Introduction

This guide contains advanced configuration information for system administrators working with C WS A&A. It provides references to information on procedures typically performed by system administrators, including installing, configuring, deploying, and testing the installation.

⚠️ Important

C WS A&A is built, installed and deployed as part of C WS Core - which is part of a default GT installation. See Installing GT 4.2.1 for installation details.

The main administration issues for this component deal with configuring credential-related settings. There are multiple mechanisms for doing this:

- Security Descriptors (This is the preferred mechanism)
  - Container Security Descriptor
  - Service Security Descriptor
- CoG properties
- Environment variables
- Relying on default behavior. The only default behaviors available concern the proxy file and trusted certificates locations.

More information on these mechanisms can be found in the public interface guide.
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Chapter 1. Building and Installing

The GT4 C WS A&A component is currently installed as part of the GT4 C WS Core component. More information on installing this component can be found in the "Building and Installing" section of the Java WS Core Admin Guide.
Chapter 2. Configuring

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. Syntax of the interface

The following properties are relevant to authentication and message/transport security:
Table 2.1. Configuring server side authentication and message/transport security

<table>
<thead>
<tr>
<th>Number</th>
<th>Task</th>
<th>Descriptor Configuration</th>
<th>Alternate Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Credentials</td>
<td>Container or service descriptor configuration</td>
<td>• X509_USER_CERT or CoG Configuration&lt;sup&gt;6&lt;/sup&gt;: User certificate configuration</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• X509_USER_KEY or CoG Configuration&lt;sup&gt;3&lt;/sup&gt;: User key configuration</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• X509_USER_PROXY or CoG Configuration&lt;sup&gt;4&lt;/sup&gt;: User proxy configuration</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>If no explicit configuration is found, the default proxy is read from /tmp/x509_up_&lt;uid&gt;.</td>
</tr>
<tr>
<td>2</td>
<td>Trusted Certificates</td>
<td>Container security descriptor configuration&lt;sup&gt;5&lt;/sup&gt;</td>
<td>CoG Configuration&lt;sup&gt;6&lt;/sup&gt;</td>
</tr>
<tr>
<td>3</td>
<td>Limited proxy policy</td>
<td>Container or service descriptor configuration</td>
<td>None.</td>
</tr>
<tr>
<td>4</td>
<td>Replay Attack Window</td>
<td>Container or service descriptor configuration</td>
<td>None.</td>
</tr>
<tr>
<td>5</td>
<td>Replay Attack Filter</td>
<td>Container or service descriptor configuration</td>
<td>None.</td>
</tr>
<tr>
<td>6</td>
<td>Replay timer interval</td>
<td>Container descriptor configuration&lt;sup&gt;10&lt;/sup&gt;</td>
<td>None.</td>
</tr>
<tr>
<td>7</td>
<td>Context timer interval</td>
<td>Container descriptor configuration&lt;sup&gt;11&lt;/sup&gt;</td>
<td>None.</td>
</tr>
</tbody>
</table>

3. [http://www.globus.org/toolkit/docs/4.2.1/common/javacog/admin/javacog-admin-configuring-user-key.html#javacog-admin-configuring-user-key](http://www.globus.org/toolkit/docs/4.2.1/common/javacog/admin/javacog-admin-configuring-user-key.html#javacog-admin-configuring-user-key)
Chapter 3. Deploying

The GT4 C WS A&A component is currently deployed as part of the GT4 C WS Core component.
Chapter 4. Testing

FIXME - information for testing ws security.
Chapter 5. Security Considerations

1. Security considerations for C WS A&A

1.1. 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 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 6. Debugging

Because this component is built on C WS Core, it uses the same sys admin logging, described below:

1. Logging

As of 4.2.1, the Globus Toolkit provides system administration logs that are CEDPs best practices\(^1\) compliant.

To enable CEDPS logging, pass the \(-log\) \(PATH\) parameter to the `globus-wsc-container` program.

For more details on the CEDPS Logging format, including descriptions of reserved name-value pairs, see http://cedps.net/index.php/LoggingBestPractices:

1.1. Sample log file

The sample log file\(^2\) contains many log entries for various scenarios in the C WS container.

---

\(^1\) http://cedps.net/index.php/LoggingBestPractices

\(^2\) http://www.globus.org/toolkit/docs/4.2/4.2.1/common/cwscore/sample-container-log.txt
Chapter 7. Troubleshooting

For a list of common errors in GT, see Error Codes.
1. Error Messages For C WS A&A
### Troubleshooting

#### Table 7.1. C WS A&A Errors

<table>
<thead>
<tr>
<th>Error Code</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERROR: Couldn't read user key: Bad passphrase</td>
<td>Unable to decrypt</td>
</tr>
<tr>
<td>globus_credential: Error reading user credential: Can't read</td>
<td>Unable to decrypt</td>
</tr>
<tr>
<td>credential's private key from PEM</td>
<td>key file location: /Users/bester/.globus/userkey.pem</td>
</tr>
<tr>
<td>OpenSSL Error: pem_lib.c:423: in library: PEM routines, function PEM_do_header:</td>
<td>Unable to decrypt</td>
</tr>
<tr>
<td>bad decrypt</td>
<td>key file location: /Users/bester/.globus/userkey.pem</td>
</tr>
<tr>
<td>OpenSSL Error: evp_enc.c:509: in library: digital envelope routines, function</td>
<td>Unable to decrypt</td>
</tr>
<tr>
<td>EVP_DecryptFinal: bad decrypt</td>
<td>key file location: /Users/bester/.globus/userkey.pem</td>
</tr>
<tr>
<td>Use -debug for further information.</td>
<td>key file location: /Users/bester/.globus/userkey.pem</td>
</tr>
<tr>
<td>globus_gsi_gssapi: Error with gss credential handle</td>
<td>No user proxy could be found</td>
</tr>
<tr>
<td>globus_credential: Valid credentials could not be found in any of the possible locations specified by the credential search order.</td>
<td>No user proxy could be found</td>
</tr>
<tr>
<td>Valid credentials could not be found in any of the possible locations specified by the credential search order.</td>
<td>No user proxy could be found</td>
</tr>
<tr>
<td>Attempt 1</td>
<td>No user proxy could be found</td>
</tr>
<tr>
<td>globus_credential: Error reading host credential</td>
<td>No user proxy could be found</td>
</tr>
<tr>
<td>globus_sysconfig: Error with certificate filename</td>
<td>No user proxy could be found</td>
</tr>
<tr>
<td>globus_sysconfig: Error with certificate filename</td>
<td>No user proxy could be found</td>
</tr>
<tr>
<td>globus_sysconfig: File is not owned by current user: /etc/grid-security/hostcert.pem is not owned by current user</td>
<td>No user proxy could be found</td>
</tr>
<tr>
<td>Attempt 2</td>
<td>No user proxy could be found</td>
</tr>
<tr>
<td>globus_credential: Error reading proxy credential</td>
<td>No user proxy could be found</td>
</tr>
<tr>
<td>globus_sysconfig: Could not find a valid proxy certificate file location</td>
<td>No user proxy could be found</td>
</tr>
<tr>
<td>globus_sysconfig: Error with key filename</td>
<td>No user proxy could be found</td>
</tr>
<tr>
<td>globus_sysconfig: File does not exist: /tmp/x509up_u501 is not a valid file</td>
<td>No user proxy could be found</td>
</tr>
<tr>
<td>Attempt 3</td>
<td>No user proxy could be found</td>
</tr>
<tr>
<td>globus_credential: Error reading user credential</td>
<td>No user proxy could be found</td>
</tr>
<tr>
<td>globus_credential: Key is password protected: GSI does not currently support password protected private keys.</td>
<td>No user proxy could be found</td>
</tr>
<tr>
<td>OpenSSL Error: pem_lib.c:401: in library: PEM routines, function PEM_do_header:</td>
<td>No user proxy could be found</td>
</tr>
<tr>
<td>bad password read</td>
<td>No user proxy could be found</td>
</tr>
<tr>
<td>globus_gsi_gssapi: Error with GSI credential</td>
<td>Proxy has expired.</td>
</tr>
<tr>
<td>globus_gsi_gssapi: Error with gss credential handle</td>
<td>Proxy has expired.</td>
</tr>
<tr>
<td>globus_credential: Error with credential: The proxy credential:</td>
<td>Proxy has expired.</td>
</tr>
<tr>
<td>/tmp/x509up_u1499</td>
<td>Proxy has expired.</td>
</tr>
<tr>
<td>with subject: /DC=org/DC=example/DC=grid/OU=People/CN=Joe User/CN=1235439010</td>
<td>Proxy has expired.</td>
</tr>
<tr>
<td>expired 44 minutes ago.</td>
<td>Proxy has expired.</td>
</tr>
<tr>
<td>Error Code</td>
<td>Definition</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td>globus_xio: The GSI XIO driver failed to establish a secure connection. The failure occurred during a handshake read. globus_xio: An end of file occurred</td>
<td>Communication disrupted during SSL handshake</td>
</tr>
<tr>
<td>globus_gsi_gssapi: Unable to verify remote side's credentials</td>
<td>Unable to verify remote certificate. Often a clock-synchronization problem where the service clock is behind that of the client.</td>
</tr>
<tr>
<td>globus_gsi_gssapi: Unable to verify remote side's credentials: Couldn't verify the remote certificate</td>
<td></td>
</tr>
<tr>
<td>OpenSSL Error: s3_pkt.c:1052: in library: SSL routines, function SSL3_READ_BYTES: ss1v3 alert bad certificate SSL alert number 42</td>
<td></td>
</tr>
<tr>
<td>OpenSSL Error: s3_clnt.c:894: in library: SSL routines, function SSL3_GET_SERVER_CERTIFICATE: certificate verify failed</td>
<td></td>
</tr>
</tbody>
</table>
**Troubleshooting**

<table>
<thead>
<tr>
<th>Error Code</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>globus_gsi_callback_module: Error with signing policy</td>
<td>The service's certificate is not trusted by the client.</td>
</tr>
<tr>
<td>globus_sysconfig: Error getting signing policy file</td>
<td></td>
</tr>
<tr>
<td>globus_sysconfig: File does not exist: /etc/grid-security/certificates/2b0e42b2.signing_policy is not a valid file</td>
<td></td>
</tr>
<tr>
<td>globus_gsi_callback_module: Could not verify credential</td>
<td>Service certificate is not trusted because the CA signing policy does not trust the CA to sign the subject name of the certificate.</td>
</tr>
<tr>
<td>globus_gsi_callback_module: Error with signing policy</td>
<td></td>
</tr>
<tr>
<td>globus_gsi_callback_module: Error in OLD GAA code: CA policy violation: &lt;no reason given&gt;</td>
<td></td>
</tr>
<tr>
<td>Error: globus_soap_message_module: SOAP Fault</td>
<td>The client sent a request to a service which message security without properly invoking the security handlers.</td>
</tr>
<tr>
<td>Fault code: Client</td>
<td></td>
</tr>
<tr>
<td>Fault string: globus_handler_ws_secure_message: Server Request handling failed</td>
<td></td>
</tr>
<tr>
<td>globus_handler_ws_secure_message: Failed to verify the message: Unable to get Security header element from message attributes.</td>
<td></td>
</tr>
</tbody>
</table>
**2. Credential Troubleshooting**

**2.1. Credential Errors**

The following are some common problems that may cause clients or servers to report that credentials are invalid:

For a list of common errors in GT, see Error Codes.
Table 7.2. Credential Errors

<table>
<thead>
<tr>
<th>Error Code</th>
<th>Definition</th>
<th>Possible Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Your proxy credential may have expired</td>
<td>Your proxy credential may have expired.</td>
<td>Use <code>grid-proxy-info</code> to check whether the proxy credential has actually expired. If it has, generate a new proxy with <code>grid-proxy-init</code>.</td>
</tr>
<tr>
<td>The system clock on either the local or remote system is wrong.</td>
<td>This may cause the server or client to conclude that a credential has expired.</td>
<td>Check the system clocks on the local and remote system.</td>
</tr>
<tr>
<td>Your end-user certificate may have expired</td>
<td>Your end-user certificate may have expired</td>
<td>Use <code>grid-cert-info</code> to check your certificate's expiration date. If it has expired, follow your CA's procedures to get a new one.</td>
</tr>
<tr>
<td>The permissions may be wrong on your proxy file</td>
<td>If the permissions on your proxy file are too lax (for example, if others can read your proxy file), Globus Toolkit clients will not use that file to authenticate.</td>
<td>You can &quot;fix&quot; this problem by changing the permissions on the file or by destroying it (with <code>grid-proxy-destroy</code>) and creating a new one (with <code>grid-proxy-init</code>). <strong>Important:</strong> However, it is still possible that someone else has made a copy of that file during the time that the permissions were wrong. In that case, they will be able to impersonate you until the proxy file expires or your permissions or end-user certificate are revoked, whichever happens first.</td>
</tr>
<tr>
<td>The permissions may be wrong on your private key file</td>
<td>If the permissions on your end user certificate private key file are too lax (for example, if others can read the file), <code>grid-proxy-init</code> will refuse to create a proxy certificate.</td>
<td>You can &quot;fix&quot; this by changing the permissions on the private key file. <strong>Important:</strong> However, you will still have a much more serious problem: it is possible that someone has made a copy of your private key file. Although this file is encrypted, it is possible that someone will be able to decrypt the private key, at which point they will be able to impersonate you as long as your end user certificate is valid. You should contact your CA to have your end-user certificate revoked and get a new one.</td>
</tr>
<tr>
<td>The remote system may not trust your CA</td>
<td>The remote system may not trust your CA</td>
<td>Verify that the remote system is configured to trust the CA that issued your end-entity certificate. See Installing GT 4.2.1 for details.</td>
</tr>
<tr>
<td>You may not trust the remote system's CA</td>
<td>You may not trust the remote system's CA</td>
<td>Verify that your system is configured to trust the remote CA (or that your environment is set up to trust the remote CA). See Installing GT 4.2.1 for details.</td>
</tr>
<tr>
<td>There may be something wrong with the remote service's credentials</td>
<td>There may be something wrong with the remote service's credentials.</td>
<td>It is sometimes difficult to distinguish between errors reported by the remote service regarding your credentials and errors reported by the client interface regarding the remote service's credentials. If you cannot find anything wrong with your credentials, check for the same conditions on the remote system (or ask a remote administrator to do so).</td>
</tr>
</tbody>
</table>
2.2. Some tools to validate certificate setup

2.2.1. grid-cert-diagnostics

The grid-cert-diagnostics program checks prints diagnostics about the user's certificates, and host security environment.

```
% grid-cert-diagnostics -p
```

2.2.2. Check that the user certificate is valid

openssl verify -CApath /etc/grid-security/certificates
  -purpose sslclient ~/.globus/usercert.pem

2.2.3. Connect to the server using s_client

openssl s_client -ssl3 -cert ~/.globus/usercert.pem -key
  ~/.globus/userkey.pem -CApath /etc/grid-security/certificates
  -connect <host:port>

Here <host:port> denotes the server and port you connect to.

If it prints an error and puts you back at the command prompt, then it typically means that the server has closed the connection, i.e. that the server was not happy with the client's certificate and verification. Check the SSL log on the server.

If the command "hangs" then it has actually opened a telnet style (but secure) socket, and you can "talk" to the server.

You should be able to scroll up and see the subject names of the server's verification chain:

```
depth=2 /DC=net/DC=ES/O=ESnet/OU=Certificate Authorities/CN=ESnet Root CA 1
verify return:1
depth=1 /DC=org/DC=DOEGrids/OU=Certificate Authorities/CN=DOEGrids CA 1
verify return:1
depth=0 /DC=org/DC=doegrids/OU=Services/CN=wiggum.mcs.anl.gov
verify return:1
```

In this case, there were no errors. Errors would give you an extra line next to the subject name of the certificate that caused the error.

2.2.4. Check that the server certificate is valid

Requires root login on server:

```
openssl verify -CApath /etc/grid-security/certificates -purpose sslserver
  /etc/grid-security/hostcert.pem
```
**Glossary**

*some terms not in the docs but wanted in glossary: scheduler*

**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.

**S**

scheduler

Term used to describe a job scheduler mechanism to which GRAM interfaces. It is a networked system for submitting, controlling, and monitoring the workload of batch jobs in one or more computers. The jobs or tasks are scheduled for execution at a time chosen by the subsystem according to an available policy and availability of resources. Popular job schedulers include Portable Batch System (PBS), Platform LSF, and IBM LoadLeveler.
Introduction

Typical user configuration for this component deals with configuring authentication mechanisms and credentials for the clients. These could be client applications, including command line clients or client configuration within services that contact other services.

There are multiple mechanisms for doing this:

- Command line options (these are application-specific)
- Client security descriptors
- CoG properties
- Environment variables
- Relying on default behavior. The only default behaviors available concern the proxy file and trusted certificates locations.

More information on these mechanisms can be found in the public interface guide.
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3.1. Credential Errors ..................................................................................... 9
3.2. C WS A&A Errors .................................................................................. 12
Command-line tools
Name
globus-credential-delegate -- Delegation client
globus-credential-delegate

Tool description

Used to contact a Delegation Factory Service and store a delegated credential. A delegated credential is created and
stored in a delegated credential WS-Resource, and the Endpoint Reference(EPR) of the credential is written out to a
file for further use.

Command syntax

globus-credential-delegate [options] <eprFilename>

Table 1. globus-credential-delegate options

<table>
<thead>
<tr>
<th>[option1]</th>
<th>Enables anonymous authentication. Only supported with transport security or the GSI Secure Conversation authentication mechanism.</th>
</tr>
</thead>
<tbody>
<tr>
<td>[option1]</td>
<td>Specifies the server's certificate file used for encryption. Only needed for the GSI Secure Message authentication mechanism.</td>
</tr>
</tbody>
</table>
Chapter 1. Domain-specific interface

1. Interface introduction

Client-side security is set up by 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:

  ```java
  // 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:

  ```java
  // 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);
  ```

**Note**

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

```java
import org.globus.axis.util.Util;
static {
    Util.registerTransport();
}
```
2. Syntax of the interface
## Table 1.1. Client side security properties

<table>
<thead>
<tr>
<th>Number</th>
<th>Task Description</th>
<th>Stub Configuration</th>
</tr>
</thead>
</table>
| 3.     | Enable GSI Secure Conversation with specified message protection level.           | 1. Property: `org.globus.wsrfs.messaging.Constants.GSI_SEC_CONV` Values equal one of the following:  
|        |                                                                                  | - Constants.ENCRYPTION  
|        |                                                                                  | - Constants.SIGNATURE  
|        | 2. Property: `org.globus.wsrfs.messaging.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. |
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.GSIClarsants.GSI_MODE
   ```
   
   **Value equals one of following:**
   
   1. `GSIClarsants.GSI_MODE_NO_DELEG`: No delegation is performed.
   2. `GSIClarsants.GSI_MODE_LIMITED_DELEG`: Limited delegation is performed.
   3. `GSIClarsants.GSI_MODE_FULL_DELEG`: Full delegation is performed.

5. **Enables GSI Secure Transport with some protection level.**

   **Property:**
   
   ```
   org.globus.gsi.GSIClarsants.GSI_TRANSPORT
   ```
   
   **Values equal one of the following:**
   
   - `Constants.ENCRYPTION`
   - `Constants.SIGNATURE`

6. **Enables anonymous authentication.**

   *This option only applies to GSI Secure Conversation and GSI Transport.*

   **Property:**
   
   ```
   org.globus.wsrw.security.Constants.GSI_ANONYMOUS
   ```
   
   **Value equals one of following:**
   
   2. `Boolean.TRUE`: Anonymous authentication is enabled.
| 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.

| 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.
<table>
<thead>
<tr>
<th></th>
<th>Property:</th>
<th>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:</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.</td>
<td><code>org.globus.wsrf.impl.security.authentication.Constants.PEER_SUBJECT</code></td>
<td><code>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);</code></td>
</tr>
<tr>
<td></td>
<td><code>org.globus.wsrf.security.TRUSTED_CERTIFICATES</code></td>
<td>Value should be a comma-separated list of directories and file names.</td>
</tr>
<tr>
<td>10.</td>
<td><code>org.globus.wsrf.impl.security.authentication.Constants.SAML_AUTHZ_ASSERTION</code></td>
<td>Value should be an instance of <code>org.opensaml.SAMLAssertion</code>.</td>
</tr>
<tr>
<td></td>
<td><code>org.globus.wsrf.impl.security.authentication.Constants.SAML_AUTHZ_ASSERTION</code></td>
<td>Value should be an instance of <code>org.opensaml.SAMLAssertion</code>.</td>
</tr>
</tbody>
</table>

Can be configured using descriptors.
Chapter 2. Debugging

1. Logging

As of 4.2.1, the Globus Toolkit provides system administration logs that are CEDPs best practices\(^1\) compliant.

To enable CEDPS logging, pass the -log PATH parameter to the `globus-wsc-container` program.

For more details on the CEDPS Logging format, including descriptions of reserved name-value pairs, see http://cedps.net/index.php/LoggingBestPractices:

1.1. Sample log file

The sample log file\(^2\) contains many log entries for various scenarios in the C WS container.

\(^1\) http://cedps.net/index.php/LoggingBestPractices
\(^2\) http://www.globus.org/toolkit/docs/4.2/4.2.1/common/cwscore/sample-container-log.txt
Chapter 3. Troubleshooting

For a list of common errors in GT, see Error Codes. For information about system administrator logs, see Chapter 7, Troubleshooting in the C WS Security Admin Guide.

1. Credential Troubleshooting

1.1. Credential Errors

The following are some common problems that may cause clients or servers to report that credentials are invalid:

For a list of common errors in GT, see Error Codes.
### Table 3.1. Credential Errors

<table>
<thead>
<tr>
<th>Error Code</th>
<th>Definition</th>
<th>Possible Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Your proxy credential may have expired</td>
<td>Your proxy credential may have expired.</td>
<td>Use <code>grid-proxy-info</code> to check whether the proxy credential has actually expired. If it has, generate a new proxy with <code>grid-proxy-init</code>.</td>
</tr>
<tr>
<td>The system clock on either the local or remote system is wrong.</td>
<td>This may cause the server or client to conclude that a credential has expired.</td>
<td>Check the system clocks on the local and remote system.</td>
</tr>
<tr>
<td>Your end-user certificate may have expired</td>
<td>Your end-user certificate may have expired.</td>
<td>Use <code>grid-cert-info</code> to check your certificate's expiration date. If it has expired, follow your CA's procedures to get a new one.</td>
</tr>
<tr>
<td>The permissions may be wrong on your proxy file</td>
<td>If the permissions on your proxy file are too lax (for example, if others can read your proxy file), Globus Toolkit clients will not use that file to authenticate.</td>
<td>You can &quot;fix&quot; this problem by changing the permissions on the file or by destroying it (with <code>grid-proxy-destroy</code>) and creating a new one (with <code>grid-proxy-init</code>). <strong>Important:</strong> However, it is still possible that someone else has made a copy of that file during the time that the permissions were wrong. In that case, they will be able to impersonate you until the proxy file expires or your permissions or end-user certificate are revoked, whichever happens first.</td>
</tr>
<tr>
<td>The permissions may be wrong on your private key file</td>
<td>If the permissions on your end user certificate private key file are too lax (for example, if others can read the file), <code>grid-proxy-init</code> will refuse to create a proxy certificate.</td>
<td>You can &quot;fix&quot; this by changing the permissions on the private key file. <strong>Important:</strong> However, you will still have a much more serious problem: it is possible that someone has made a copy of your private key file. Although this file is encrypted, it is possible that someone will be able to decrypt the private key, at which point they will be able to impersonate you as long as your end user certificate is valid. You should contact your CA to have your end-user certificate revoked and get a new one.</td>
</tr>
<tr>
<td>The remote system may not trust your CA</td>
<td>The remote system may not trust your CA</td>
<td>Verify that the remote system is configured to trust the CA that issued your end-entity certificate. See Installing GT 4.2.1 for details.</td>
</tr>
<tr>
<td>You may not trust the remote system's CA</td>
<td>You may not trust the remote system's CA</td>
<td>Verify that your system is configured to trust the remote CA (or that your environment is set up to trust the remote CA). See Installing GT 4.2.1 for details.</td>
</tr>
<tr>
<td>There may be something wrong with the remote service's credentials</td>
<td>There may be something wrong with the remote service's credentials</td>
<td>It is sometimes difficult to distinguish between errors reported by the remote service regarding your credentials and errors reported by the client interface regarding the remote service's credentials. If you cannot find anything wrong with your credentials, check for the same conditions on the remote system (or ask a remote administrator to do so).</td>
</tr>
</tbody>
</table>
1.2. Some tools to validate certificate setup

1.2.1. grid-cert-diagnostics

The `grid-cert-diagnostics` program checks prints diagnostics about the user's certificates, and host security environment.

```
% grid-cert-diagnostics -p
```

1.2.2. Check that the user certificate is valid

```
openssl verify -CApath /etc/grid-security/certificates
   -purpose sslclient ~/.globus/usercert.pem
```

1.2.3. Connect to the server using s_client

```
openssl s_client -ssl3 -cert ~/.globus/usercert.pem -key ~/.globus/userkey.pem -CApath /etc/grid-security/certificates
   -connect <host:port>
```

Here `<host:port>` denotes the server and port you connect to.

If it prints an error and puts you back at the command prompt, then it typically means that the server has closed the connection, i.e. that the server was not happy with the client's certificate and verification. Check the SSL log on the server.

If the command "hangs" then it has actually opened a telnet style (but secure) socket, and you can "talk" to the server.

You should be able to scroll up and see the subject names of the server's verification chain:

```
depth=2 /DC=net/DC=ES/O=ESnet/OU=Certificate Authorities/CN=ESnet Root CA 1
   verify return:1
depth=1 /DC=org/DC=DOEGrids/OU=Certificate Authorities/CN=DOEGrids CA 1
   verify return:1
depth=0 /DC=org/DC=doegrids/OU=Services/CN=wiggum.mcs.anl.gov
   verify return:1
```

In this case, there were no errors. Errors would give you an extra line next to the subject name of the certificate that caused the error.

1.2.4. Check that the server certificate is valid

Requires root login on server:

```
openssl verify -CApath /etc/grid-security/certificates -purpose sslserver
   /etc/grid-security/hostcert.pem
```
2. Error Messages For C WS A&A
### Table 3.2. C WS A&A Errors

<table>
<thead>
<tr>
<th>Error Code</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERROR: Couldn't read user key: Bad passphrase</td>
<td>Unable to decrypt</td>
</tr>
<tr>
<td>globus_credential: Error reading user credential: Can't read</td>
<td>No user proxy could be found</td>
</tr>
<tr>
<td>credential's private key from PEM</td>
<td></td>
</tr>
<tr>
<td>OpenSSL Error: pem_lib.c:423: in library: PEM routines, function PEM_do_header:</td>
<td></td>
</tr>
<tr>
<td>bad decrypt</td>
<td></td>
</tr>
<tr>
<td>OpenSSL Error: evp_enc.c:509: in library: digital envelope routines, function</td>
<td></td>
</tr>
<tr>
<td>EVP_DecryptFinal: bad decrypt</td>
<td></td>
</tr>
<tr>
<td>Use -debug for further information.</td>
<td></td>
</tr>
<tr>
<td>globus_gsi_gssapi: Error with gss credential handle</td>
<td></td>
</tr>
<tr>
<td>globus_credential: Valid credentials could not be found in any of the possible locations specified by the credential search order.</td>
<td></td>
</tr>
<tr>
<td>Valid credentials could not be found in any of the possible locations specified by the credential search order.</td>
<td></td>
</tr>
<tr>
<td>Attempt 1</td>
<td></td>
</tr>
<tr>
<td>globus_credential: Error reading host credential</td>
<td></td>
</tr>
<tr>
<td>globus_sysconfig: Error with certificate filename</td>
<td></td>
</tr>
<tr>
<td>globus_sysconfig: Error with certificate filename</td>
<td></td>
</tr>
<tr>
<td>globus_sysconfig: File is not owned by current user: /etc/grid-security/hostcert.pem is not owned by current user</td>
<td></td>
</tr>
<tr>
<td>Attempt 2</td>
<td></td>
</tr>
<tr>
<td>globus_credential: Error reading proxy credential</td>
<td></td>
</tr>
<tr>
<td>globus_sysconfig: Could not find a valid proxy certificate file location</td>
<td></td>
</tr>
<tr>
<td>globus_sysconfig: Error with key filename</td>
<td></td>
</tr>
<tr>
<td>globus_sysconfig: File does not exist: /tmp/x509up_u501 is not a valid file</td>
<td></td>
</tr>
<tr>
<td>Attempt 3</td>
<td></td>
</tr>
<tr>
<td>globus_credential: Error reading user credential</td>
<td></td>
</tr>
<tr>
<td>globus_credential: Key is password protected: GSI does not currently support password protected private keys.</td>
<td></td>
</tr>
<tr>
<td>OpenSSL Error: pem_lib.c:401: in library: PEM routines, function PEM_do_header:</td>
<td></td>
</tr>
<tr>
<td>bad password read</td>
<td></td>
</tr>
<tr>
<td>globus_gsi_gssapi: Error with GSI credential</td>
<td></td>
</tr>
<tr>
<td>globus_gsi_gssapi: Error with gss credential handle</td>
<td></td>
</tr>
<tr>
<td>globus_credential: Error with credential: /tmp/x509up_u1499</td>
<td></td>
</tr>
<tr>
<td>with subject: /DC=org/DC=example/DC=grid/OU=People/CN=Joe User/CN=1235439010 expired 44 minutes ago.</td>
<td></td>
</tr>
<tr>
<td>Error Code</td>
<td>Definition</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td>globus_xio: The GSI XIO driver failed to establish a secure connection. The failure occurred during a handshake read.</td>
<td>Communication disrupted during SSL handshake</td>
</tr>
<tr>
<td>globus_xio: An end of file occurred</td>
<td></td>
</tr>
<tr>
<td>globus_gsi_gssapi: Unable to verify remote side's credentials</td>
<td>Unable to verify remote certificate. Often a clock-synchronization problem where the service clock is behind that of the client.</td>
</tr>
<tr>
<td>globus_gsi_gssapi: Unable to verify remote side's credentials: Couldn't verify the remote certificate</td>
<td></td>
</tr>
<tr>
<td>OpenSSL Error: s3_pkt.c:1052: in library: SSL routines, function SSL3_READ_BYTES: sslv3 alert bad certificate SSL alert number 42</td>
<td></td>
</tr>
<tr>
<td>OpenSSL Error: s3_clnt.c:894: in library: SSL routines, function SSL3_GET_SERVER_CERTIFICATE: certificate verify failed</td>
<td></td>
</tr>
<tr>
<td>globus_gsi_callback_module: Could not verify credential</td>
<td></td>
</tr>
<tr>
<td>globus_gsi_callback_module: The certificate is not yet valid: Cert with subject: /DC=org/DC=example/DC=grid/OU=People/CN=Joe User/CN=464555355 is not yet valid- check clock skew between hosts.</td>
<td>Unable to verify remote certificate. Often a clock-synchronization problem where the client clock is behind that of the service.</td>
</tr>
</tbody>
</table>
### Error Code

<table>
<thead>
<tr>
<th>Error Code</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>globus_gsi_callback_module: Error with signing policy</td>
<td>The service's certificate is not trusted by the client</td>
</tr>
<tr>
<td>globus_sysconfig: Error getting signing policy file</td>
<td></td>
</tr>
<tr>
<td>globus_sysconfig: File does not exist: /etc/grid-security/certificates/2b0e42b2.signing_policy is not a valid file</td>
<td></td>
</tr>
<tr>
<td>globus_gsi_callback_module: Could not verify credential</td>
<td>Service certificate is not trusted because the CA signing policy does not trust the CA to sign the subject name of the certificate.</td>
</tr>
<tr>
<td>globus_gsi_callback_module: Error with signing policy</td>
<td></td>
</tr>
<tr>
<td>globus_gsi_callback_module: Error in OLD GAA code: CA policy violation: &lt;no reason given&gt;</td>
<td></td>
</tr>
<tr>
<td>Error: globus_soap_message_module: SOAP Fault</td>
<td>The client sent a request to a service which message security without properly invoking the security handlers</td>
</tr>
<tr>
<td>Fault code: Client</td>
<td></td>
</tr>
<tr>
<td>Fault string: globus_handler_ws_secure_message: Server Request handling failed</td>
<td></td>
</tr>
<tr>
<td>globus_handler_ws_secure_message: Failed to verify the message: Unable to get Security header element from message attributes.</td>
<td></td>
</tr>
<tr>
<td>Error Code</td>
<td>Definition</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Error: globus_soap_message_module: SOAP Fault</td>
<td>The client sent a request protected with message-level security but the server did not understand the required security headers</td>
</tr>
<tr>
<td>Fault code: Client</td>
<td></td>
</tr>
<tr>
<td>Fault string: globus_soap_message_module: Loaded message handlers do not understand required header element:</td>
<td></td>
</tr>
<tr>
<td>{<a href="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd%7DSecurity">http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd}Security</a></td>
<td></td>
</tr>
</tbody>
</table>
### Glossary

*some terms not in the docs but wanted in glossary: scheduler*

**C**

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>certificate</td>
<td>A public key plus information about the certificate owner bound together by the digital signature of a CA. In the case of a CA certificate, the certificate is self signed, i.e. it was signed using its own private key.</td>
</tr>
</tbody>
</table>

**P**

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>public key</td>
<td>The public part of a key pair used for cryptographic operations (e.g. signing, encrypting).</td>
</tr>
</tbody>
</table>

**S**

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>scheduler</td>
<td>Term used to describe a job scheduler mechanism to which GRAM interfaces. It is a networked system for submitting, controlling, and monitoring the workload of batch jobs in one or more computers. The jobs or tasks are scheduled for execution at a time chosen by the subsystem according to an available policy and availability of resources. Popular job schedulers include Portable Batch System (PBS), Platform LSF, and IBM LoadLeveler.</td>
</tr>
</tbody>
</table>
GT4 C WS A&A Developer's Guide

Introduction

This component 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.
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Chapter 1. Before you begin

1. Feature summary

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 integrity protection.

Deprecated Features

• None.

2. Tested platforms

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

Tested Platforms for C WS A&A

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

3. Backward compatibility summary

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.

4. Technology dependencies

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

• C WS Core
• GSI
C WS A&A depends on the following 3rd party software:

- OpenSSL \(^1\)

## 5. Security considerations for C WS A&A

### 5.1. 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 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.

\(^1\) http://www.openssl.org
Chapter 2. 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. If full or limited delegation is performed, the client credential can be obtained from the message context as follows:

```java
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. 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:

```java
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 embedded 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.

```java
import org.globus.wsrf.security.SecurityManager;
import javax.security.auth.Subject;
```
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:

```java
import org.globus.wsrf.impl.security.authentication.Constants;
import org.globus.wsrf.impl.security.authentication.secureconv.service.SecurityContext;
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 =
```
• **GSI Secure Transport:** With this mechanism, the peer credentials can be obtained once the handshake is completed:

```java
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:

```java
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 Authorization**

[describe what authz info there is for c ws aa]

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:

```java
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 http://bugzilla.mcs.anl.gov/globus/show_bug.cgi?id=4350
Similarly Secure Messages can be used in tandem with other message protection mechanisms.
Chapter 3. Tutorials

There are no tutorials available at this time.
Chapter 4. Architecture and design overview

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. 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.

1.2. 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.

2. Message Level Security

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.
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.

### 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.

### 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 4.2. JAX-RPC handlers involved in security related message processing on a server.**

#### 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.
Chapter 5. APIs

1. Programming Model Overview

The security 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 ?????. More information about the security descriptor can be found in Java WS A&A Security Descriptor Framework.

2. Component API

- Stable interfaces:
  - org.globus.wsrf.security.Constants
  - org.globus.wsrf.security.SecureResource
  - org.globus.wsrf.security.SecurityManager
  - org.globus.wsrf.security.SecurityException
- Less stable interfaces:
  - org.globus.wsrf.impl.security.descriptor.ClientSecurityDescriptor

Documentation for these interfaces can be found here\(^1\).

\(^1\) [http://www.globus.org/api/javadoc-4.2.1/globus_java_ws_core](http://www.globus.org/api/javadoc-4.2.1/globus_java_ws_core)
Chapter 6. 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:

```xml
<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>
```

```xml
<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:

```xml
<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>
```

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 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**

Services and WSDL

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

---

Chapter 7. 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](http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-soap-message-security-1.0.pdf)


\(^3\) [http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-x509-token-profile-1.0.pdf](http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-x509-token-profile-1.0.pdf)

Command-line tools
Name

globus-credential-delegate -- Delegation client

globus-credential-delegate

Tool description

Used to contact a Delegation Factory Service and store a delegated credential. A delegated credential is created and stored in a delegated credential WS-Resource, and the Endpoint Reference(EPR) of the credential is written out to a file for further use.

Command syntax

globus-credential-delegate [options] <eprFilename>

Table 1. globus-credential-delegate options

<table>
<thead>
<tr>
<th>option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[-]</td>
<td>Enables anonymous authentication. Only supported with transport security or the GSI Secure Conversation authentication mechanism.</td>
</tr>
<tr>
<td>[-]</td>
<td>Specifies the server's certificate file used for encryption. Only needed for the GSI Secure Message authentication mechanism.</td>
</tr>
</tbody>
</table>
Chapter 8. Domain-specific interface

1. Interface introduction

Client-side security is set up by 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:

  ```java
  // 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:

  ```java
  // 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);
  ```

**Note**

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

```java
import org.globus.axis.util.Util;
static {
    Util.registerTransport();
}
```
2. Syntax of the interface
### Table 8.1. Client side security properties

<table>
<thead>
<tr>
<th>Number</th>
<th>Task</th>
<th>Stub Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.</td>
<td>Enable GSI Secure Conversation with specified message protection level.</td>
<td>1. Property: <code>org.globus.wsrf.security.Constants.GSI_SEC_CONV</code>&lt;br&gt;Values equal one of the following:&lt;br&gt;• <code>Constants.ENCRIPTION</code>&lt;br&gt;• <code>Constants.SIGNATURE</code>&lt;br&gt;2. Property: <code>org.globus.wsrf.security.Constants.GSI_SEC_CONV_SECREPLY_UNNECESSARY</code>&lt;br&gt;If the value is set to <code>Boolean.TRUE</code>, 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.&lt;br&gt;3. Property:&lt;br&gt;You can set the SOAP Actor of the GSI signed/encrypted SOAP message by using the <code>gssActor</code> property. We recommend that you <em>not</em> do this unless you <em>really</em> know what you are doing.</td>
</tr>
</tbody>
</table>
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).

<table>
<thead>
<tr>
<th>Property:</th>
<th>org.globus.axis.gsi.GSIClients.GSI_MODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value equals one of following:</td>
<td></td>
</tr>
<tr>
<td>1. GSIClients.GSI_MODE_NO_DELEG: No delegation is performed.</td>
<td></td>
</tr>
<tr>
<td>2. GSIClients.GSI_MODE_LIMITED_DELEG: Limited delegation is performed.</td>
<td></td>
</tr>
<tr>
<td>3. GSIClients.GSI_MODE_FULL_DELEG: Full delegation is performed.</td>
<td></td>
</tr>
</tbody>
</table>

5. Enables GSI Secure Transport with some protection level.

<table>
<thead>
<tr>
<th>Property:</th>
<th>org.globus.gsi.GSIClients.GSI_TRANSPORT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Values equal one of the following:</td>
<td></td>
</tr>
<tr>
<td>• Constants.ENCRYPTION</td>
<td></td>
</tr>
<tr>
<td>• Constants.SIGNATURE</td>
<td></td>
</tr>
</tbody>
</table>

6. Enables anonymous authentication. *This option only applies to GSI Secure Conversation and GSI Transport.*

<table>
<thead>
<tr>
<th>Property:</th>
<th>org.globus.wsrf.security.Constants.GSI_ANONYMOUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value equals one of following:</td>
<td></td>
</tr>
<tr>
<td>2. Boolean.TRUE: Anonymous authentication is enabled.</td>
<td></td>
</tr>
</tbody>
</table>
### Domain-specific interface

| 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.ENCRIPTION  
- 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. |
|---|---|---|
| 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. |
9. **Sets the credential that is used to encrypt the message (typically, the recipient's public key).**

   **Usage:**
   - Used for GSI Secure Message only.

   **Property:**
   ```
   org.globus.wsrf.impl.security.authentication.Constants.PEER_SUBJECT
   ```

   **Value equals the instance of`javax.security.auth.Subject`**.

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

   For example, if `publicKeyFilename` was the file that had the recipient’s public key:

   ```java
   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);
   ```

10. **Sets the trusted certificates location.**

    **Property:**
    ```
    org.globus.wsrf.security.TRUSTED_CERTIFICATES
    ```

    **Value should be a comma-separated list of directories and file names.**

11. **Sets the SAML Authorization Assertion to embed in SOAP Header.**

    **Property:**
    ```
    org.globus.wsrf.impl.security.authentication.Constants.SAML_AUTHZ_ASSERTION
    ```

    **Value should be an instance of`org.opensaml.SAMLAssertion.`**

    Cannot be configured using descriptors.
Chapter 9. Configuring

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. Syntax of the interface

The following properties are relevant to authentication and message/transport security:
Table 9.1. Configuring server side authentication and message/transport security

<table>
<thead>
<tr>
<th>Number</th>
<th>Task</th>
<th>Descriptor Configuration</th>
<th>Alternate Configuration</th>
</tr>
</thead>
</table>
| 1      | Credentials                         | Container or service descriptor configuration | • X509_USER_CERT or CoG Configuration²: User certificate configuration  
|        |                                     |                                               | • X509_USER_KEY or CoG Configuration³: User key configuration  
|        |                                     |                                               | • X509_USER_PROXY or CoG Configuration⁴: 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 configuration² | CoG Configuration⁶                                            |
| 3      | Limited proxy policy configuration   | Container or service descriptor configuration³| None.                                                       |
| 4      | Replay Attack Window                | Container or service descriptor configuration³ | None.                                                       |
| 5      | Replay Attack Filter                | Container or service descriptor configuration³ | None.                                                       |
| 6      | Replay timer interval               | Container descriptor configuration¹⁰          | None.                                                       |
| 7      | Context timer interval               | Container descriptor configuration¹¹          | None.                                                       |

2. [http://www.globus.org/toolkit/docs/4.2/4.2.1/common/javacog/admin/javacog-admin-configuring.html#javacog-admin-configuring-user-certificate](http://www.globus.org/toolkit/docs/4.2/4.2.1/common/javacog/admin/javacog-admin-configuring.html#javacog-admin-configuring-user-certificate)
3. [http://www.globus.org/toolkit/docs/4.2/4.2.1/common/javacog/admin/javacog-admin-configuring.html#javacog-admin-configuring-user-key](http://www.globus.org/toolkit/docs/4.2/4.2.1/common/javacog/admin/javacog-admin-configuring.html#javacog-admin-configuring-user-key)
Chapter 10. Environment variable interface

1. Environmental variables for C WS A&A

Refer to Chapter 2, Configuring for environment variables. Note that the above environment variable [fixme - not clear which envar you mean] does not supersede any settings provided in security descriptors.
Chapter 11. Debugging

Because C WS A&A is built on top of C WS Core, developer debugging is the same as described in Chapter 8, Debugging.

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

C WS Core also provides an API for CEDPs-compliant logging as described in Section 2, “Logging”.

1. Logging

As of 4.2.1, the Globus Toolkit provides system administration logs that are CEDPs best practices\(^1\) compliant.

To enable CEDPS logging, pass the -log PATH parameter to the **globus-wsc-container** program.

For more details on the CEDPS Logging format, including descriptions of reserved name-value pairs, see [http://cedps.net/index.php/LoggingBestPractices](http://cedps.net/index.php/LoggingBestPractices):

1.1. Sample log file

The sample log file\(^2\) contains many log entries for various scenarios in the C WS container.

---

\(^1\) [http://cedps.net/index.php/LoggingBestPractices](http://cedps.net/index.php/LoggingBestPractices)

Chapter 12. Troubleshooting

For a list of common errors in GT, see Error Codes.
1. Error Messages For C WS A&A
## Table 12.1. C WS A&A Errors

<table>
<thead>
<tr>
<th>Error Code</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERROR: Couldn't read user key: Bad passphrase key file location: /Users/bester/.globus/userkey.pem</td>
<td>Unable to decrypt</td>
</tr>
<tr>
<td>globus gsi gssapi: Error with gss credential handle globusCredential: Valid credentials could not be found in any of the possible locations specified by the credential search order. Valid credentials could not be found in any of the possible locations specified by the credential search order. Attempt 1 globusCredential: Error reading host credential globus sysconfig: Error with certificate filename globus sysconfig: Error with certificate filename globus sysconfig: File is not owned by current user: /etc/grid-security/hostcert.pem is not owned by current user Attempt 2 globusCredential: Error reading proxy credential globus sysconfig: Could not find a valid proxy certificate file location globus sysconfig: Error with key filename globus sysconfig: File does not exist: /tmp/x509up_u501 is not a valid file Attempt 3 globusCredential: Error reading user credential globusCredential: Key is password protected: GSI does not currently support password protected private keys. OpenSSL Error: pem_lib.c:401: in library: PEM routines, function PEM_do_header: bad password read</td>
<td>No user proxy could be found</td>
</tr>
<tr>
<td>globus gsi gssapi: Error with GSI credential globus gsi gssapi: Error with gss credential handle globusCredential: Error with credential: The proxy credential: /tmp/x509up_u1499 with subject: /DC=org/DC=example/DC=grid/OU=People/CN=Joe User/CN=1235439010 expired 44 minutes ago.</td>
<td>Proxy has expired.</td>
</tr>
<tr>
<td>Error Code</td>
<td>Definition</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>globus_xio: The GSI XIO driver failed to establish a secure connection. The failure occurred during a handshake read.</td>
<td>Communication disrupted during SSL handshake</td>
</tr>
<tr>
<td>globus_xio: An end of file occurred</td>
<td></td>
</tr>
<tr>
<td>globus_gsi_gssapi: Unable to verify remote side's credentials</td>
<td>Unable to verify remote certificate. Often a clock-synchronization problem where the service clock is behind that of the client.</td>
</tr>
<tr>
<td>globus_gsi_gssapi: Unable to verify remote side's credentials: Couldn't verify the remote certificate</td>
<td></td>
</tr>
<tr>
<td>OpenSSL Error: s3_pkt.c:1052: in library: SSL routines, function SSL3_READ_BYTES: sslv3 alert bad certificate SSL alert number 42</td>
<td></td>
</tr>
<tr>
<td>OpenSSL Error: s3_clnt.c:894: in library: SSL routines, function SSL3_GET_SERVER_CERTIFICATE: certificate verify failed</td>
<td></td>
</tr>
<tr>
<td>globus_gsi_callback_module: Could not verify credential</td>
<td></td>
</tr>
<tr>
<td>globus_gsi_callback_module: The certificate is not yet valid: Cert with subject: /DC=org/DC=example/DC=grid/OU=People/CN=Joe User/CN=464555355 is not yet valid- check clock skew between hosts.</td>
<td></td>
</tr>
</tbody>
</table>
## Troubleshooting

<table>
<thead>
<tr>
<th>Error Code</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>globus_gsi_callback_module: Error with signing policy</td>
<td>The service's certificate is not trusted by the client</td>
</tr>
<tr>
<td>globus_sysconfig: Error getting signing policy file</td>
<td>Service certificate is not trusted because the CA signing policy does not trust the CA to sign the subject name of the certificate.</td>
</tr>
<tr>
<td>globus_sysconfig: File does not exist: /etc/grid-security/certificates/2b0e42b2.signing_policy is not a valid file</td>
<td>Service certificate is not trusted because the CA signing policy does not trust the CA to sign the subject name of the certificate.</td>
</tr>
<tr>
<td>globus_gsi_callback_module: Could not verify credential</td>
<td>Service certificate is not trusted because the CA signing policy does not trust the CA to sign the subject name of the certificate.</td>
</tr>
<tr>
<td>globus_gsi_callback_module: Error with signing policy</td>
<td>Service certificate is not trusted because the CA signing policy does not trust the CA to sign the subject name of the certificate.</td>
</tr>
<tr>
<td>globus_gsi_callback_module: Error in OLD GAA code: CA policy violation: &lt;no reason given&gt;</td>
<td>Service certificate is not trusted because the CA signing policy does not trust the CA to sign the subject name of the certificate.</td>
</tr>
<tr>
<td>Error: globus_soap_message_module: SOAP Fault</td>
<td>The client sent a request to a service which message security without properly invoking the security handlers</td>
</tr>
<tr>
<td>Fault code: Client</td>
<td>The client sent a request to a service which message security without properly invoking the security handlers</td>
</tr>
<tr>
<td>Fault string: globus_handler_ws_secure_message: Server Request handling failed</td>
<td>The client sent a request to a service which message security without properly invoking the security handlers</td>
</tr>
<tr>
<td>globus_handler_ws_secure_message: Failed to verify the message: Unable to get Security header element from message attributes.</td>
<td>The client sent a request to a service which message security without properly invoking the security handlers</td>
</tr>
</tbody>
</table>
Possible Solutions

Error Code

Error: globus_soap_message_module: SOAP Fault
Fault code: Client
Fault string: globus_soap_message_module: Loaded message handlers do not understand required header element:
{http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd}Security

Troubleshooting
Chapter 13. Related Documentation

## Glossary

### C

**certificate**  
A public key plus information about the certificate owner bound together by the digital signature of a CA. In the case of a CA certificate, the certificate is self signed, i.e. it was signed using its own private key.

### 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](http://dev.globus.org/wiki/Security/ProxyCertTypes).

**proxy certificate**  
A short lived certificate issued using an 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](http://dev.globus.org/wiki/Security/ProxyCertTypes).

**public key**  
The public part of a key pair used for cryptographic operations (e.g. signing, encrypting).
The following provides available information about migrating from previous versions of the Globus Toolkit.

1. Migrating host credentials from GT 4.0

FIXME

2. Migrating host credentials from GT3

The information from Section 3.1, “Host credentials” applies to migrating from GT3 as well.

3. Migrating host credentials from GT2

3.1. Host credentials

GT2 and GT3 services were set up to run with root owned host credentials. In GT4 most, but not all, services will run as the globus user. To allow the globus user to start services using host credentials the globus user needs to be able to access them. This requirement can be satisfied by making a copy of the root owned host credentials, i.e. the host certificate and private key, owned by the globus user. In GT4 this copy is assumed to be /etc/grid-security/container{cert,key}.pem.

Glossary

H

host certificate

An EEC belonging to a host. When using GSI this certificate is typically stored in /etc/grid-security/hostcert.pem. For more information on possible host certificate locations see the GSI C Developer’s Guide.
GT4 C WS A&A Quality Profile

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<titleabbrev>Quality Profile</titleabbrev>

1. Test coverage reports

No reports are available at this time.

2. Code analysis reports

No reports are available at this time.

3. Outstanding bugs

• Campaign 4598:¹ Implement WS-SecureConversation in C WS Core

4. Bug Fixes

There have been no fixes for C WS A&A since GT 4.0.x.

5. Performance reports

No reports are available at this time.

¹ http://bugzilla.globus.org/bugzilla/show_bug.cgi?id=4598
GT4 C WS A&A Release Notes

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<titleabbrev>Release Notes</titleabbrev>

1. Component Overview

The Web Services portion of GT 4.2.1 uses SOAP over HTTP for communicating messages. C WS A&A implements the WS-Security standard and the WS-SecureConversation specification to provide message protection for SOAP messages. Features include:

- authentication of the sender
- encryption of the message
- integrity protection of the message
- replay attack protection

C WS A&A provide a secure channel by using HTTP over SSL/TLS (HTTPS) for transporting the messages. This security mechanism supports all of the security features provided by SSL/TLS with the addition of support for X.509 Proxy Certificates.

2. Feature summary

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 integrity protection.
Deprecation Features

• None.

3. Summary of Changes in C WS A&A

There have been no changes for C WS A&A since GT 4.0.x.

4. Bug Fixes

There have been no fixes for C WS A&A since GT 4.0.x.

5. Known Problems

The following problems and limitations are known to exist for C WS A&A at the time of the 4.2.1 release:

5.1. Limitations

• WS-Secure Conversation is not implemented.

5.2. Outstanding bugs

• Campaign 4598:1 Implement WS-SecureConversation in C WS Core

6. Technology Dependencies

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

• C WS Core
  GSI

C WS A&A depends on the following 3rd party software:

• OpenSSL2

7. Tested Platforms

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

Tested Platforms for C WS A&A

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

---

1 http://bugzilla.globus.org/bugzilla/show_bug.cgi?id=4598
2 http://www.openssl.org
8. Backward compatibility summary

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.

9. Associated standards for C WS A&A

- Simple Assertion Markup Language
- SAML Schema Protocol
- XML Signature Syntax and Processing
- Web Services Security: SOAP Message Security 1.0
- Web Services Security X.509 Certificate Token Profile

10. For More Information

See C WS A&A for more information about this component.

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P

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.

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4 http://www.oasis-open.org/committees/download.php/3407/oasis-sstc-saml-schema-protocol-1.1.xsd
5 http://www.w3.org/TR/xmldsig-core/
6 http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-soap-message-security-1.0.pdf
7 http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-x509-token-profile-1.0.pdf