GT 5.2.2 SimpleCA: Admin Guide
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Introduction

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

Important

This information is in addition to the basic Globus Toolkit prerequisite, overview, installation, security configuration instructions in the Installing GT 5.2.2. Read through this guide before continuing!

The following are instructions for how to use SimpleCA to request and sign a certificate for a GT 5.2.2 installation.

SimpleCA provides an easy way to create and package a Certificate Authority (CA), as well as tools for requesting and signing user and host certificates. It is similar to OpenSSL's CA.sh command but includes support for packaging the CA certificate, creating a signing policy file, and generating information needed by clients to request certificates. You can find other CA options in Obtaining host certificates.
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Chapter 1. Building and Installing

1. Create users

Make sure you have the following users on your machine:

- Your user account, which will be used to run the client programs.
- A generic globus account, which will be used to perform administrative tasks. This user will also be in charge of managing the SimpleCA.

2. Install SimpleCA

SimpleCA can be installed in three ways, from a debian package, from an RPM package, and from the source installer. These installation methods are described in Installing GT 5.2.2

To install SimpleCA from binary packages, install the packages globus-simple-ca and globus-gsi-cert-utils-progs and their dependencies. On Debian based systems, use the command `apt-get install globus-simple-ca globus-gsi-cert-utils-progs`. On RPM-based systems, use the command `yum install globus-simple-ca globus-gsi-cert-utils-progs`.

To install SimpleCA from the source installer, build the `globus_simple_ca` and `globus_gsi_cert_utils` installer targets with the command `make globus_simple_ca globus_gsi_cert_utils`. 
Chapter 2. Creating a SimpleCA

To create a CA and certificate, as the globus user, run the grid-ca-create command. This will prompt for information needed to name the certificate, how to contact the CA administrator, lifetime of the CA certificate, and passphrase, and will then generate the new CA certificate and private key. Command-line options described in grid-ca-create can be used to avoid some of these prompts.

1. Invoking grid-ca-create

As the globus user, when you run the command, you'll see output like this:

```
Certificate Authority Setup
This script will setup a Certificate Authority for signing Globus users certificates. It will also generate a simple CA package that can be distributed to the users of the CA.

The CA information about the certificates it distributes will be kept in:
/home/globus/.globus/simpleCA
This intro screen shows the path that the CA will be created into (in this example, /home/globus/.globus/simpleCA). The other commands needed by SimpleCA will automatically look in that path by default when invoked by the globus user.

2. Configure the subject name

The grid-ca-create program next prompts you for information about the name of CA you wish to create:

The unique subject name for this CA is:
cn=Globus Simple CA, ou=simpleCA-grid.example.org, ou=GlobusTest, o=Grid
Do you want to keep this as the CA subject (y/n) [y]:
To accept the default name, enter y. To choose a different name, type n, after which you will be prompted by

Enter a unique subject name for this CA:

The subject name is an X.509 distinguished name. The name component type abbreviations have the following meanings:

Table 2.1. CA Name components

<table>
<thead>
<tr>
<th>Component</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>cn</td>
<td>Represents &quot;common name&quot;. It identifies this particular certificate within the CA Certificate.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>ou</td>
<td>Represents &quot;organizational unit&quot;. It identifies this CA from other CAs created by SimpleCA by oth-</td>
</tr>
</tbody>
</table>
3. Configure the CA's email

The next prompt looks like this:

Enter the email of the CA (this is the email where certificate requests will be sent to be signed by the CA) [globus@grid.example.org]:

Enter the email address where you intend to receive certificate requests. It should be your real email address that you check, not the address of the globus user. When users request certificates with grid-cert-request, they will be instructed to send the request to this address.

4. Configure the expiration date

Then you'll see:

The CA certificate has an expiration date. Keep in mind that once the CA certificate has expired, all the certificates signed by that CA become invalid. A CA should regenerate the CA certificate and start re-issuing ca-setup packages before the actual CA certificate expires. This can be done by re-running this setup script. Enter the number of DAYS the CA certificate should last before it expires. [default: 5 years 1825 days]:

This is the number of days for which the CA certificate is valid. Once this time expires, the CA certificate will have to be recreated.

To accept the default, hit enter, or otherwise, enter a value in days.

5. Create a Passphrase to Encrypt the CA's Private Key

The next prompt will be for the passphrase for the CA's private key. It will be used to decrypt the CA's private key when signing certificates. It should be hard to guess, as its compromise might compromise all the certificates signed by the CA. You will be prompted twice for the passphrase, to verify that you typed it correctly. Enter the passphrase at these prompts.

Enter PEM pass phrase:
Verifying - Enter PEM pass phrase:

6. SimpleCA Distribution Files

Finally grid-ca-create will create a tarball containing the public information about the CA, including its public certificate, signing policy, and supported X.509v3 extensions. This information is needed on machines that will be trusting the CA, and also on machines which will be used to request certificates from this CA.
Creating a SimpleCA

Since we didn’t run in this example as root, `grid-ca-create` will not be able to write the CA files to system paths, so it displays a warning message indicating that. We can use the tarball output here, or packages described below to install the CA support files on this and other machines.

The package output summary looks like this:

```
Insufficient permissions to install CA into the trusted certificate
directory (tried ${sysconfdir}/grid-security/certificates and
${datadir}/certificates)
Creating RPM source tarball... done
globus_simple_ca_68ea3306.tar.gz
```

This information will be important for setting up other machines in your grid. The number `68ea3306` in the last line is known as your **CA hash**. It is an 8 digit hexadecimal string which is a hash of the subject name of the CA certificate.

The tarball contains Debian and RPM package metadata, so that it can be compiled to a binary package which can be easily installed on this and other systems on your Grid. It can also be packaged as a GPT setup package for compatibility with older versions of the Globus Toolkit.

### 7. Generating Binary CA Packages

The `grid-ca-package` command can be used to generate RPM, debian, or legacy GPT packages for a SimpleCA, or for any other CA which is installed on a host. These packages can make it easy to distribute the CA certificate and policy to other hosts with which you want to establish Grid trust relationships.

#### 7.1. Generating RPM Packages

To generate an RPM package for the CA which we created, use the following command:

```
grid-ca-package -r -cadir ~/.globus/simpleCA
```

Creating RPM source tarball... done
```
globus_simple_ca_68ea3306.tar.gz
```
Creating RPM binary.../home/globus/globus-simple-ca-68ea3306

The resulting rpm package will be placed in the current directory. As root, you can install this via the `yum` or `rpm` tools. This package can then be installed on any RPM-based system.

#### 7.2. Generating Debian Packages

To generate a Debian package for the CA which we created, use the following command:

```
grid-ca-package -d -cadir ~/.globus/simpleCA
```

Creating RPM source tarball... done
```
globus_simple_ca_68ea3306.tar.gz
```
Creating debian binary...dpkg-buildpackage: export CFLAGS from dpkg-buildflags (origin: vendor): -g -O2
```
Lots of dpkg-buildpackage output
```

The resulting debian package will be placed in the current directory. As root, you can install this via the `dpkg` tool.

#### 7.3. Generating GPT Packages

The `grid-ca-package` command can also generate GPT packages in the form similar to previous versions of the Globus Toolkit. This is done with the `-g` and `-b` command-line options. See `grid-ca-package` for more details.
Chapter 3. Using a SimpleCA

As a CA, your main task will be to sign certificates. To sign a certificate request, use the tool grid-ca-sign. This tool reads a certificate request (such as those created by grid-cert-request) and creates a certificate signed by the CA certificate with the public key from in the certificate request. This indicates that you confirm that the identity of the certificate matches its name. You can use the openssl command to view the contents of the certificate request.

1. Examining a Certificate Request

To examine a certificate request, use the command openssl req -text -in REQNAME, as shown in the following example.

Example 3.1. Examine a Certificate Request

globus% openssl req -noout -text -in certreq.pem
Certificate Request:
Data:
  Version: 0 (0x0)
  Subject: o=Grid, OU=GlobusTest, OU=simpleCA-grid.example.org, OU=local, CN=Joe User
  Subject Public Key Info:
    Public Key Algorithm: rsaEncryption
    RSA Public Key: (1024 bit)
      Modulus (1024 bit):
        37:6f:f0:06:ea:b0:6f:70:12:a8:34:ac:8e:be:98:
        00:b9:b8:ec:39:b5:6b:23:ad:1b:00:62:4b:cc:79:
        d0:eb:59:6b:25:cc:30:b0:47:15:bc:11:5d:7e:ff:
        03:4a:92:b0:de:6f:bb:0a:bd
      Exponent: 65537 (0x10001)
Attributes:
  Requested Extensions:
    Netscape Cert Type:
      SSL CA, S/MIME CA, Object Signing CA
Signature Algorithm: sha1WithRSAEncryption
  ad:5b:de:0c:6e:60:e0:0f:2c:ad:8d:b9:59:3b:d3:49:19:52:
  ae:be

In this case, you see a certificate request with the subject distinguished name o=Grid, OU=GlobusTest, OU=simpleCA-grid.example.org, OU=local, CN=Joe User.
2. Signing a Certificate Request

If you are satisfied with the certificate request and are willing to sign it, use the `grid-ca-sign` command to do so. The command will store a copy of the newly signed certificate in the SimpleCA directory, so that you can keep track of what you’ve signed, and will also write it to the value of the `-out` parameter. Transmit this result file back to the user which requested the certificate.

**Example 3.2. Sign with grid-ca-sign**

```
globus% grid-ca-sign -in certreq.pem -out cert.pem
```

To sign the request
please enter the password for the CA key:

The new signed certificate is at: /home/globus/.globus/simpleCA/newcerts/01.pem

3. Revoking a Certificate

SimpleCA does not yet provide a convenient interface to revoke a signed certificate, but it can be done with the `openssl` command.

**Example 3.3. Revoke a certificate**

```
globus% openssl ca -config ~/.globus/simpleCA/grid-ca-ssl.conf -revoke ~/.globus/simpleCA/newcerts/01.pem
```

Using configuration from /home/globus/.globus/simpleCA/grid-ca-ssl.conf
Enter pass phrase for /home/globus/.globus/simpleCA/private/cakey.pem:
Revoking Certificate 01.
Data Base Updated

Once a certificate is revoked, you can generate a Certificate Revocation List (CRL) for your CA, which will be a signed list of certificates which have been revoked. Sites which use your CA will need to keep the CRL up to date to be able to reject revoked certificates. This CRL can be generated with an `openssl` command. See `ca(1)` for details about how to control the CRL lifetime and other options.

**Example 3.4. Create CRL**

```
globus% openssl ca -config ~/.globus/simpleCA/grid-ca-ssl.conf -gencrl > CAHASH.crl
```

Using configuration from /home/globus/.globus/simpleCA/grid-ca-ssl.conf
Enter pass phrase for /home/globus/.globus/simpleCA/private/cakey.pem:

The output file `CAHASH.crl` (based on the hash of your CA subject name) should be distributed to sites which trust your CA, so that they can install it into the trusted certificate directory.

4. Renewing a CA

The `openssl` command can be used to renew a CA certificate. This will generate a new CA certificate with the same subject name and private key as before, but valid for a different time interval. This new certificate packaged and distributed as before using `grid-ca-package`. 

Example 3.5. Renew CA Certificate

```
globus% openssl req -key ~/.globus/simpleCA/private/cakey.pem -new -x509 -days 1825 -out newca.pem -config ~/.globus/simpleCA/grid-ca-ssl.conf
```

You are about to be asked to enter information that will be incorporated into your certificate request.

What you are about to enter is what is called a Distinguished Name or a DN. There are quite a few fields but you can leave some blank.

For some fields there will be a default value,
If you enter '.', the field will be left blank.

-----

Level 0 Organization [Grid]:
Level 0 Organizational Unit [GlobusTest]:
Level 1 Organizational Unit [simpleCA-grid.example.org]:
Name (E.g., John M. Smith) []: Globus Simple CA

⚠️ Important

The Subject Name of the new certificate must match *exactly* the previous certificate name, or clients will not recognize it as the correct certificate.
Simple CA Commands
Name
grid-ca-create — Create a CA to sign certificates for use on a grid

Synopsis


grid-ca-create [-force] [-noint] [-dir DIRECTORY]
[-subject SUBJECT] [-email ADDRESS] [-days DAYS] [-pass PASSWORD]
[-nobuild] [-g] [-b]
[-openssl-help] [OPENSSL-OPTIONS]

Description

The grid-ca-create program creates a self-signed CA certificate and related files needed to use the CA with other Globus tools. The grid-ca-create program prompts for information to use to generate the CA certificate, but the prompts may be avoided by using the command line options.

By default, the grid-ca-create program creates the self-signed CA certificate, installs it on the current machine in its trusted certificate directory, and creates a source tarball which can be used to generate an RPM package for the CA. If the RPM package is installed on a machine, users on that machine can create certificate requests for user, host, or service identity certificates to be signed by the CA certificate generated by running grid-ca-create.

If run as a privileged user, the grid-ca-create program creates the CA certificate and support files in ${local-statedir}/lib/globus/simple_ca and the CA certificate and signing policy are installed in the /etc/grid-security directory. Otherwise, the files are created in the ${HOME}/.globus/simpleCA directory.

The full set of command-line options to grid-ca-create follows. In addition to these, unknown options will be passed to the openssl command when creating the self-signed certificate.

-help, -h, -usage Display the command-line options to grid-ca-create and exit.
-version, -versions Display the version number of the grid-ca-create command. The second form includes more details.
-force Overwrite existing CA in the destination directory if one exists
-noint Run in non-interactive mode. This will choose defaults for parameters or those specified on the command line without prompting. This option also implies -force.
-dir DIRECTORY Create the CA in DIRECTORY. The DIRECTORY must not exist prior to running grid-ca-create.
-subject SUBJECT Use SUBJECT as the subject name of the self-signed CA to create. If this is not specified on the command-line, grid-ca-create will default to using the subject name cn=Globus Simple CA, ou=$HOSTNAME, ou=GlobusTest, o=Grid.
-email ADDRESS Use ADDRESS as the email address of the CA. The default instructions generated by grid-ca-create tell users to mail the certificate request to this address. If this is not specified on the command-line, grid-ca-create will default to the $LOGNAME@$HOSTNAME.
-days DAYS Set the default lifetime of the self-signed CA certificate to DAYS. If not set, the grid-ca-create program will default to 1825 days (5 years).
grid-ca-create

-\texttt{pass \textit{PASSWORD}}

Use the string \textit{PASSWORD} to protect the CA’s private key. This is useful for automating Simple CA, but may make it easier to compromise the CA if someone obtains a shell on the machine storing the CA’s private key.

-\texttt{nobuild}

Disable building a source tarball for distributing the CA’s public information to other machines. The source tarball can be created later by using the \texttt{grid-ca-package} command.

-\texttt{g}

Create a binary GPT package containing the new CA’s public information. The package will be created in the current working directory. This package can be deployed by with the \texttt{gpt-install} tool.

-\texttt{b}

Create a binary GPT package containing the new CA’s public information that is backward-compatible with GPT 3.2. Packages created in this manner will work with Globus Toolkit 2.0.0-5.0.x.

\section*{Examples}

Create a simple CA in $HOME/SimpleCA

\begin{verbatim}
\$ grid-ca-create -noint -dir $HOME/SimpleCA
\end{verbatim}

Certificate Authority Setup

This script will setup a Certificate Authority for signing Globus users certificates. It will also generate a simple CA package that can be distributed to the users of the CA.

The CA information about the certificates it distributes will be kept in:

/home/juser/SimpleCA

The unique subject name for this CA is:

cn=Globus Simple CA, ou=simpleCA-grid.example.org, ou=GlobusTest, o=Grid

Insufficient permissions to install CA into the trusted certificate directory (tried ${sysconfdir}/grid-security/certificates and ${datadir}/certificates)

Creating RPM source tarball... done
globus_simple_ca_0146c503.tar.gz

\section*{Environment Variables}

The following environment variables affect the execution of \texttt{grid-ca-create}:

\texttt{GLOBUS\_LOCATION} \hspace{1em} Non-standard installation path of the Globus toolkit.

\section*{See Also}

grid-cert-request(1), grid-ca-sign(1), grid-default-ca(1), grid-ca-package(1)
Name
grid-ca-package — Prepare a CA certificate, configuration, and policy for distribution

Synopsis
grid-ca-package [[-ca HASH] | [-cadir SIMPLECADIR]] [-g] [-b] [-r] [-d]

Description
The grid-ca-package utility creates a tarball containing an RPM spec file and the files needed to use a CA with grid tools. It optionally will also create a GPT package for distributing a CA.

By default, the grid-ca-package utility displays a list of installed grid CA and prompts for which CA to package. It then creates a tarball containing the CA certificate, signing policy, CA configuration files, and an spec script to generate a binary RPM package containing the CA. If the CA hash is known prior to running grid-ca-package, it may provided as an argument to the -ca parameter to avoid prompting. grid-ca-package may also be used to package a SimpleCA directory, using the -cadir parameter.

In addition to generating a spec script and tarball, grid-ca-package creates a GPT package if either the -g or -b options are used on the command-line. These packages may be used to distribute a CA and configuration to systems which do not support RPM packages.

The grid-ca-package utility writes the package tarballs to the current working directory.

The full set of command-line options to grid-ca-package follows.

-help, -h, -usage Display the command-line options to grid-ca-package and exit.
-version, -versions Display the version number of the grid-ca-package command. The second form includes more details.
-ca CA Use the CA whose name matches the hash string CA. When invoked with this option, grid-ca-package runs non-interactively.
-cadir SIMPLECADIR Use the SimpleCA located in SIMPLECADIR When invoked with this option, grid-ca-package runs non-interactively.
-g Create a GPT binary package in addition to the RPM script tarball. This package may be installed on other systems using the gpt-install program.
-b Create a GPT binary package with GPT metadata located in the path expected by GPT 3.2 (used in Globus 2.0.0-5.0.x) instead of $(datadir)/globus/packages as used in Globus 5.2.x. This option overrides the -g command-line option.
-r Create a binary RPM package for the CA. This option currently only works on RPM-based distributions.
-d Create a binary Debian package for the CA. This option currently only works on Debian-based distributions.

Examples
Package a Simple CA with hash 0146c503
% grid-ca-package -ca 0146c503
Creating RPM source tarball... done
globus_simple_ca_0146c503.tar.gz

Environment Variables

The following environment variables affect the execution of grid-ca-package:

GLOBUS_LOCATION Non-standard installation path of the Globus toolkit.

See Also

grid-cert-request(1), grid-ca-sign(1), grid-default-ca(1), grid-ca-create(1)
Name
grid-ca-sign — Sign a certificate with a SimpleCA for use on a grid

Synopsis


grid-ca-sign -in REQUEST -out CERTIFICATE
[ -force] [-dir DIRECTORY]
[-openssl-help] [OPENSSL-OPTIONS]

Description

The grid-ca-sign program signs a certificate based on a request file with a CA certificate created by grid-ca-create. The new certificate is written to a file. If the CA has already signed a certificate with the same subject name as contained in the certificate request, it will refuse to sign the new request unless the -force option is provided on the command-line.

If run as a privileged user, grid-ca-sign uses the CA certificate and configuration located in ${localstate-dir} /lib/globus/simple_ca to sign the certificate. For a non-privileged user, grid-ca-sign uses the CA certificate and configuration located in $HOME/.globus/simpleCA. The grid-ca-sign program an use a different CA configuration and certificate by using the -dir option.

The full set of command-line options to grid-ca-sign follows. In addition to these, unknown options will be passed to the openssl command when creating the self-signed certificate.

-help, -h, -usage Display the command-line options to grid-ca-sign and exit.
-version, -versions Display the version number of the grid-ca-sign command. The second form includes details about the package containing grid-ca-sign.
-in REQUEST Sign the request contained in the REQUEST file.
-out CERTIFICATE Write the signed request to the CERTIFICATE file.
-force Revoke any previously issued certificate with the same subject name as in the certificate request and issue a new certificate. Otherwise, grid-ca-sign will refuse to sign the request.
-dir DIRECTORY Sign the certificate using the Simple CA certificate and configuration located in DIRECTORY instead of the default.
-openssl-help Print the command-line options available for the openssl ca command.

Examples

Sign a certificate request using the simple CA in $HOME/SimpleCA

% grid-ca-sign -in usercert_request.pem -out usercert.pem -dir $HOME/SimpleCA

To sign the request
please enter the password for the CA key:

The new signed certificate is at: /home/juser/.globus/simpleCA/newcerts/01.pem
Environment Variables

The following environment variables affect the execution of \texttt{grid-ca-sign}:

\texttt{GLOBUS\_LOCATION} \hspace{1em} Non-standard installation path of the Globus toolkit.

\textbf{See Also}

grid-cert-request(1), grid-ca-create(1), grid-default-ca(1), grid-ca-package(1)
Chapter 4. Security Considerations

1. Security considerations for SimpleCA

The operator of a CA must protect the private key of the CA. It should not be stored unencrypted or on a network filesystem.

Simple CA enforces the subject name policies in the simple CA's configuration files. If modified, the signing_policy file distributed to clients of the CA must also be modified.
## Glossary

### C

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certificate Authority (CA)</td>
<td>An entity that issues certificates.</td>
</tr>
<tr>
<td>CA Certificate</td>
<td>The CA's certificate. This certificate is used to verify signature on certificates issued by the CA. GSI typically stores a given CA certificate in <code>/etc/grid-security/certificates/&lt;hash&gt;.0</code>, where <code>&lt;hash&gt;</code> is the hash code of the CA identity.</td>
</tr>
<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>
GT 5.2.2 Release Notes: SimpleCA

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1. Component Overview

SimpleCA provides a simple implementation of a certification authority which can issue X.509 certificates to Globus Toolkit users and services.

2. Feature Summary

Features new in GT 5.2

- Remove dependency on GPT to generate and use SimpleCA
- Support for generating native RPM and Debian packages for SimpleCA files.

Other Supported Features

- Easy creation of X.509 certificates for use with the Globus Toolkit
- Easy creation of GPT packages for the created SimpleCA

Deprecated Features

- GPT package distribution of CA data

3. Summary of Changes in SimpleCA

The Globus Toolkit 5.2.2 version of SimpleCA significantly changes the procedure for creating and distributing CA packages. In particular, the GPT setup package method of creating a package is removed. In its place are the grid-ca-create and grid-ca-package tools.

This version also provides native RPM and Debian packages for a range of Linux systems, as well as support for creating native packages from CA configuration files to make it easier to manage a distribution of CAs.

4. Bug Fixes

- **RIC-150:** New SimpleCA does not conform to FHS

  ^1^ http://jira.globus.org/browse/RIC-150
5. Known Problems

The following problems and limitations are known to exist for SimpleCA at the time of the 5.2.2 release:

5.1. Limitations

• Revocation, CRL management, and CA renewal must be done manually with OpenSSL.

5.2. Known Bugs

None.

6. Technology Dependencies

SimpleCA depends on the following GT components:

• Non-WS Authentication and Authorization

SimpleCA depends on the following 3rd party software:

• OpenSSL

7. Tested Platforms

No content is available at this time.

8. Backward Compatibility Summary

Protocol changes for SimpleCA since GT 5.2.1

• Not applicable

API changes since GT 5.2.1

• Not applicable

Exception changes since GT 5.2.1

• Not applicable

Schema changes since GT 5.2.1

• Not applicable

9. Associated Standards

Globus SimpleCA generates X.509v3 certificates

10. For More Information

See Installing SimpleCA for more information about this component.