM
  (one of DER, NET or PEM)
- **keyform arg** - private key format - default PEM
- **CAform arg** - CA format - default PEM
- **CAkeyform arg** - CA key format - default PEM
- **in arg** - input file - default stdin
- **out arg** - output file - default stdout
- **serial** - print serial number value
- **hash** - print serial number value
- **subject** - print subject DN
- **issuer** - print issuer DN
- **startdate** - notBefore field
- **enddate** - notAfter field
- **dates** - both Before and After dates
- **modulus** - print the RSA key modulus
- **fingerprint** - print the certificate fingerprint
- **noout** - no certificate output
- **days arg** - How long till expiry of a signed certificate
  - def 30 days
- **signkey arg** - self sign cert with arg
- **x509toreq** - output a certification request object
- **req** - input is a certificate request, sign and output
- **CA arg** - set the CA certificate, must be PEM format
-CAkey arg  - set the CA key, must be PEM format. If missing it is assumed to be in the CA file
-CAcreateserial  - create serial number file if it does not exist
-CAserial  - serial file
-text  - print the certificate in text form
-C  - print out C code forms
-md2/-md5/-sha1/-mdc2  - digest to do an RSA sign with

Using the x509 utility

To print the text details of an existing PEM-format X.509 certificate, use the x509 utility as follows:
openssl x509 -in MyCert.pem -inform PEM -text
To print the text details of an existing DER-format X.509 certificate, use the x509 utility as follows:
openssl x509 -in MyCert.der -inform DER -text
To change a certificate from PEM format to DER format, use the x509 utility as follows:
openssl x509 -in MyCert.pem -inform PEM -outform DER -out MyCert.der
The req Utility

Purpose of the x509 utility

The req utility is used to generate a self-signed certificate or a certificate signing request (CSR). A CSR contains details of a certificate to be issued by a CA. When creating a CSR, the req command prompts you for the necessary information from which a certificate request file and an encrypted private key file are produced. The certificate request is then submitted to a CA for signing. If the -nodes (no DES) parameter is not supplied to req, you are prompted for a pass phrase which will be used to protect the private key.

Note: It is important to specify a validity period (using the -days parameter). If the certificate expires, applications that are using that certificate will not be authenticated successfully.

Options

The options supported by the openssl req utility are as follows:

- -inform arg input format - one of DER TXT PEM
- -outform arg output format - one of DER TXT PEM
- -in arg inout file
- -out arg output file
- -text arg text form of request
- -noout do not output REQ
- -verify verify signature on REQ
- -modulus RSA modulus
- -nodes do not encrypt the output key
- -key file use the private key contained in file
- -keyform arg key file format
- -keyout arg file to send the key to
- -newkey rsa:bits generate a new RSA key of ‘bits’ in size
- -newkey dsa:file generate a new DSA key, parameters taken from CA in ‘file’
- -[digest] Digest to sign with (md5, sha1, md2, mdc2)
- -config file request template file
- -new new request
Using the req Utility

To create a self-signed certificate with an expiry date a year from now, the `req` utility can be used as follows to create the certificate `CA_cert.pem` and the corresponding encrypted private key file `CA_pk.pem`:

```
openssl req -config ssl_conf_path_name -days 365 -out CA_cert.pem -new -x509 -keyout CA_pk.pem
```

This following command creates the certificate request `MyReq.pem` and the corresponding encrypted private key file `MyEncryptedKey.pem`:

```
openssl req -config ssl_conf_path_name -days 365 -out MyReq.pem -new -keyout MyEncryptedKey.pem
```

- `-x509` output an x509 structure instead of a certificate req. (Used for creating self signed certificates)
- `-days` number of days an x509 generated by `-x509` is valid for
- `-asn1-kludge` Output the 'request' in a format that is wrong but some CA's have been reported as requiring [It is now always turned on but can be turned off with `-no-asn1-kludge`]
The rsa Utility

**Purpose of the rsa utility**
The rsa command is a useful utility for examining and modifying RSA private key files. Generally RSA keys are stored encrypted with a symmetric algorithm using a user-supplied pass phrase. The OpenSSL req command prompts the user for a pass phrase in order to encrypt the private key. By default, req uses the triple DES algorithm. The rsa command can be used to change the password that protects the private key and to convert the format of the private key. Any rsa command that involves reading an encrypted rsa private key will prompt for the PEM pass phrase used to encrypt it.

**Options**
The options supported by the openssl rsa utility are as follows:

- **-inform arg** input format - one of DER NET PEM
- **-outform arg** output format - one of DER NET PEM
- **-in arg** inout file
- **-out arg** output file
- **-des** encrypt PEM output with cbc des
- **-des3** encrypt PEM output with ede cbc des using 168 bit key
- **-text** print the key in text
- **-noout** do not print key out
- **-modulus** print the RSA key modulus

**Using the rsa Utility**
Converting a private key to PEM format from DER format involves using the rsa utility as follows:

openssl rsa -inform DER -in MyKey.der -outform PEM -out MyKey.pem

Changing the pass phrase which is used to encrypt the private key involves using the rsa utility as follows:

openssl rsa -inform PEM -in MyKey.pem -outform PEM -out MyKey.pem -des3

Removing encryption from the private key (which is not recommended) involves using the rsa command utility as follows:

openssl rsa -inform PEM -in MyKey.pem -outform PEM -out MyKey2.pem
Note: Do not specify the same file for the `in` and `out` parameters, because this can corrupt the file.
The ca Utility

Purpose of the ca utility
You can use the ca utility create X.509 certificates by signing existing signing requests. It is imperative that you check the details of a certificate request before signing. Your organization should have a policy with respect to the issuing of certificates.

The ca utility is used to sign certificate requests thereby creating a valid X.509 certificate which can be returned to the request submitter. It can also be used to generate Certificate Revocation Lists (CRLS). For information on the ca -policy and -name options, refer to “The OpenSSL Configuration File” on page 671.

Creating a new CA
To create a new CA using the openssl ca utility, two files (serial and index.txt) need to be created in the location specified by the openssl configuration file that you are using.

Options
The options supported by the openssl ca utility are as follows:

-verbose - Talk alot while doing things
-config file - A config file
-name arg - The particular CA definition to use
-gencrl - Generate a new CRL
-crlays days - Days is when the next CRL is due
-crlhours hours - Hours is when the next CRL is due
-days arg - number of days to certify the certificate for
-md arg - md to use, one of md2, md5, sha or shal
-policy arg - The CA 'policy' to support
-keyfile arg - PEM private key file
-key arg - key to decode the private key if it is encrypted
-cert - The CA certificate
-in file - The input PEM encoded certificate request(s)
-out file - Where to put the output file(s)
-outdir dir - Where to put output certificates
Using the ca Utility

Converting a private key to PEM format from DER format involves using the `ca` utility as shown in the following example. To sign the supplied CSR `MyReq.pem` to be valid for 365 days and create a new X.509 certificate in PEM format, use the `ca` utility as follows:

```
openssl ca -config ssl_conf_path_name -days 365
-in MyReq.pem -out MyNewCert.pem
```

Note: Most of the above parameters have default values as defined in `openssl.cnf`.

- `infiles`: The last argument, requests to process
- `spkac file`: File contains DN and signed public key and challenge
- `preserveDN`: Do not re-order the DN
- `batch`: Do not ask questions
- `msie_hack`: Msie modifications to handle all those universal strings
The OpenSSL Configuration File

Overview

A number of OpenSSL commands (for example, req and ca) take a -config parameter that specifies the location of the openssl configuration file. This section provides a brief description of the format of the configuration file and how it applies to the req and ca commands. An example configuration file is listed at the end of this section.

Structure of openssl.cnf

The openssl.cnf configuration file consists of a number of sections that specify a series of default values that are used by the openssl commands.

In this section

This section contains the following subsections:

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<td>[policy] Variables</td>
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<tr>
<td>Example openssl.cnf File</td>
<td>675</td>
</tr>
</tbody>
</table>
### [req] Variables

**Overview of the variables**

The `req` section contains the following variables:

- `default_bits` = 1024
- `default_keyfile` = `privkey.pem`
- `distinguished_name` = `req_distinguished_name`
- `attributes` = `req_attributes`

**default_bits configuration variable**

The `default_bits` variable is the default RSA key size that you wish to use. Other possible values are 512, 2048, and 4096.

**default_keyfile configuration variable**

The `default_keyfile` variable is the default name for the private key file created by `req`.

**distinguished_name configuration variable**

The `distinguished_name` variable specifies the section in the configuration file that defines the default values for components of the distinguished name field. The `req_attributes` variable specifies the section in the configuration file that defines defaults for certificate request attributes.
[ca] Variables

Choosing the CA section

You can configure the file `openssl.cnf` to support a number of CAs that have different policies for signing CSRs. The `-name` parameter to the `ca` command specifies which CA section to use. For example:

```
openssl ca -name MyCa ...
```

This command refers to the CA section `[MyCa]`. If `-name` is not supplied to the `ca` command, the CA section used is the one indicated by the `default_ca` variable. In the “Example openssl.cnf File” on page 675, this is set to `CA_default` (which is the name of another section listing the defaults for a number of settings associated with the `ca` command). Multiple different CAs can be supported in the configuration file, but there can be only one default CA.

Overview of the variables

Possible `[ca]` variables include the following

- **dir**: The location for the CA database
  
  The database is a simple text database containing the following tab separated fields:

  - **status**: A value of ‘R’ - revoked, ‘E’ - expired or ‘V’ valid
  - **issued date**: When the certificate was certified
  - **revoked date**: When it was revoked, blank if not revoked
  - **serial number**: The certificate serial number
  - **certificate**: Where the certificate is located
  - **CN**: The name of the certificate

  The serial number field should be unique, as should the CN/status combination. The `ca` utility checks these at startup.

- **certs**: This is where all the previously issued certificates are kept
[policy] Variables

Choosing the policy section

The policy variable specifies the default policy section to be used if the -policy argument is not supplied to the ca command. The CA policy section of a configuration file identifies the requirements for the contents of a certificate request which must be met before it is signed by the CA.

There are two policy sections defined in the “Example openssl.cnf File” on page 675: policy_match and policy_anything.

Example policy section

The policy_match section of the example openssl.cnf file specifies the order of the attributes in the generated certificate as follows:

- countryName
- stateOrProvinceName
- organizationName
- organizationalUnitName
- commonName
- emailAddress

The match policy value

Consider the following value:

countryName = match

This means that the country name must match the CA certificate.

The optional policy value

Consider the following value:

organizationalUnitName = optional

This means that the organizationalUnitName does not have to be present.

The supplied policy value

Consider the following value:

commonName = supplied

This means that the commonName must be supplied in the certificate request.
Example openssl.cnf File

The following listing shows the contents of an example openssl.cnf configuration file:

```
# openssl example configuration file.
# This is mostly used for generation of certificate requests.

[ ca ]
default_ca= CA_default # The default ca section

[ CA_default ]

dir=/opt/iona/OrbixSSL1.0c/certs # Where everything is kept

certs=$dir # Where the issued certs are kept
crl_dir= $dir/crl # Where the issued crl are kept
database= $dir/index.txt # database index file
new_certs_dir= $dir/new_certs # default place for new certs
certificate=$dir/CA/OrbixCA # The CA certificate
serial= $dir/serial # The current serial number
crl= $dir/crl.pem # The current CRL
private_key= $dir/CA/OrbixCA.pk # The private key
RANDFILE= $dir/.rand # private random number file
default_days= 365 # how long to certify for
default_crl_days= 30 # how long before next CRL
default_md= md5 # which message digest to use
preserve= no # keep passed DN ordering

# A few different ways of specifying how closely the request should
# conform to the details of the CA

policy= policy_match

# For the CA policy

[policy_match]
countryName= match
stateOrProvinceName= match
organizationName= match
organizationalUnitName= optional
commonName= supplied
```
emailAddress= optional

# For the ‘anything’ policy
# At this point in time, you must list all acceptable ‘object’
# types

[ policy_anything ]
countryName = optional
stateOrProvinceName= optional
localityName= optional
organizationName = optional
organizationalUnitName = optional
countryName= supplied
countryName= supplied
emailAddress= optional

[ req ]
default_bits = 1024
default_keyfile= privkey.pem
distinguished_name = req_distinguished_name
attributes = req_attributes

[ req_distinguished_name ]
countryName= Country Name (2 letter code)
countryName_min= 2
countryName_max = 2
stateOrProvinceName= State or Province Name (full name)
localityName = Locality Name (eg, city)
organizationName = Organization Name (eg, company)
organizationalUnitName = Organizational Unit Name (eg, section)
countryName = Common Name (eg. YOUR name)
countryName_max = 64
countryName_max = 64
emailAddress = Email Address
emailAddress_max = 40

[ req_attributes ]
challengePassword = A challenge password
challengePassword_min = 4
challengePassword_max = 20
unstructuredName= An optional company name
Security Recommendations

This appendix lists some general recommendations for ensuring the effectiveness of Orbix security.

In this appendix

This appendix contains the following sections:

General Recommendations  page 678
General Recommendations

List of recommendations

The following general recommendations can help you secure your system using Orbix applications

1. Use SSL security for every application wherever possible.
2. Use the strongest cipher suites available. There is little extra overhead if you use 128 bit instead of 40 bit encryption for a typical connection.
3. If your application must connect to insecure applications, limit the aspects of your system that use insecure communications to the minimum necessary using policies and security aware code.
4. Treat any IOR received from an insecure endpoint as untrustworthy. Set your policies so that you cannot use insecure IORs accidentally. Set all communications in your ORBs to be secure by default and use the appropriate policies to override these where necessary.
5. It is important to remember that the certificates supplied with Orbix are for demonstration purposes only and must be replaced with a securely generated set of real certificates before applications can run in a production environment.
6. The contents of your trusted CA list files must only include CA certificates that you trust.
7. Do not use passwords in the configuration file. This feature is only a developer aid.
8. The security of all SSL/TLS programs is only as strong as the weakest cipher suite that they support. Consider making stronger cipher suites available as an optional service which may be availed of by applications with stronger minimum security requirements.

The bad guys will of course choose to use the weakest cipher suites.

9. Depending on the sensitivity of your system an RSA key size greater than 512 bits might be appropriate. 1024 bit keys are significantly slower than 512 bit keys but are much more secure.
Sample TLS Configurations

This appendix lists the standard demonstration configurations from the demos.tls configuration scope.

In this appendix

This appendix contains the following section:

| Demonstration TLS Scopes | page 680 |
Demonstration TLS Scopes

Overview

The following TLS scopes demonstrate how to configure elementary security policies for secure IIOP/TLS clients and servers.

```plaintext
# Orbix Configuration File
demos {
  tls {
    secure_client_with_no_cert {
      principal_sponsor:use_principal_sponsor = "false";
      policies:client_secure_invocation_policy:requires = ["Confidentiality", "EstablishTrustInTarget"];
      policies:client_secure_invocation_policy:supports = ["Confidentiality", "Integrity", "DetectReplay", "DetectMisordering", "EstablishTrustInTarget"];
    }
    secure_client_with_cert {
      policies:client_secure_invocation_policy:requires = ["Confidentiality", "EstablishTrustInTarget"];
      policies:client_secure_invocation_policy:supports = ["Confidentiality", "Integrity", "DetectReplay", "DetectMisordering", "EstablishTrustInClient", "EstablishTrustInTarget"];
      principal_sponsor:use_principal_sponsor = "true";
      principal_sponsor:auth_method_id = "pkcs12_file";
      principal_sponsor:auth_method_data = ["filename=C:\Programs\IONA\asp\6.3\etc\tls\x509\certs\demos\bob.p12", "password=bobpass"];
      initial_references:IT_TLS_Toolkit:plugin = "schannel_toolkit";
    }
  }
}
```

680
event_log:filters = ["IT_ATLI_TLS="*, "IT_IIO="*, "IT_IIO_TLS="*, "IT_TLS="*, "IT_SCHANNEL="*" ];

{}

smart_card
{
    principal_sponsor:auth_method_id = "pkcs11";

    principal_sponsor:auth_method_data = ["provider=dkck132.dll", "slot=0", "pin=demopassword"];

}

semi_secure_client_with_cert
{
    orb_plugins = ["iiop_profile", "giop", "iiop", "iiop_tls", "local_log_stream" ];

    policies:client_secure_invocation_policy:requires = ["NoProtection"];

    policies:client_secure_invocation_policy:supports = ["NoProtection", "Confidentiality", "Integrity", "DetectReplay", "DetectMisordering", "EstablishTrustInClient", "EstablishTrustInTarget"];

    principal_sponsor:use_principal_sponsor = "true";

    principal_sponsor:auth_method_id = "pkcs12_file";

    principal_sponsor:auth_method_data = ["filename=C:\Programs\IONA\asp\6.3\etc\tls\x509\certs\demos\bank_server.p12", "password=bankserverpass"];

}

semi_secure_client_with_no_cert
{
    orb_plugins = ["iiop_profile", "giop", "iiop", "iiop_tls", "local_log_stream" ];

    principal_sponsor:use_principal_sponsor = "false";

    policies:client_secure_invocation_policy:requires = ["NoProtection"];

}
policies:client_secure_invocation_policy:supports = [
"NoProtection", 
"Confidentiality", "Integrity", "DetectReplay", "DetectMisordering", 
"EstablishTrustInTarget"];
}

insecure_server
{
    orb_plugins = ["iiop_profile", "giop", "iiop", "local_log_stream"]; 
}

secure_server_no_client_auth
{
    policies:target_secure_invocation_policy:requires = ["Confidentiality"]; 
    policies:target_secure_invocation_policy:supports = ["Confidentiality", 
"Integrity", "DetectReplay", "DetectMisordering", "EstablishTrustInTarget"]; 
    principal_sponsor:use_principal_sponsor = "true";
    principal_sponsor:auth_method_id = "pkcs12_file";
    principal_sponsor:auth_method_data = 
["filename=C:\Programs\IONA\asp\6.3\etc\tls\x509\certs\demos\bank_server.p12", 
"password=bankserverpass"]; 
}

secure_server_request_client_auth
{
    policies:target_secure_invocation_policy:requires = ["Confidentiality"]; 
    policies:target_secure_invocation_policy:supports = ["EstablishTrustInClient", 
"Confidentiality", "Integrity", "DetectReplay", "DetectMisordering", 
"EstablishTrustInTarget"]; 
    principal_sponsor:use_principal_sponsor = "true";
    principal_sponsor:auth_method_id = "pkcs12_file";
    principal_sponsor:auth_method_data = 
["filename=C:\Programs\IONA\asp\6.3\etc\tls\x509\certs\demos\bank_server.p12", 
"password=bankserverpass"]; 
}
secure_server_enforce_client_auth
{
    policies:target_secure_invocation_policy:requires = ["EstablishTrustInClient", "Confidentiality"];

    policies:target_secure_invocation_policy:supports = ["EstablishTrustInClient", "Confidentiality", "Integrity", "DetectReplay", "DetectMisordering", "EstablishTrustInTarget"];

    principal_sponsor:use_principal_sponsor = "true";

    principal_sponsor:auth_method_id = "pkcs12_file";

    principal_sponsor:auth_method_data = [
        "filename=C:\Programs\IONA\asp\6.3\etc\tls\x509\certs\demos\bank_server.p12",
        "password=bankserverpass"];

    schannel
    {
        principal_sponsor:auth_method_id = "security_label";

        principal_sponsor:auth_method_data = ["label=Abigbank Accounts Server"];

        initial_references:IT_TLS_Toolkit:plugin = "schannel_toolkit";

        event_log:filters = ["IT_ATLI_TLS=*", "IT_IIOPI=*", "IT_IIOPTLS=*", "IT_TLS=*", "IT_SCHANNEL=*"];

    }
};

semi_secure_server_no_client_auth
{
    orb_plugins = ["iiop_profile", "giop", "iiop", "iiop_tls", "local_log_stream"];

    policies:target_secure_invocation_policy:requires = ["NoProtection"];

    policies:target_secure_invocation_policy:supports = ["NoProtection", "Confidentiality", "Integrity", "DetectReplay", "DetectMisordering", "EstablishTrustInTarget"];

    principal_sponsor:use_principal_sponsor = "true";

    principal_sponsor:auth_method_id = "pkcs12_file";
principal_sponsor:auth_method_data =
["filename=C:\Programs\IONA\asp\6.3\etc\tls\x509\certs\demos\bank_server.p12",
"password=bankserverpass"];

};

semi_secure_server_enforce_client_auth
{
    orb_plugins = ["iiop_profile", "giop", "iiop", "iiop_tls", "local_log_stream"];
    policies:target_secure_invocation_policy:requires = ["NoProtection"];
    policies:target_secure_invocation_policy:supports = ["NoProtection",
"Confidentiality", "Integrity", "DetectReplay", "DetectMisordering",
"EstablishTrustInClient", "EstablishTrustInTarget"];

    principal_sponsor:use_principal_sponsor = "true";
    principal_sponsor:auth_method_id = "pkcs12_file";

    principal_sponsor:auth_method_data =
["filename=C:\Programs\IONA\asp\6.3\etc\tls\x509\certs\demos\bank_server.p12",
"password=bankserverpass"];

};

semi_secure_server_request_client_auth
{
    orb_plugins = ["iiop_profile", "giop", "iiop", "iiop_tls", "local_log_stream"];
    policies:target_secure_invocation_policy:requires = ["NoProtection"];
    policies:target_secure_invocation_policy:supports = ["NoProtection",
"Confidentiality", "Integrity", "DetectReplay", "DetectMisordering",
"EstablishTrustInClient", "EstablishTrustInTarget"];

    policies:allow_unauthenticated_clients_policy = "true";
    principal_sponsor:use_principal_sponsor = "true";
    principal_sponsor:auth_method_id = "pkcs12_file";

    principal_sponsor:auth_method_data =
["filename=C:\Programs\IONA\asp\6.3\etc\tls\x509\certs\demos\bank_server.p12",
"password=bankserverpass"];

Demonstration TLS Scopes

```javascript
});
});
});
```
License Issues

This appendix contains the text of licenses relevant to Orbix.

In this appendix

This appendix contains the following section:

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CHAPTER I | License Issues

OpenSSL License

Overview

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