GT 4.2.1 Java WS A&A Developer's Guide

GT 4.2.1 Java WS A&A Developer's Guide

Introduction

fixme

Table of Contents

1. Overview 1
    1. Authentication overview 1
    2. Authorization framework overview 1
2. Before you begin 2
    1. Feature Summary 2
    2. Tested platforms 3
    3. Backward compatibility summary 3
    4. Technology dependencies 3
    5. Security considerations for Java WS A&A 4
3. Usage scenarios 6
    1. Delegation 6
    2. Embedding Key Information in EPRs 6
    3. Obtaining peer credentials on the server side 6
    4. Obtaining peer credentials from message context on the client side 7
    5. Using SAML Authorization Assertions 8
    6. Using Multiple Message Protection Schemes 9
4. Tutorials 10
5. Architecture and design overview 11
    1. Authentication/message-level architecture 11
    2. Authorization architecture 15
6. APIs 17
    1. Authorization Programming Model 17
    2. Authentication/message protection Programming Model 17
    3. API 17
7. Services and WSDL 19
    1. Secure Conversation Service 19
    2. SAML Authorization Callout 21
8. Framework-level Protocols 23
    1. WS-Security 23
    2. Transport (HTTPS) Security 23
9. Configuring client authentication and message/transport security 24
    1. Interface introduction 24
    2. Syntax of the interface 26
10. Authorization domain-level interface 31
    1. Interface introduction 31
    2. Syntax of the interface 31
11. Configuring 36
    1. Configuring authorization 36
    2. Configuring authentication/message protection 37
12. Environment variable interface 38
    1. Environmental variables for WS Authentication & Authorization (Java) 38
13. PDP/PIP Links 39
14. Debugging 40
    1. Debugging authorization 40
15. Troubleshooting 42
    1. Error Messages For Java WS A&A 43
16. Related Documentation 46
Glossary 47

List of Figures

5.1. The new certificate is signed by the owner, rather than a CA. 12
5.2. JAX-RPC handlers involved in security related message processing on a server. 14

List of Tables

9.1. Client side security properties 27
11.1. Configuring server side authentication and message/transport security 37
15.1. Java WS A&A Errors 44

Chapter 1. Overview

1. Authentication overview

Java WS authentication contains mainly framework-level code and, as such, developing services and clients utilizing this component does in general involve either programmatically or declaratively driving the framework-level security code.

Now, what does this entail? On the programmatic side of things, it involves acquiring credentials, passing these credentials on to the framework, and setting various authentication- and protection-related flags, either in a descriptor or as properties on a stub object. On the declarative side, it involves setting up security descriptors, both client and service side, to prescribe the security policy used to drive the security framework code.

2. Authorization framework overview

The authorization framework enforces the configured authorization policy on the service and client side.

On the service side, the framework allows developers to configure a chain of authorization mechanisms either programmatically or declaratively using security descriptors. It also allows for plugging in new authorization schemes (in addition to using those that are provided with the framework). Moreover, the framework allows for this configuration to be done at resource, service or container level, each taking precedence in the order specified and scoped as the name suggests.

On the client side, a pluggable framework for authorization of service is provided.

Chapter 2. Before you begin

1. Feature Summary

1.1. Authentication/message protection features

Features new in GT 4.2.1

None.

Other Supported Features

- Compliance with published IBM/Microsoft WS-Trust and WS-SecureConversation specifications
- Compliance with the Web Services Security 1.0 standard
- HTTPS support
- Message encryption, integrity protection and replay attack prevention
- Establishment of a session key for light-weight message protection

Deprecated Features

- None.

1.2. Authorization features

Features new in GT 4.2.1:

- *Enhanced server-side attributed-based authorization framework:* The server-side authorization framework has been reworked to support attribute based authorization with delegation of rights. The framework allows for configuring a chain of Policy Information Points(PIPs) and Policy Decision Points(PDPs) and a combining alogorithm that processes the individual decisions returned by the PDPs. Some of the key changes from the previous versions are:
  - Java Server side authorization framework has been moved to an independent module. Refer to Changes Summary for details.
  - Authorization framework uses a set of attributes to identify entities
  - The authorization engine uses Java Security provider framework to allow different combining algorithms to be plugged in.
  - A default implementation of permit override combining algorithm, which looks for a permit decision chain, to allow for fine grained delegation of rights.

  Refer Chapter 5, Architecture and design overview for detailed information on the architecture.
- *Host or Self Authoriation:* Support for a pluggable PDP that does host authorization, and if that fails, tries self authorization.

- The security descriptor framework, used to configure security properties for the security framework has been enhanced. Detailed information about the framework is provided Java WS A&A Security Descriptor Framework.

Other Supported Features

- Authorization based on `grid-mapfile` and other access control lists.
- Ability to implement custom authorization modules.
- A SAML callout authorization module enables outsourcing of authorization decisions to an authorization service (e.g. PERMIS).

Deprecated Features

- None

2. Tested platforms

Java WS A&A should work on any platform that supports J2SE 1.3.1 or higher.

Tested Platforms for Java WS A&A:

- Linux (Red Hat 7.3)
- Windows 2000
- Solaris 9

3. Backward compatibility summary

3.1. Authentication compatibility

Since GT 4.0.x release, some incompatible changes have been made:

- Security Descriptors: The security descriptor schema has changed since GT 4.0.x and the descriptors from GT 4.0.x cannot be used as is.
- Secure Conversation port type: The WS Addressing version in Java WS Core has been updated and the secure conversation port type has changed to reflect this. Therefore, GT 4.0.x secure conversation clients are incompatible with GT 4.2.x servers and vice versa.

3.2. Authorization compatibility

The authorization framework has been reworked as described in Change Summary. The configuration and authorization interfaces have since changed and a Migration Guide is provided.

4. Technology dependencies

Java WS A&A depends on the following GT components:

- Java WS Core.

Authentication and message-protection depends on the following 3rd party software:

- Apache WSFX Security Libraries
- PureTLS Libraries
- BouncyCastle JCE provider
- Cryptix Libraries
- Apache XML Security Libraries

The authorization framework depends on the following 3rd party software:

- OpenSAML

5. Security considerations for Java WS A&A

5.1. Security considerations for authorization

5.1.1. Client side authorization

Client authorization of the server is done after the completion of the operation when GSI Secure Message authentication is used. If you require client authorization to be done prior, use GSI Secure Conversation or GSI *Transport security*.

5.1.2. Host authorization

During host authorization, the toolkit treats DNs "hostname-*.edu" as equivalent to "hostname.edu". This means that if a service was setup to do host authorization and hence accept the certificate "hostname.edu", it would also accept certificates with DNs "hostname-*.edu".

The feature is in place to allow a multi-homed host folowing a "hostname-interface" naming convention, to have a single host certificate. For example, host "grid.test.edu" would also accept likes of "grid-1.test.edu" or "grid-foo.test.edu".

Note

The wildcard character "*" matches only name of the hostand not domain components. This means that "hostname.edu" will not match "hostname-foo.sub.edu", but will match "host-foo.edu".

Note

If a host was set up to accept "hostname-1.edu", it will not accept any of "hostname-*.edu".

A bug[1] has been opened to see if this feature needs to be modfiied.

5.2. Security considerations for Message/Transport-level Security

5.2.1. File permissions

The Java security code currently does not enforce secure permissions and, implicitly, file ownership requirements on any of the security related files, e.g. configuration and credential files. It is thus important that administrators ensure

[1] http://bugzilla.globus.org/bugzilla/show_bug.cgi?id=2969

that the relevant files have correct permissions and ownership. Permissions should generally be as restrictive as possible, i.e. *private keys* should be readable only by the file owner and other files should be writable by owner only, and the files should generally be owned by the globus user (the requirements that the C code enforces are documented in Configuring GSI).

Also refer to Section 5, "Known Problems" for details on any other open issues.

Chapter 3. Usage scenarios

1. Delegation

There are two ways a client can delegate its credential to a service:

- using Delegation Service, and
- using GSI Secure Conversation.

A client can delegate using the Delegation Service. This method is independent of the security scheme used and can be reused across multiple invocations of the client to multiple services (provided the services are in the same hosting environment as the Delegation Service). The link provided has details on client-side steps to delegate and service-side code to get the delegated credential.

GSI Secure Conversation has delegation built into the protocol. Delegation can be requested by setting the `GSIConstants.GSI_MODE` property on the Stub or using security descriptors as described in Section 4, “GSI Secure Conversation”. If full or limited delegation is performed, the client credential can be obtained from the message context as follows:

```
Subject subject = (Subject) msgCtx.getProperty(Constants.PEER_SUBJECT);
```

The server can be configured such that container, service or client credentials are used for the operation invoked. For the client credentials to be used, the client should have delegated the credentials. Configuring this option is described in ????. Note that this is a server-side configuration. If `caller-identity` is chosen for the `run-as` configuration and the client's credentials have been successfully delegated, then the delegated credentials are associated with the current thread. The credentials in this case can be obtained as follows:

```
Subject subject = JaasSubject.getCurrentSubject();
```

2. Embedding Key Information in EPRs

GT provides an API to embed key information in an Endpoint Reference, as defined in the OGSA Basic Security Profile. The key information is embedded in the extensibility element of the EPR rather than the meta-data element as defined in the specification, since the toolkit uses older version of the WS Addressing specification.

This information would be useful to ascertain the expected identity of the service for authorizing the service or to get the public certificate of the resource to be used for encrypting the request to the service. The optional `usage` element in the emebedded key information indicates the use of the embedded keys, either for signature or encryption.

The API is in class `org.globus.wsrf.impl.security.util.EPRUtil`. The method to embed the certificates is called `insertCertificates` and the method to extract the key information is called `extractCertificates`. Please refer to API documentation for details on using the methods.

3. Obtaining peer credentials on the server side

The security handlers populate a Subject object with peer information. The following code can be used to access the peer credentials. Note that the message context needs to be associated with the thread.

```
import org.globus.wsrf.security.SecurityManager;
```

```
import javax.security.auth.Subject;

org.apache.axis.MessageContext mctx =
org.apache.axis.MessageContext.getCurrentContext();
SecurityManager manager = SecurityManager.getManager(mctx);
Subject subject = manager.getPeerSubject();
```

The following code snippet shows how the certificate chain can be extracted from the peer subject:

```
java.util.Set set =
subject.getPublicCredentials(X509Certificate[].class);
Iterator iterator = set.iterator();
while (iterator.hasNext()) {
X509Certificate[] certArray = (X509Certificate[]) iterator.next();
System.out.println("Cert array " + certArray.length);
}
```

To obtain the peer principal (for example, the Distinguished Name from X509 Certificate), the following code snippet can be used:

```
org.apache.axis.MessageContext mctx =
org.apache.axis.MessageContext.getCurrentContext();
SecurityManager manager = SecurityManager.getManager(mctx);
Principal principal = manager.getCallerPrincipal();
String caller = manager.getCaller();
```

If credentials were delegated as described above, private credentials are also populated:

```
java.util.Set set = subject.getPrivateCredentials();
```

4. Obtaining peer credentials from message context on the client side

- **GSI Secure Conversation:** With this mechanism, the peer credentials can be obtained once the handshake is completed:

```
import org.globus.wsrf.impl.security.authentication.Constants;
import org.globus.wsrf.impl.security.authentication.secureconv.service.S
import org.ietf.jgss.GSSContext;
import org.globus.gsi.gssapi.GSSContants;

// Get current secure context from message context
SecurityContext secContext =
messageContext.getProperty(Constants.CONTEXT);
GSSContext gssContext = secContext.getContext();
```

```
Vector peerCerts =
gssContext.inquireByOid(GSSContants.X509_CERT_CHAIN);
```

- **GSI Secure Transport:** With this mechanism, the peer credentials can be obtained once the handshake is completed:

```
import org.ietf.jgss.GSSContext;
import org.globus.gsi.gssapi.GSSContants;
import org.globus.wsrf.impl.security.authentication.Constants;

// Get current secure context from message context
GSSContext gssContext =
messageContext.getProperty(Constants.TRANSPORT_SECURITY_CONTEXT);
Vector peerCerts =
gssContext.inquireByOid(GSSContants.X509_CERT_CHAIN);
```

- **GSI Secure Message:** With this mechanism, the peer credentials can be obtained only when the response is received:

```
import org.globus.wsrf.impl.security.authentication.Constants;

// Get peer subject from current message context
Subject subject =
(Subject) messageCtx.getProperty(Constants.PEER_SUBJECT);
Set peerCerts =
subject.getPublicCredentials(X509Certificate[].class);
```

5. Using SAML Authorization Assertions

SAML Authorization assertions can be used to transport authorization decision statements to the point of enforcement. Such assertions can be obtained from any entity that manages use rights. For example, Community Authorization Service (CAS), a Globus Toolikit higher level service, can be used to manage user rights and issue such assertions. On the remote side, PDPs/PIPs might be used to extract the assertion and enforce the rights. Some PDPs/PIPs with such functionality are distributed and details can be found in PIP Reference and PDP Reference.

The toolkit provides two mechanisms to do this:

- **Using proxy certificates:** In this mechanism the SAML Authorization Assertions are embedded as non-critical assertions in the proxy certificate. These assertions can then be extracted from the certificate, to enforce access rights at the resource.

  A command line client `$GLOBUS_LOCATION/bin/globus-embed-assertion` implemented using `org.globus.wsrf.client.EmbedAssertion` can be used to embed a SAML Assertion stored in a file into a credential.

- **Using SOAP Header:** The SAML Assertion can also be embedded in the SOAP Header. The toolkit uses the WS-Security SAML Token Profile to embed the assertion.

Section 2, “Syntax of the interface” describes the configuration required to embded an assertion into the message header. At the remote end, the security handlers detect the presence of the SAML Assertion in the header and store it as a string in the Message Context property `Constants.SAML_ASSERTION_STR`.

6. Using Multiple Message Protection Schemes

Multiple message protection schemes can be used in a single invocation, although it is worth noting that this will cause a performance penalty.

For example, both Secure Transport and Secure Conversation can be done on the same invocation by using the following:

```
stub._setProperty(Constants.GSI_SEC_CONV, Constants.INTEGRITY);
stub._setProperty(Constants.GSI_TRANSPORT, Constants.PRIVACY);
```

Note

These two mechanisms share a single property for authorization. There is a bug open to provide independent support: Bug 4350[1]

Similarly Secure Messages can be used in tandem with other message protection mechanisms.

[1] http://bugzilla.mcs.anl.gov/globus/show_bug.cgi?id=4350

Chapter 4. Tutorials

There are no tutorials available at this time.

Chapter 5. Architecture and design overview

1. Authentication/message-level architecture

1.1. Transport Security

The toolkit by default is deployed with our implementation of transport security, which is based on HTTP over SSL, also known as HTTPS, with modifications to path validation to enable X.509 *Proxy Certificate* support. In contrast to the GT3 version of the toolkit, the default transport security enabled in the toolkit does not support delegation of proxy certificates as part of the security handshake.

However, the underlying security libraries and handlers required for secure transport with delegation, also known as HTTPG, is still supported and shipped as part of the CoG library. The GT4 Java WS code base and configuration can be modified to use the HTTPG protocol as required.

Transport security is implemented by layering on top of the *GSISocket* class provided in JGlobus. This class deals with the security-related aspects of connection establishment as well as message protection. The socket interface serves as an abstraction layer that allows the HTTP protocol handling code to be unaware of the underlying security properties of the connection.

Container-level credentials are required and, irrespective of security settings on the service being accessed, these credentials are used for the handshake.

1.1.1. Server-Side Security

On the server-side, transport security is enabled by simply switching a non-secure socket implementation with the *GSISocket* implementation. In addition to this change, some code was added to propagate authentication information and message protection settings to the relevant security handlers, in particular the authorization and security policy handlers.

1.1.2. Client-Side Security

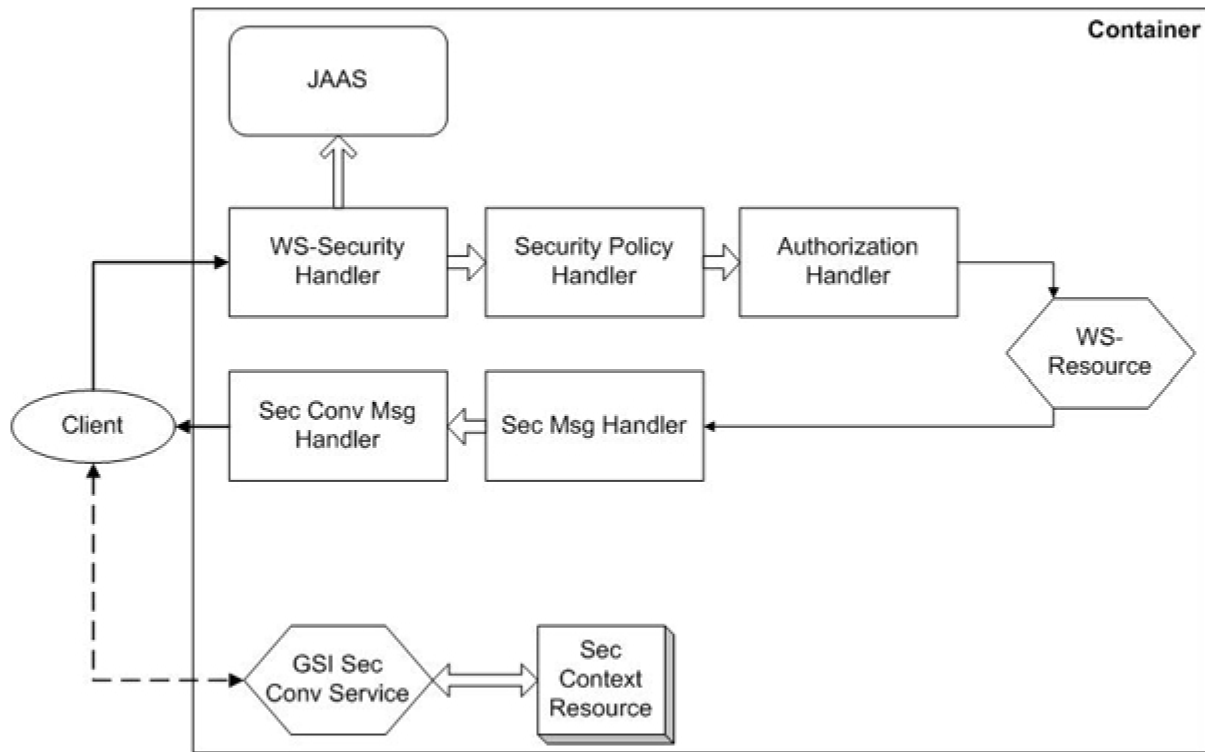
On the client-side, transport security is similarly enabled by switching a non-secure socket implementation with the *GSISocket* implementation and registering a protocol handler for HTTPS that uses the secure socket implementation. In practice, this means that any messages targeted at an HTTPS endpoint will, irregardless of any stub properties, be authenticated and protected. It also means that any messages sent to an HTTP endpoint will not be secured, again irregardless of any stub properties. Stub properties are only used to communicate the desired message protection level, i.e. either integrity only or integrity and privacy.

1.2. Message Level Security

1.2.1. Server Side Security

This section aims to describe the message flow and processing that occurs for a security-enabled service. The figure below shows the JAX-RPC handlers that are involved in security-related message processing on a server.

Figure 5.1. The new certificate is signed by the owner, rather than a CA.



GT4 provides two mechanisms, **GSI Secure Conversation** and **GSI Secure Message** security, for authentication and secure communication.

- In the GSI Secure Conversation approach the client establishes a context with the server before sending any data. This context serves to authenticate the client identity to the server and to establish a shared secret using a collocated GSI Secure Conversation Service. Once the context establishment is complete, the client can securely invoke an operation on the service by signing or encrypting outgoing messages using the shared secret captured in the context.
- The GSI Secure Message approach differs in that no context is established before invoking an operation. The client simply uses existing keying material, such as an X509 *End Entity Certificate*, to secure messages and authenticate itself to the service.

Securing of messages in the GSI Secure Conversation approach, i.e. using a shared secret, requires less computational effort than using existing keying material in the GSI Secure Message approach. This allows the client to trade off the extra step of establishing a context to enable more computationally efficient messages protection once that context has been established.

1.2.2. Message Processing

When a message arrives from the client, the SOAP engine invokes several security-related handlers:

1. The first of these handlers, the **WS-Security handler**, searches the message for any WS-Security headers. From these headers, it extracts any keying material, which can be either in the form of an X509 certificate and associated certificate chain or a reference to a previously established secure conversation session. It also checks any signatures and/or decrypts elements in the SOAP body. The handler then populates a peer JAAS subject object with principals and any associated keying material whose veracity was ascertained during the signature checking or decryption step.

2. The next handler that gets invoked, the **security policy handler**, checks that incoming messages fulfill any security requirements the service may have. These requirements are specified, on a per-operation basis, as part of a security descriptor during service deployment. The security policy handler will also identify the correct JAAS subject to associate with the current thread of execution. Generally, this means choosing between the peer subject populated by the WS-Security handler, the subject associated with the hosting environment and the subject associated with the service itself. The actual association is done by the pivot handler, a non-security handler not shown in the figure that handles the details of delivering the message to the service.

3. The security policy handler is followed by an **authorization handler**. This handler verifies that the principal established by the WS-Security handler is authorized to invoke the service. The type of authorization that is performed is specified as part of a deployment descriptor. More information can be found in the authorization framework documentation.

Once the message has passed the authorization handler, it is finally handed off to the actual service for processing (discounting any non-security-related handlers, which are outside the scope of this document).

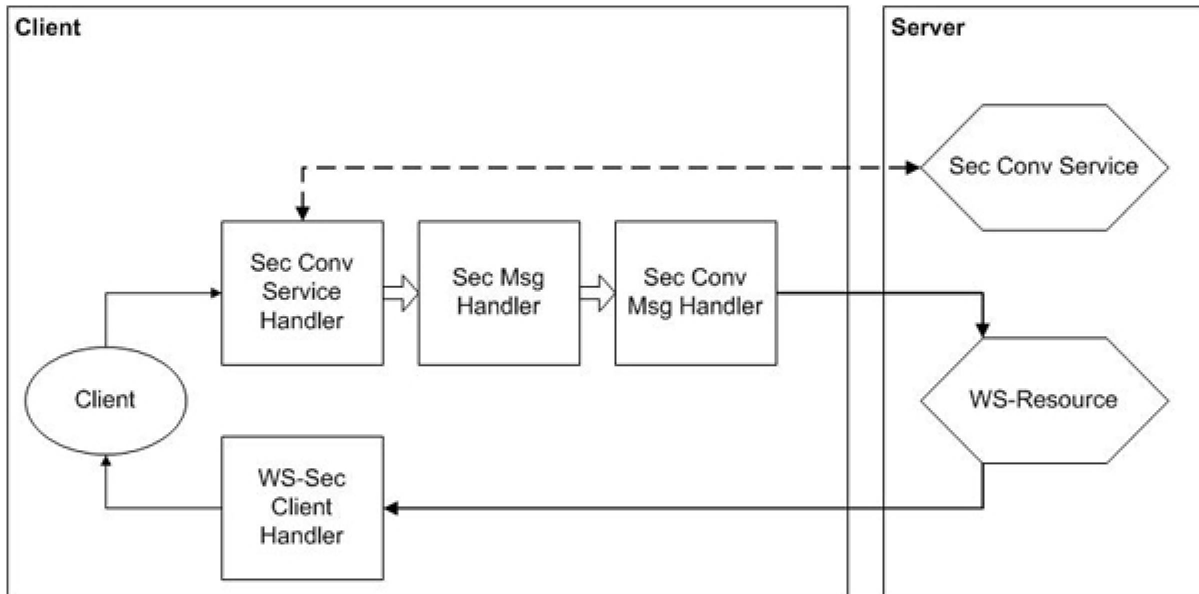
Replies from the service back to the client are processed by two outbound handlers: the GSI Secure Conversation message handler and the GSI Secure Message handler. The GSI Secure Conversation message handler deals with encrypting and signing messages using a previously established security context, whereas the GSI Secure Message handler deals with messages by signing or encrypting the messages using X509 certificates.

The operations that are actually performed depend on the message properties associated with the message by the inbound handlers, i.e. outbound messages will have the same security attributes as inbound messages. That being said, a service has the option of modifying the message properties, if so desired. These handlers are identical to the client-side handlers described in the following section.

1.2.3. Client Side Security

This section describes the security-related message processing for Java-based GT4 clients. In contrast to the server side, where security is specified via deployment descriptors, client side security configuration is handled by the application. This means that a client-side application must explicitly pass information to the client-side handlers on what type of security to use. This is also true for the case of services acting as clients. The below figure shows the JAX-RPC handlers that are involved in security-related message processing on a server.

Figure 5.2. JAX-RPC handlers involved in security related message processing on a server.



1.2.4. Message Processing

The client-side application can specify the use of either the GSI Secure Conversation security approach or the GSI Secure Message security approach. It does this by setting a per-message property that is processed by the client-side security handlers.

There are three outbound client-side security handlers:

1. The **secure conversation service handler** is only operational if GSI Secure Conversation mode is in use. It establishes a security session with a secure conversation service collocated with the service with which the client aims to communicate. When the client sends the initial message to the service with a property indicating that session-based security is required, this handler intercepts the message and establishes a security session. It will also authorize the service by comparing the service's principal/subject obtained during session establishment with a value provided by the client application. Once the session has been established, the handler passes on the original message for further processing.

2. The next handler in the chain, the **secure message handler**, is only operational if GSI Secure Message mode is in use. It signs and/or encrypts messages using X.509 credentials.

3. The third outbound handler [fixme - is there a name?] is operational only if GSI Secure Conversation mode is in use. It handles signing and/or encryption of messages using a security session established by the first handler.

The client-side inbound handler (the WS-Security client handler) deals with verifying and decrypting any signed and/or encrypted incoming messages. In the case of the GSI Secure Message operation, it will also authorize the remote side in a similar fashion to the outbound secure conversation service handler.

2. Authorization architecture

2.1. Server-side authorization

The Java WS Authorization framework leverages the generic GT Java Authorization Framework. The framework consists of an engine that evaluates a chain of configured authorization schemes, also known as Policy Decision Points (PDPs), to determine if the client making the invocation can access the resource/service. The chain can also be configured with Policy Information Points (PIPs), which can be used to glean information that would be useful in the decision making process.

The framework enables attribute-based authorization. PIPs can be used to collect attributes about resource/operations/subjects and used in the decision making process. While the toolkit provides some implementations of PIPs/PDPs, the framework is pluggable and custom mechanisms can be written and configured.

An authorization engine consists of PIPs, PDPs and a combining algorithm. The configured authorization engine is invoked as part of a handler chain, immediately after authentication of the invocation (`java:org.globus.wsrf.impl.security.authorization.AuthorizationHandler`). If no security mechanism is used for an operation, authorization is not done for that operation.

The architecture of Generic Java Authorization Engine is described in detail in this document[1]. It also describes interfaces and writing custom PDPs/PIPs.

Any PDP has to implement the interface `org.globus.security.authorization.PDP` and contain the logic to return a permit or deny based on information such as the subject DN, the service being accessed and the operation being performed. To manage configuration information, each PDP can be bootstrapped with an object implementing the `org.globus.security.authorization.ChainConfig` interface. The interface has get and set methods which can be used to retrieve and set scoped parameters for the PDP.

PIPs have to implement the interface `org.globus.security.authorization.PIP` with the functionality to collect attributes from the invocation context that are relevant to making the authorization decision.

2.1.1. Authorization Policy Configuration

A chain of PDPs and PIPs, with relevant configuration information, can be configured at resource, service or container level. These chain use Permit Override with Delegation as default combining algorithm. Additionally an administrative policy can be configured at the container level. The administrative chain uses First Applicable combining algorithm by default. Note that comining algorithms can be configured to over-ride the deafult. The following describes the precedence in which configured policy is used:

1. If container level administrative policy is specified, it is evaluated.
    a. If (1) returns a deny, the request is denied.
    b. If (1) returns a permit, step (2) is done.
2. If resource level policy is specified, it is evaluated.
    a. If (2) returns a deny, the request is denied.
    b. If (2) returns a permit, the request is permitted.
3. If (2) is not specified and service level policy is specified, it is evaluated.

[1] ../gtJavaAuthzEngine.pdf

   a. If (3) returns a deny, the request is denied.
   b. If (3) returns a permit, the request is permitted.

4. If (3) is not specified and container level policy configuration is specified, it is evalauted.
   a. If (4) returns a deny, the request is denied.
   b. If (4) returns a permit, the request is permitted.

2.1.2. Authorization Handler Steps

1. Invoke Container PIP to collect attributes inherent to the framework. The PIP creates an instance of RequestEntities class to use as parameter with PIPs. It also creates an instance of ResourceChainConfig class to push the current message context as a parameter to ContianerPIP.
2. Evaluate the administrator authorization engine, if one is configured
   a. If bootstrap overwrite is configured, then only BootstrapPIPs in administrator engine is invoked. Else the X509 Bootstrap PIP is invoked prior to any other Bootstrap PIPs configured.
   b. The authorization engine is run and if a deny decision is returned, the operation is denied. If a permit decision is returned, the operation is permitted. If a not applicable or indeterminate is returned, further authorization engines are evaluated.
3. Evaluate the authorization engine configured in the resource, service, container, in that order depending on which is configured
   a. If bootstrap overwrite is configured, then only BootstrapPIPs in administrator engine is invoked. Else the X509 Bootstrap PIP is invoked prior to any other Bootstrap PIPs configured.
   b. If any decision other than a Permit is returned, the operation is denied. If a permit is returned the operation is allowed.
4. If no authorization engine was configured, then default authorization engine is created, which checks whether the caller has same credentials as service (self authorization)

2.2. Client-side authorization

Client side authorization is done as a part of the authentication handler. GSI Secure Message authentication does client-side authorization only after the operation is completed. This is done as a part of the web services client handler. The other two authentication schemes supported, GSI Secure Conversation and GSI Transport, authorize the server during the handshake, prior to the operation invocation.

The Transport Level Security protocol allows for authorization (an expected DN comparison) during the handshake. This is disabled by default in the toolkit, unless delegation of credential is requested. If no delegation is requested, the configured authorization mechanism is invoked afer the handshake is complete, prior to the operation invocation. If delegation is requested, authorization (expected DN comparison) is done during key exchange as a part of the protocol.

The toolkit supports self, gridmap, host and identity authorization on the client side. The authorization to be used is set programmatically on the Stub and the handler enforces it.

Chapter 6. APIs

Documentation for these interfaces can be found here [1].

1. Authorization Programming Model

Independent authorization settings can be configured on the server and client side. The security programming model on the server side is declarative and all configuration is done by setting a security descriptor. The descriptor can be a resource, service or container descriptor, depending on the required scope for the authorization. Alternatively the security settings can be done using programmatic security descriptor constructs. The client side the configuration is done by setting required properties on the stub used to make the method invocation. The security properties, and hence the authorization settings, can be set directly as properties on the stub, or a client security descriptor that encapsulates the individual properties may be written and in turn passed to the framework via a property on the stub object.

2. Authentication/message protection Programming Model

The authentication programming model differs between the client and server side. The client side model is programmatic in nature, i.e. security-related code is driven by making actual function calls, whereas the server-side model is declarative, i.e. security-related settings are declared in a security descriptor. For more information on the available client side calls see Chapter 4, Configuring client authentication and message/transport security. More information about the security descriptor can be found in Java WS A&A Security Descriptor Framework.

3. API

- Generic Java Authorization Engine API
    - org.globus.security.authorization.PDP
    - org.globus.security.authorization.PIP
    - org.globus.security.authorization.ChainConfig
    - org.globus.security.authorization.Interceptor
- Stable API
    - org.globus.wsrf.security.Constants
    - org.globus.wsrf.security.SecureResource
    - org.globus.wsrf.security.SecurityManager
    - org.globus.wsrf.security.authorization.Constants
    - org.globus.wsrf.security.impl.authorization.Authorization
- Less stable API

[1] http://www.globus.org/api/javadoc-4.2.1/globus_java_ws_core

- org.globus.wsrf.impl.security.descriptor.ClientSecurityDescriptor
- org.globus.wsrf.impl.security.descriptor.ServiceSecurityDescriptor
- org.globus.wsrf.impl.security.descriptor.ResourceSecurityDescriptor

Chapter 7. Services and WSDL

1. Secure Conversation Service

1.1. Protocol overview

This service provides a mechanism for generating a security session, i.e the negotiation of a shared secret which may be used to secure a set of subsequent messages. It is based on the WS-Trust[1] and WS-SecureConversation[2] specifications.

1.2. Operations

- `RequestSecurityToken`: This operation initiates a new security session negotiation. Furthermore, since the actual schema for this message is not unambiguously defined by the specifications, this is the actual schema used:

```
<xs:element name='RequestSecurityToken'>
   <xs:complexType name='RequestSecurityTokenType'>
      <xs:sequence>
         <xs:element ref='wst:TokenType'/>
         <xs:element ref='wst:RequestType'/>
         <xs:element ref='wst:BinaryExchange'/>
      </xs:sequence>
      <xs:attribute name='Context' type='xs:anyURI'/>
   </xs:complexType>
</xs:element>

<xs:element name='RequestSecurityTokenResponse'>
   <xs:complexType name='RequestSecurityTokenResponseType'>
      <xs:sequence>
         <xs:element ref='wst:TokenType'/>
         <xs:element ref='wst:RequestType'/>
         <xs:element ref='wst:BinaryExchange'/>
      </xs:sequence>
      <xs:attribute name='Context' type='xs:anyURI'/>
   </xs:complexType>
</xs:element>
```

- `RequestSecurityTokenResponse`: This operation continues a security session negotiation. Furthermore, since the actual schema for this message is not unambiguously defined by the specifications, this is the actual schema used:

```
<xs:element name='RequestSecurityTokenResponse'>
   <xs:complexType name='RequestSecurityTokenResponseType'>
      <xs:sequence>
         <xs:element ref='wst:TokenType'/>
         <xs:element ref='wst:RequestType'/>
         <xs:element ref='wst:BinaryExchange'/>
      </xs:sequence>
      <xs:attribute name='Context' type='xs:anyURI'/>
```

[1] http://www.ibm.com/developerworks/library/ws-trust/
[2] http://www-106.ibm.com/developerworks/library/ws-secon/

```
   </xs:complexType>
</xs:element>

<xs:element name='RequestSecurityTokenResponse'>
   <xs:complexType name='RequestSecurityTokenResponseType'>
      <xs:sequence>
         <xs:element ref='wst:TokenType'/>
         <xs:element ref='wst:RequestType'/>
         <xs:element ref='wst:BinaryExchange'
                     minOccurs="0"/>
         <xs:element ref='wsc:SecurityContextToken'/>
      </xs:sequence>
      <xs:attribute name='Context' type='xs:anyURI'/>
   </xs:complexType>
</xs:element>
```

In the above schema, the second `RequestSecurityTokenResponse` element refers to the final message in the exchange.

1.3. Resource properties

This service has no associated resource properties.

1.4. Faults

Both `RequestSecurityToken` and `RequestSecurityTokenResponse` throw the following faults:

- `ValueTypeNotSupportedFault`: This fault indicates that the value type attribute on the binary exchange token element is not supported by the service.
- `EncodingTypeNotSupportedFault`: This fault indicates that the encoding type attribute on the binary exchange token element is not supported by the service.
- `RequestTypeNotSupportedFault`: This fault indicates that the request type specified in the request type element is not supported by the service
- `TokenTypeNotSupportedFault`: This fault indicates that the token type specified in the token type element is not supported by the service.
- `MalformedMessageFault`: This fault indicates that the message content received by the service does not conform to the expected content. This is necessary since the schema does not give a well defined content model.
- `BinaryExchangeFault`: This fault indicates that a failure occurred during the in the underlying security constant responsible for the session negotiation.
- `InvalidContextIdFault`: This fault indicates that the context id passed in the message is not valid within the context of this service or negotiation.

1.5. WSDL and Schema Definitions

- WS-Trust WSDL[3]

[3] http://www-106.ibm.com/developerworks/library/specification/ws-trust/ws-trust.wsdl

- WS-Trust XSD[4]
- WS-SecureConversation XSD[5]
- Secure Conversation WSDL [fixme - link]

2. SAML Authorization Callout

The authorization framework as such does not have a WSDL interface. On the other hand one of the authorization schemes in the toolkit, a callout to an authorization service compliant with the specification published by the OGSA Authorization Working Group (OGSA-AuthZ)[6] requires a WSDL interface for the service. The callout makes a query on the configured authorization service, which returns an authorization decision.

2.1. Protocol overview

The authorization service takes a query as input and returns an authorization decision. The Security Assertion Markup Language (SAML)[7] is used for expressing the query and the decision. If any fault occurs, it is embedded as a part of the decision. The decision can be a permit, deny or indeterminate.

2.2. Operations

- `SAMLRequest`: Used to send queries to the authorization service, which after processing returns an authorization decision. All faults are embedded as part of the decision that is returned, i.e. no fault is declared at the WSDL level.
- `GetResourceProperty`: Gets the value of a specific resource property. This operation throws the following faults:
  - ResourceUnknownFault
  - InvalidResourcePropertyQNameFault
- `SetResourceProperties`: Sets the value for resource properties. This operation throws the following faults:
  - ResourceUnknownFault
  - InvalidSetResourcePropertiesRequestContentFault
  - UnableToModifyResourcePropertyFault
  - InvalidResourcePropertyQNameFault
  - SetResourcePropertyRequestFailedFault
- `QueryResourceProperties`: Used for the querying of resource properties using a query expression. This operation throws the following faults:
  - ResourceUnknownFault
  - InvalidResourcePropertyQNameFault

[4] http://www-106.ibm.com/developerworks/library/specification/ws-trust/ws-trust.xsd
[5] http://www-106.ibm.com/developerworks/library/specification/ws-secon/ws-secureconversation.xsd
[6] https://forge.gridforum.org/projects/ogsa-authz
[7] http://www.oasis-open.org/committees/tc_home.php?wg_abbrev=security

- UnknownQueryExpressionDialectFault
- InvalidQueryExpressionFault
- QueryEvaluationErrorFault

2.3. Resource properties

- `supportedPolicies`: Contains identifiers for any or all access control policies that the authorization service is capable of rendering decisions regarding.
- `supportsIndeterminate`: Indicates whether the authorization service may return an "indeterminate" authorization decision. If set to flase, only permit or deny is returned.
- `signatureCapable`: Indicates if the authorization service is capable of signing the decision returned. If not, only unsigned decisions are returned.

2.4. Faults

- ResourceUnknownFault[8]
- InvalidSetResourcePropertiesRequestContentFault[9]
- UnableToModifyResourcePropertyFault[10]
- InvalidResourcePropertyQNameFault[11]
- SetResourcePropertyRequestFailedFault[12]
- UnknownQueryExpressionDialectFault[13]
- InvalidQueryExpressionFault[14]
- QueryEvaluationErrorFault[15]

2.5. WSDL and Schema Definition

- OGSA-AuthZ Authorization Service WSDL [16]

[8] http://docs.oasis-open.org/wsrf/2004/06/wsrf-WS-ResourceProperties-1.2-draft-04.pdf
[9] http://docs.oasis-open.org/wsrf/2004/06/wsrf-WS-ResourceProperties-1.2-draft-04.pdf
[10] http://docs.oasis-open.org/wsrf/2004/06/wsrf-WS-ResourceProperties-1.2-draft-04.pdf
[11] http://docs.oasis-open.org/wsrf/2004/06/wsrf-WS-ResourceProperties-1.2-draft-04.pdf
[12] http://docs.oasis-open.org/wsrf/2004/06/wsrf-WS-ResourceProperties-1.2-draft-04.pdf
[13] http://docs.oasis-open.org/wsrf/2004/06/wsrf-WS-ResourceProperties-1.2-draft-04.pdf
[14] http://docs.oasis-open.org/wsrf/2004/06/wsrf-WS-ResourceProperties-1.2-draft-04.pdf
[15] http://docs.oasis-open.org/wsrf/2004/06/wsrf-WS-ResourceProperties-1.2-draft-04.pdf
[16] http://viewcvs.globus.org/viewcvs.cgi/wsrf/schema/core/security/authorization/authz_port_type.wsdl?rev=1.9&only_with_tag=globus_4_2_0&content-type=text/vnd.viewcvs-markup

Chapter 8. Framework-level Protocols

1. WS-Security

The framework implements the Web Services Security: SOAP Message Security[1], Web Services Security: Username Token Profile[2] and Web Services Security: X.509 Token Profile[3] specifications.

2. Transport (HTTPS) Security

The transport security solution used by the framework consists of HTTP over SSL/TLS (HTTPS) using X.509 certificates. The path validation step has been augmented to support the Proxy Certificate Profile (RFC3820[4]).

[1] http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-soap-message-security-1.0.pdf
[2] http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-username-token-profile-1.0.pdf
[3] http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-x509-token-profile-1.0.pdf
[4] ftp://ftp.rfc-editor.org/in-notes/rfc3820.txt

Chapter 9. Configuring client authentication and message/transport security

1. Interface introduction

Client-side security is set up by either setting individual properties on the `javax.xml.rpc.Stub` object used for the web service method invocation or by setting properties on a client-side security descriptor object, which in turn is propagated to client-side security handlers by making it available as a stub object property. Here are examples of the two approaches:

- Setting a property on the stub:

```
// Create endpoint reference
EndpointReferenceType endpoint = new EndpointReferenceType();
// Set address of service
String counterAddr =
   "http://localhost:8080/wsrf/services/CounterService";
// Get handle to port
CounterPortType port =
   locator.getCounterPortTypePort(endpoint);
// set client authorization to self
  ((Stub)port)._setProperty(Constants.AUTHORIZATION,
               SelfAuthorization.getInstance());
```

- Setting properties using a client descriptor:

```
// Client security descriptor file
String CLIENT_DESC =
   "org/globus/wsrf/samples/counter/client/client-security-config.xml";
// Create endpoint reference
EndpointReferenceType endpoint = new EndpointReferenceType();
// Set address of service
String counterAddr =
   "http://localhost:8080/wsrf/services/CounterService";
// Get handle to port
CounterPortType port =
   locator.getCounterPortTypePort(endpoint);
//Set descriptor on Stub
((Stub)port)._setProperty(Constants.CLIENT_DESCRIPTOR_FILE, CLIENT_DESC);
```

The descriptor file is described in detail in Chapter 1, Introduction.

Note

If the client needs to use transport security, the following API must be used to register the Axis transport handler for `https`:

```
import org.globus.axis.util.Util;
static {
        Util.registerTransport();
    }
```

2. Syntax of the interface

Table 9.1. Client side security properties

Number	Task	Stub Configuration	Des Co tion
1.	Allows for configuration of credentials for authentication.	Property: `org.globus.axis.gsi.GSIConstants.GSI_CREDENTIALS` Value equals the Instance of `org.ietf.jgss.GSSCredential`.	Sec “Cr tial
2.	Allows for configuring client-side authorization.	Property: `org.globus.wsrf.security.Constants.AUTHORIZATION` Value equals the Instance of `org.globus.wsrf.security.authorization.Authorization` If GSI Secure Transport or GSI Secure Conversation is used, the value should be an instance of `org.globus.gsi.gssapi.auth.Authorization`. But this translation is done automatically by the toolkit.	Ref Sec “Au tion
3.	Enable GSI Secure Conversation with specified message protection level.	1. Property: `org.globus.wsrf.security.Constants.GSI_SEC_CONV` Values equal one of the following: • Constants.ENCRYPTION • Constants.SIGNATURE 2. Property: `org.globus.wsrf.security.Constants.GSI_SEC_CONV_SECREPLY_UNNECESSARY` If the value is set to Boolean.TRUE, the GSI Secure conversation protection is not required in the reply message. By default, if the request was secured with GSI Secure Conversation, the response is also required to have the same protection. 3. Property: You can set the SOAP Actor of the GSI signed/encrypted SOAP message by using the `gssActor` property. We recommend that you *not* do this unless you *really* know what you are doing.	Ref tion Sec ver

4.	Sets the GSI delegation mode. *Used for GSI Secure Conversation only.* If limited or full delegation is chosen, then some form of client-side authorization needs to be done (i.e client-side authorization cannot be set to `none`).	Property: `org.globus.axis.gsi.GSIConstants.GSI_MODE` Value equals one of following: 1. `GSIConstants.GSI_MODE_NO_DELEG`: No delegation is performed. 2. `GSIConstants.GSI_MODE_LIMITED_DELEG`: Limited delegation is performed. 3. `GSIConstants.GSI_MODE_FULL_DELEG`: Full delegation is performed.	Ref tion Sec ver
5.	Enables GSI Secure Transport with some protection level.	Property: `org.globus.gsi.GSIConstants.GSI_TRANSPORT` Values equal one of the following: • `Constants.ENCRYPTION` • `Constants.SIGNATURE`	Ref tion Sec Tra
6.	Enables anonymous authentication. *This option only applies to GSI Secure Conversation and GSI Transport.*	Property: `org.globus.wsrf.security.Constants.GSI_ANONYMOUS` Value equals one of following: 1. Boolean.FALSE: Anonymous authentication is disabled. 2. Boolean.TRUE: Anonymous authentication is enabled.	Ref tion Sec ver and tion Sec Tra

7.	Enable GSI Secure Message with specified message protection level.	1. Property:
		`org.globus.wsrf.security.Constants.GSI_SEC_MSG`
		Values equal one of the following:
		• `Constants.ENCRYPTION`
		• `Constants.SIGNATURE`
		2. Property:
		`org.globus.wsrf.security.Constants.GSI_SEC_MSG_SECREPLY_UNNECESSARY`
		If the value is set to Boolean.TRUE, the GSI Secure Message protection is not required in the reply message. By default, if the request was secured with GSI Secure Message, the response is also required to have the same protection.
		3. Property:
		`org.globus.wsrf.security.Constants.GSI_SEC_MSG_SINGLECERT`
		If the value is set to Boolean.TRUE, only a single certificate is used for the GSI Secure Message request. By default, the whole certificate chain is sent.
		4. Property:
		You can set the SOAP Actor of the signed message using the `x509Actor` property, but we do *not* recommend this unless you know what you are doing.
			Ref tion Sec Me

8.	Enable WS-Security username/password authentication.	Properties:
		`org.globus.wsrf.security.Constants.USERNAME`
		Value equals the username.
		`org.globus.wsrf.security.Constants.PASSWORD`
		Value equals the password.
			Ref tion “U nar wo

<table>
<tr>
<td>9.</td>
<td>Sets the credential that is used to encrypt the message (typically, the recipient's public key). Used for GSI Secure Message only.</td>
<td>Property:
<pre>org.globus.wsrf.impl.security.authentication
                          .Constants.PEER_SUBJECT</pre>
Value equals the instance of <code>javax.security.auth.Subject</code>.

The credential object needs to be wrapped in <code>org.globus.wsrf.impl.security.authentication.encryption</code> and added to the set of public credentials of the <code>Subject</code> object.

For example, if <code>publicKeyFilename</code> was the file that had the recipient's public key:
<pre>Subject subject = new Subject();
X509Certificate serverCert =
    CertUtil.loadCertificate(publicKeyFilename);
EncryptionCredentials encryptionCreds =
    new EncryptionCredentials(
        new X509Certificate[] { serverCert });
subject.getPublicCredentials().add(encryptionCreds);
stub._setProperty(Constants.PEER_SUBJECT, subject);</pre></td>
<td>Ref
tion
Sec
Me</td>
</tr>
<tr>
<td>10.</td>
<td>Sets the trusted certificates location.</td>
<td>Property:
<pre>org.globus.wsrf.security.TRUSTED_CERTIFICATES</pre>
Value should be a comma-separated list of directories and file names.</td>
<td>Ref
tion
“Tr
cred</td>
</tr>
<tr>
<td>11.</td>
<td>Sets the SAML Authorization Assertion to embed in SOAP Header.</td>
<td>Property:
<pre>org.globus.wsrf.impl.security.authentication.Constants.SAML_AUTHZ_ASSERTION</pre>
Value should be an instance of org.opensaml.SAMLAssertion.</td>
<td>Can
con
usi
des</td>
</tr>
</table>

Chapter 10. Authorization domain-level interface

1. Interface introduction

Configuration on the server side is done using Chapter 1, Introduction. Make sure you have read about security descriptors (in the aforementioned link) before continuing with this chapter. Custom authorization mechanisms can be written and used as a part of the GT framework. The next section describes the steps involved.

On the client side, in addition to the security descriptor, properties on the stub can be set to configure security properties. Properties and values are described in detail in the next section.

2. Syntax of the interface

2.1. Configuring client-side authorization on the stub

The property to use depends on the authentication scheme:

- **If GSI Secure Transport or GSI Secure Conversation is used**, the `org.globus.axis.gsi.GSIConstants.GSI_AUTHORIZATION` property must be set on the stub. The value of this property must be an instance of an object that extends from `org.globus.gsi.gssapi.auth.GSSAuthorization`. All distributed authorization schemes have implementation in `org.globus.gsi.gssapi.auth` package.
- **For all other authentication schemes**, the `org.globus.wsrf.impl.security.Constants.AUTHORIZATION` property must be set on the stub. The value of this property must be an instance of an object that implements the `org.globus.wsrf.impl.security.authorization.Authorization` interface.
- Example:

```
// Create endpoint reference EndpointReferenceType
endpoint = new EndpointReferenceType();
// Set address of service
String counterAddr =
   "http://localhost:8080/wsrf/services/CounterService";
// Get handle to stub object
CounterPortType port =
     locator.getCounterPortTypePort(endpoint);
// set client authorization to self
((Stub)port)._setProperty(Constants.AUTHORIZATION,
             SelfAuthorization.getInstance());
```

2.2. Writing custom client-side authorization scheme

Other than the distributed client authorization scheme, custom client-side authorization schemes can be written and can be set as the value for the appropriate property on the stub.

Note

Security descriptors cannot be used to configure custom authorization schemes on the client side.

- **If the authentication scheme to be used is GSI Secure Transport or GSI Secure Conversation**, the custom authorization scheme should extend from extends from `org.globus.gsi.gssapi.auth.GSSAuthorization`.

```
public class TestAuthorization extends GSSAuthorization {

  // Provide some way to instantiate this class. Can use constructor
  // with arguments to pass in parameters.
   public TestAuthorization() {

   }

   public GSSName getExpectedName(GSSCredential cred, String host)
      throws GSSException {

      // Return the expected GSSName of the remote entity.
   }


    public void authorize(GSSContext context, String host)
throws AuthorizationException {

       // Perform the authorization steps.
       // context.getSrcName() provides the local GSSName
       // context.getTargName() provides the remote GSSName

       // if authorization fails, throw AuthorizationException
   }
}
```

The following describes the steps done for client side authorization during context establishment:

- Prior to initialization of context establishment the relevant handler (HTTPSSender in case of GSI Secure Transport or SecContextHandler in case of GSI Secure Conversation), invokes *getExpectedName* on the instance of GSSAuthorization set on the Stub.
- During context establishment, if the expected target name from previous step is not null, it is compared with the remote peer's GSSName. If it is not a match, context establishment is abandoned and an error is thrown.

  If the expected target name is null, then a match is not done, unless the option of delegation is used. That is, if GSI Secure Conversation with delegation is used, then the expected target name cannot be null and must match the remote peer's identity.
- Once the context has been established, the *authorize* method is invoked.

Note

Client authorization is done prior to invocation.

To configure the custom authorization scheme:

```
((Stub)port)._setProperty(GSIConstants.GSI_AUTHORIZATION,
              new TestAuthorization());
```

Various authorization scheme implementations in package `org.globus.gsi.gssapi.auth` would serve as examples. View CVS Link[1]

- **For all authentication schemes other than those in previous step** the `org.globus.wsrf.impl.security.Constants.AUTHORIZATION` property must be set on the stub. The value of this property must be an instance of an object that implements the `org.globus.wsrf.impl.security.authorization.Authorization` interface.

```
public class TestAuthorization implements Authorization {

  // Provide some way to instantiate this class. Can use constructor
  // with arguments to pass in parameters.
   public TestAuthorization() {

   }

   public GSSName getName(MessageContext ctx)
      throws GSSException {

      // Return the expected GSSName of the remote entity.
   }


    void authorize(Subject peerSubject, MessageContext context)
                            throws AuthorizationException {

        // Perform the authorization steps.
        // peerSubject provides the remote Subject
        // Use SecurityManager API to get local Subject

        // if authorization fails, throw AuthorizationException
   }
}
```

The following describes the steps done for client side authorization:

- The client side handler WSSecurityClientHandler, invokes *authorize* method on the authorization instance.

Note

Client authorization is done after the invocation.

To configure the custom authorization scheme:

[1] http://viewcvs.globus.org/viewcvs.cgi/jglobus/src/org/globus/gsi/gssapi/auth/?root=Java+COG&pathrev=HEAD

```
        ((Stub)port)._setProperty(Constants.AUTHORIZATION,
                     new TestAuthorization());
```

Various authorization scheme implementations in package `org.globus.wsrf.impl.security.authorization` would serve as examples. View CVS Link[2].

2.3. Writing a custom server-side authorization mechanism

The server side authorization framework can be configured to use custom authorization interceptors, bootstrap PIP, PIP and PDP. Detailed information on writing custom PDPs can be found in GT Java Authorization Framework[3]. Also, the section Section 1, "Migrating Java WS Authorization Framework from GT 4.0" describes migrating from older PDP/PIP implementations.

For example, a custom PDP must implement the interface `org.globus.security.authorization.PDP`.

Example:

```
package org.foobar;

import ....;

public class FooPDP implements PDP
{
    private Principal authorizedIdentity;


    public Decision canAccess(RequestEntity requestEntity,
                              NonRequestEntity nonRequestEntity)
        throws AuthorizationException {

        // process and return decision
    }

    public Decision canAdminister(RequestEntity requestEntity,
                                  NonRequestEntity nonRequestEntity)
        throws AuthorizationException {

        // process and return decision
    }

}
```

To use the above PDP one would configure a service security descriptor with the following authorization settings:

```
<securityConfig xmlns="http://www.globus.org">
   ...
   <authz value="foo1:org.foobar.FooPDP"/>
   ...
<securityConfig/>
```

[2] http://viewcvs.globus.org/viewcvs.cgi/wsrf/java/core/source/src/org/globus/wsrf/impl/security/authorization/?pathrev=HEAD
[3] ../gtJavaAuthzEngine.pdf

This security descriptor (identified as `/.../foo-pdp-security-config.xml` below) can then be used by a service. The association is created by adding a couple of parameters to the service's WSDD entry:

```
...
<service name="MyDummyService"
             provider="Handler"
             style="document">
   ...
   <parameter name="securityDescriptor"
                     value="/.../foo-pdp-security-config.xml"/>
   <parameter name="foo1-authorizedIdentity"
                     value="/DC=org/DC=doe/OU=People/CN=John D"/>
   ...
</service>
```

Note that the parameter <parameter>foo1-authorizedIdentity</parameter> in the above configures the identity the PDP uses for authorizing incoming requests. The parameter name is derived by composing the prefix (<parameter>foo1</parameter>) used when specifying the PDP in the security descriptor with the property (<parameter>authorizedIdentity</parameter>) used in the PDP code.

Chapter 11. Configuring

Java WS A&A is configured using security descriptors. The following describes configuration settings specific for authorization and authentication. You can read the entire Java WS A&A Security Descriptor documentation here.

- Configuring authorization
- Configuring authentication/message protection

1. Configuring authorization

1.1. Configuration overview

Security descriptors are mechanisms used to configure authorization mechanism and policy. The authorization on the server side can be configured at the container, service or resource level.

On the client side, authorization can be configured using security descriptors or as a property on the stub. This configuration can be done on a per invocation granularity

1.2. Server side authorization

The server side authorization can be configured at the container, service or resource level using

- Security descriptors using files. Refer to ????
- Security descriptors programmatically. Refer to ????

To write and configure a server-side custom authorization mechanism refer to Section 2.3, “Writing a custom server-side authorization mechanism”.

1.3. Client side authorization

The client side authorization can be configured for each invocation.

- Security descriptors using files. Refer to ????, specifically Section 3, “Authorization policy”.
- Security descriptors programmatically. Refer to ????
- Properties on the Stub. Refer to Section 2.1, “Configuring client-side authorization on the stub”

To write and configure custom authorization mechanism refer to Section 2.2, “Writing custom client-side authorization scheme”.

If no authorization mechanism has been specified, HostOrSelf authorization is used. In this scheme host authorization is tried first, if it fails, self authorization is attempted

2. Configuring authentication/message protection

2.1. Configuration overview

Configuration of service-side security settings can be achieved by using container or service security descriptor. Some of the security configuration, like the credential to use and trusted certificates location, can also be configured using CoG properties or rely on default location. **The preferred way is to provide these settings in a security descriptor.**

The next section provides details on the relevant properties. An overview of the syntax of security descriptors can be found in Java WS A&A Security Descriptor Framework. Available CoG security properties can be found in Chapter 2, Configuring

2.2. Syntax of the interface

The following properties are relevant to authentication and message/transport security:

Table 11.1. Configuring server side authentication and message/transport security

Number	Task	Descriptor Configuration	Alternate Configuration
1	Credentials	Container or service descriptor configuration	• X509_USER_CERT or CoG Configuration: User certificate configuration • X509_USER_KEY or CoG Configuration: User key configuration • X509_USER_PROXY or CoG Configuration: User proxy configuration If no explicit configuration is found, the default proxy is read from `/tmp/x509_up_<uid>`.
2	Trusted Certificates	Container security descriptor configuration	CoG Configuration
3	Limited proxy policy configuration	Container or service descriptor configuration	None.
4	Replay Attack Window	Container or service descriptor configuration	None.
5	Replay Attack Filter	Container or service descriptor configuration	None.
6	Replay timer interval	Container descriptor configuration	None.
7	Context timer interval	Container descriptor configuration	None.

Chapter 12. Environment variable interface

1. Environmental variables for WS Authentication & Authorization (Java)

Refer to Chapter 2, Configuring for environment variables. Note that the above environment variables do *not* supersede any settings provided in security descriptors.

Chapter 13. PDP/PIP Links

The following are links to PDPs and PIPs included in GT 4.2.1:

- PDP Reference
- PIP Reference

Chapter 14. Debugging

Because Java WS A&A is built on top of Java WS Core, developer debugging is the same as described in Chapter 10, Debugging.

For information about system administrator logs, see Chapter 6, Debugging.

Java WS Core also provides an API for CEDPs-compliant logging as described in Section 1.2, "Configuring system administration logs".

1. Debugging authorization

Log output from the authorization framework is a useful tool for debugging issues. Because the Authorization Framework is built on top of Java WS Core, developer debugging is the same as described in Chapter 10, Debugging.

1.1. Development Logging in Java WS Core

The following information applies to Java WS Core and those services built on it.

Logging in the Java WS Core is based on the Jakarta Commons Logging[1] API. Commons Logging provides a consistent interface for instrumenting source code while at the same time allowing the user to plug-in a different logging implementation. Currently we use Log4j[2] as a logging implementation. Log4j uses a separate configuration file to configure itself. Please see Log4j documentation for details on the configuration file format[3].

1.1.1. Configuring server side developer logs

Server side logging can be configured in `$GLOBUS_LOCATION/container-log4j.properties`, when the container is stand alone container. For tomcat level logging, refer to Logging for Tomcat[4], . The logger `log4j.appender.A1` is used for developer logging and by default writes output to the system output. By default it is set for all warnings in the Globus Toolkit package to be displayed.

Additional logging can be enabled for a package by adding a new line to the configuration file. Example:

```
#for debug level logging from org.globus.package.FooClass
log4j.category.org.globus.package.name.FooClass=DEBUG
#for warnings from org.some.warn.package
log4j.category.org.some.warn.package=WARN
```

1.1.2. Configuring client side developer logs

Client side logging can be configured in `$GLOBUS_LOCATION/log4j.properties`. The logger `log4j.appender.A1` is used for developer logging and by default writes output to the system output. By default it is set for all warnings in the Globus Toolkit package to be displayed.

[1] http://jakarta.apache.org/commons/logging/
[2] http://logging.apache.org/log4j/
[3] http://logging.apache.org/log4j/docs/api/org/apache/log4j/PropertyConfigurator.html#doConfigure(java.lang.String, org.apache.log4j.spi.LoggerRepository)
[4] http://tomcat.apache.org/tomcat-5.5-doc/logging.html

1.2. Enabling verbose logging

As described in the above section, configuration files need to be edited to enable logging at different levels. For example, to see all logging for server side authorization, the following lines need to be added to container logging configuration file. To see client-side authorization framework logging, the same line needs to be added to *$GLOBUS_LOCATION/log4j.properties*.

```
log4j.category.org.globus.wsrf.impl.security.authorization=DEBUG
```

The authorization module uses Java CoG Kit[5] for some of the functionality. To turn on logging for that functionality, the following can be added to the relevant logging file, depending on whether it is the client or the server side logging.

```
log4j.category.org.globus.gsi.jaas=DEBUG
log4j.category.org.globus.gsi.gssapi=DEBUG
log4j.category.org.globus.security.gridmap=DEBUG
```

[5] http://www.globus.org/cog/java/

Chapter 15. Troubleshooting

For a list of common errors in GT, see Error Codes.

1. Error Messages For Java WS A&A

Table 15.1. Java WS A&A Errors

Error Code	Definition	Possible Solutions
`[JWSSEC-248] Secure container requires valid credentials`	This error occurs when globus-start-container is run without any valid credentials. Either a proxy certificate or service/host certificate needs to be configured for the container to start up.	1. If you are not looking to start up a container that uses GSI Secure Transport, which is used by the container by default, use `globus-start-container -nosec`. You will be able to use insecure clients and services. However, this also implies that if you have not configured individual services with credentials, you will not be able to securely access the service. 2. If you are running a personal container, generate a proxy certificate with grid-proxy-init. If the proxy certificate is not in the default location, configure the container security descriptor as described in Configuring Container Security Descriptor. 3. If you want to use host certificates, configure the container security descriptor as described Configuring Credentials.
`Failed to start container: Container failed to initialize [Caused by: [JWSSEC-250] Failed to load certificate/key file]`	This error occurs if the file path to the container certificate and key configured are invalid.	1. The path to the container certificate and key are configured in `$GLOBUS_LOCATION/etc/globus_wsrf_core/global_security_descriptor.xml`. This file is loaded as described [here - fixme link]. Ensure that the path is correct.
`Failed to start container: Container failed to initialize [Caused by: [JWSSEC-249] Failed to load proxy file]`	This error occurs if container proxy file configured is invalid.	1. The path to the container proxy certificates are configured in `$GLOBUS_LOCATION/etc/globus_wsrf_core/global_security_descriptor.xml`. This file is loaded as described [here - fixme link]. Ensure that the path is correct.
`Failed to start container: Container failed to initialize [Caused by: [JWSSEC-245] Error parsing file: "etc/globus_wsrf_core/ global_security_descriptor.xml" [Caused by: ...]`	This error occurs if the container security descriptor configured is invalid.	1. The container security descriptor should conform to the Container Security Descriptor Schema.[1] 2. Refer to the "Caused by: " section for details on the specific element that is not correct.

[1] http://www.globus.org/toolkit/docs/4.2.1/security/container_security_descriptor.xsd

Error Code	Definition	Possible Solutions
`[JGLOBUS-77] Unknown CA`	This error occurs if the CA certificate for the credentials being used is not installed correctly.	1. If this issue occurs on the server side, the container is not configured with CA certificates. The container looks for trusted certificates in the default location as described Java CoG Toolkit FAQ[2] 2. On the server side, the trusted certificates can be configured as described in Trusted Certificates 3. On the client side, trusted certificates can be configured as described in Configuring Trusted Credentials

[2] http://www.globus.org/cog/distribution/1.2/FAQ.TXT

Chapter 16. Related Documentation

See Section 9, “Associated Standards” for a list of associated standards.

Glossary

E

End Entity Certificate (EEC)
: A certificate belonging to a non-CA entity, e.g. you, me or the computer on your desk.

P

private key
: The private part of a key pair. Depending on the type of certificate the key corresponds to it may typically be found in `$HOME/.globus/userkey.pem` (for user certificates), `/etc/grid-security/hostkey.pem` (for host certificates) or `/etc/grid-security/<service>/<service>key.pem` (for service certificates).

  For more information on possible private key locations see this.

proxy certificate
: A short lived certificate issued using a EEC. A proxy certificate typically has the same effective subject as the EEC that issued it and can thus be used in its place. GSI uses proxy certificates for single sign on and delegation of rights to other entities.

  For more information about types of proxy certificates and their compatibility in different versions of GT, see http://dev.globus.org/wiki/Security/ProxyCertTypes.

public key
: The public part of a key pair used for cryptographic operations (e.g. signing, encrypting).

T

transport-level security
: Uses transport-level security (TLS) mechanisms.