Web Services and Applications Deployment Guide

Appendix: How-to Create SSL Certificate

4/30/2025

Contents

Appendix: How-to Create SSL Certificate

Prerequisites

- Create the root pair (rootCA key & rootCA cert).
- Prepare the `mkdir /root/ca` directory.
- Create the directory structure:

```
# cd /root/ca
 # mkdir certs crl newcerts private
 # chmod 700 private
 # touch index.txt
 # echo 1000 > serial
```

- Copy the root CA configuration (openssl.cnf) to /root/ca/openssl.cnf
- Create the root key:

```
# cd /root/ca
 # openssl genrsa -aes256 -out private/<rootCA>.key.pem 4096
```

- Enter pass phrase for `<rootCA>.key.pem`: <Enter password>
- Verifying - Enter pass phrase for `<rootCA>.key.pem`: <Enter password>

```
# chmod 400 private/<rootCA>.key.pem
```

Create Root Certificate

- Use the `<rootCA>.key.pem` root key to create the `<rootCA>.cert.pem` root certificate.

```
# cd /root/ca
 # openssl req -config openssl.cnf -key private/<rootCA>.key.pem -new -x509 -days 7300
 -sha256 -extensions v3_ca -out certs/<rootCA>.cert.pem
```

- Enter the pass phrase for `<rootCA>.key.pem`: <password for “rootCA.key.pem”>

```
You are about to be asked to enter information that will be incorporated
 into your certificate request.
 -----
 Country Name (2 letter code) [XX]: <Enter country code>
 State or Province Name []: <Enter state or province>
 Locality Name []: <Enter city>
 Organization Name []: <Enter company name>
 Organizational Unit Name []: <Enter company OU>
 Common Name []: <Enter some value>
 Email Address []: <Enter admin mail account>
```

```
# chmod 444 certs/<rootCA>.cert.pem
```

Verify Root Certificate

```
# cd /<rootCA>.cert.pem
```

The output shows:

- The `Signature Algorithm` used
- The dates of certificate `Validity`
- The `Public-Key` bit length
- The `Issuer`, which is the entity that signed the certificate
- The `Subject`, which refers to the certificate itself

The `Issuer` and `Subject` are identical as the certificate is self-signed. Note that all root certificates are self-signed.

```
Signature Algorithm: sha256WithRSAEncryption
    Issuer: C=GB, ST=England,
            O=Alice Ltd, OU=Alice Ltd Certificate Authority,
            CN=Alice Ltd Root CA
    Validity
        Not Before: Apr 11 12:22:58 2015 GMT
        Not After : Apr  6 12:22:58 2035 GMT
    Subject: C=GB, ST=England,
             O=Alice Ltd, OU=Alice Ltd Certificate Authority,
             CN=Alice Ltd Root CA
    Subject Public Key Info:
        Public Key Algorithm: rsaEncryption
            Public-Key: (4096 bit)
```

The output also shows the `X509v3 extensions`. We applied the `v3_ca` extension, so the options from `[ v3_ca ]` should be reflected in the output.

```
X509v3 extensions:
    X509v3 Subject Key Identifier:
        38:58:29:2F:6B:57:79:4F:39:FD:32:35:60:74:92:60:6E:E8:2A:31
    X509v3 Authority Key Identifier:
        keyid:38:58:29:2F:6B:57:79:4F:39:FD:32:35:60:74:92:60:6E:E8:2A:31

    X509v3 Basic Constraints: critical
        CA:TRUE
    X509v3 Key Usage: critical
        Digital Signature, Certificate Sign, CRL Sign
```

GWS Key and Certificate Generation

- Make a directory for GWS files:

  ```
  # cd /root/ca # mkdir gwsCerts
  ```

- Create a key:

  ```
  # cd /root/ca
  ```

```
# openssl genrsa -aes256 -out gwsCerts/<gwsKey>.key.pem 2048
# chmod 400 gwsCerts/<gwsKey>.key.pem
```

- Create a certificate (CSR):
  Requirement
  the Common Name must be a fully qualified domain name.

  Copy `san.cnf` and `v3.ext` to `/root/ca` and modify the following parameters in these files

```
commonName = <Enter FQDN of your GWS host>
DNS.1   = commonName
DNS.2   = *.<part of FQDN>
```

```
# cd /root/ca
# openssl req -out gwsCerts/<gwsCSR>.csr -newkey rsa:2048 -nodes -keyout
gwsCerts/<gwsKey>.key.pem -config san.cnf
```

- **Enter pass phrase for <gwsKey>.key.pem**
  <password for gws Key>

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

```
Country Name (2 letter code) [XX]: <Enter country code>
State or Province Name []: <Enter state>
Locality Name []: <Enter city>
Organization Name []: <Enter company>
Organizational Unit Name []: <Enter company OU>
Common Name []: <Enter FQDN of your GWS host>
Email Address []: <Enter email address>
```

- Sign the GWS CSR file:
  Use rootCA authority to sign up GWS csr file.

```
# cd /root/ca
# openssl x509 -req -sha256 -days 367 -in gwsCerts/<gwsCSR>.csr -CA <full path to
'rootCA.cert.pem'> -CAkey <full path to 'rootCA.key.pem'> -CAcreateserial -out
gwsCerts/<gwsSignedCert>.pem -extfile v3.ext -extensions v3_req
# chmod 444 gwsCerts/<gwsSignedCert>.cert.pem
```

Example:

```
openssl x509 -req -sha256 -days 367 -in gwsCerts/gwsCSR.csr -CA /root/ca/certs/
rootCA.cert.pem -CAkey /root/ca/private/rootCA.key.pem -CAcreateserial -out gwsCerts/
gwsSignedCert.pem -extfile v3.ext -extensions v3_req
# chmod 444 gwsCerts/gwsSignedCert.pem
```

- Verify the certificate:

```
# openssl x509 -noout -text -in gwsCerts/<gwsSignedCert>.pem
Check for x509v3 extensions (SAN & v3 extensions).
```

Converting Procedures

- Convert the existing cert to a PKCS12 using OpenSSL.

> **Important**
> A password is required.

```
# cd /root/ca
 # openssl pkcs12 -export -in <gwsSignedCert>.pem -inkey <gwsKey>.key.pem -out
 <keystore.p12> -name <certAlias> -CAfile <full path to 'rootCA.cert.pem'> -caname rootCA
```

Example:

```
# openssl pkcs12 -export -in /root/ca/gwsCerts/gwsSignedCert.pem -inkey /root/ca/gwsCerts/
 gwsKey.key.pem -out keystore.p12 -name firstcert -CAfile /root/ca/certs/rootCA.cert.pem
 -caname rootCA
```

- Convert the PKCS12 to a Java Keystore File.

```
# cd /root/ca
 # keytool -importkeystore -deststorepass <new_keystore_pass> -destkeypass <new_key_pass>
 -destkeystore <gwsKeystore.jks> -srckeystore <keystore.p12> -srcstoretype PKCS12
 -srcstorepass <pass_used_in_p12_keystore> -alias <alias_used_in_p12_keystore>
```

Example:

```
keytool -importkeystore -deststorepass password -destkeypass password -destkeystore
 gwsKeystore.jks -srckeystore keystore.p12 -srcstoretype PKCS12 -srcstorepass password
 -alias firstcert
 * System will automatically tell to change the format:<source lang="text">
 keytool -importkeystore -srckeystore gwsKeystore.jks -destkeystore gwsKeystore.jks
 -deststoretype pkcs12
```

Import Missing Certs and Create Truststore

- Import rootCa certificate to gwsKeystore.jks:
- Use keytool -importcert to import the rootCa certificate into each node keystore:

```
# cd /root/ca
 # keytool -importcert -keystore <gwsKeystore>.jks -alias rootCA -file <path to
 'rootCA.cert.pem'> -noprompt -keypass <keystore password> -storepass <password>
```

Example:

```
# keytool -importcert -keystore gwsKeystore.jks -alias rootCA -file /root/ca/certs/
 rootCA.cert.pem -noprompt -keypass password -storepass password
```

- Create a server truststore:

```
# cd /root/ca
 # keytool -importcert -keystore <gwsTruststore>.jks -alias rootCA -file
 <rootCA>.cert.pem -noprompt -keypass <key password> -storepass <password>
```

Example:

```
# keytool -importcert -keystore gwsTruststore.jks -alias rootCA -file /root/ca/certs/
 rootCA.cert.pem -noprompt -keypass password -storepass password
```

GWS Configuration (application.yaml)

- Configuration example (**jetty** section):

```
enableSsl: true
  ssl:
    port: 8443
    securePort: 443
    idleTimeout: 30000
    soLingerTime: -1
    trustAll: true
    keyStorePath: /root/ca/<gwsKeystore>.jks
    keyStorePassword: <keystore password>
    keyStoreType: JKS
    trustStorePath: /root/ca/<gwsTruststore>.jks
    trustStorePassword: <truststore password>
```

Example:

```
# caCertificate: /root/ca/myKeystore.jks
 # jksPassword: Manila@1234
 port: 8443
 securePort: 443
 idleTimeout: 30000
 soLingerTime: -1
 trustAll: true
 keyStorePath: /root/ca/gwsKeystore.jks
 keyStorePassword: password
 keyStoreType: JKS
 trustStorePath: /root/ca/gwsTruststore.jks
 trustStorePassword: password
```

On Client Desktop

- Add your host (hostname should be specified as FQDN) in `<%system_drive%>\Windows\System32\drivers\etc\hosts`.
  Example in the file

```
192.168.100.26      gws-centos7.genesys.com
```

- Convert `<rootCA>.cert.pem` to PFX format:

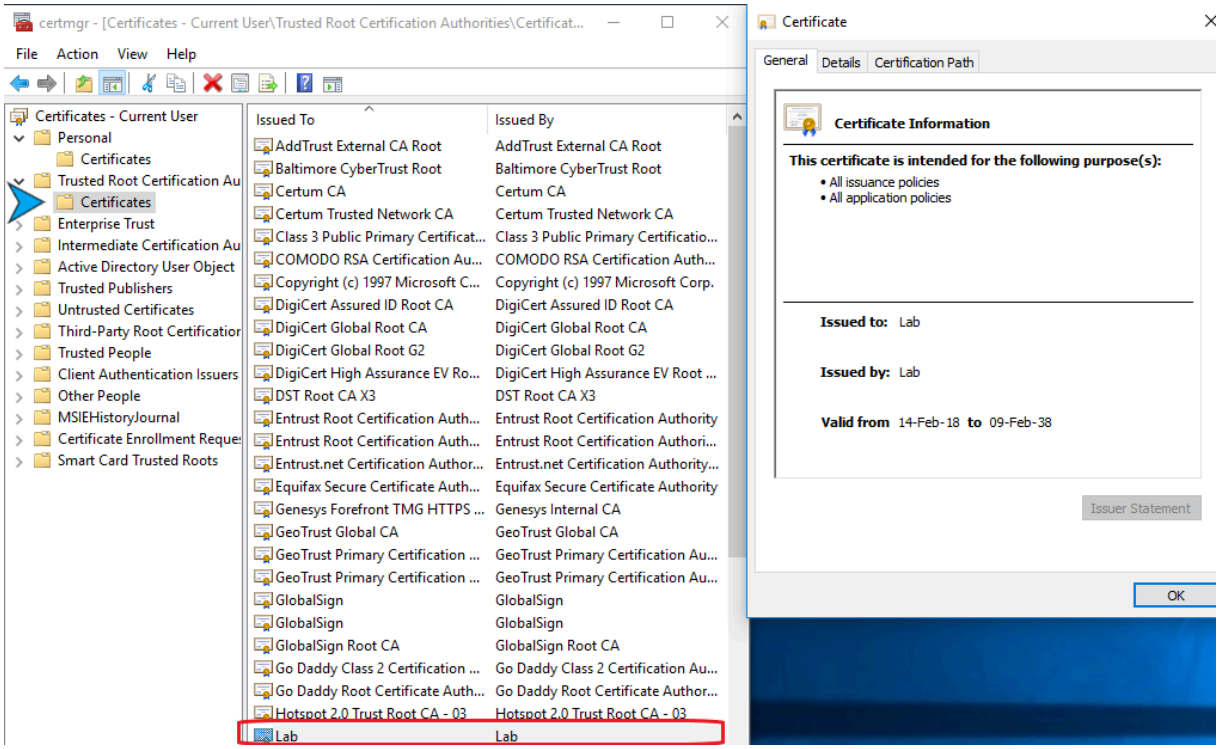
```
# cd /root/ca
 # openssl pkcs12 -inkey <rootCA>.key.pem -in <rootCA>.cert.pem -export -out <rootCA>.pfx
```

Example:

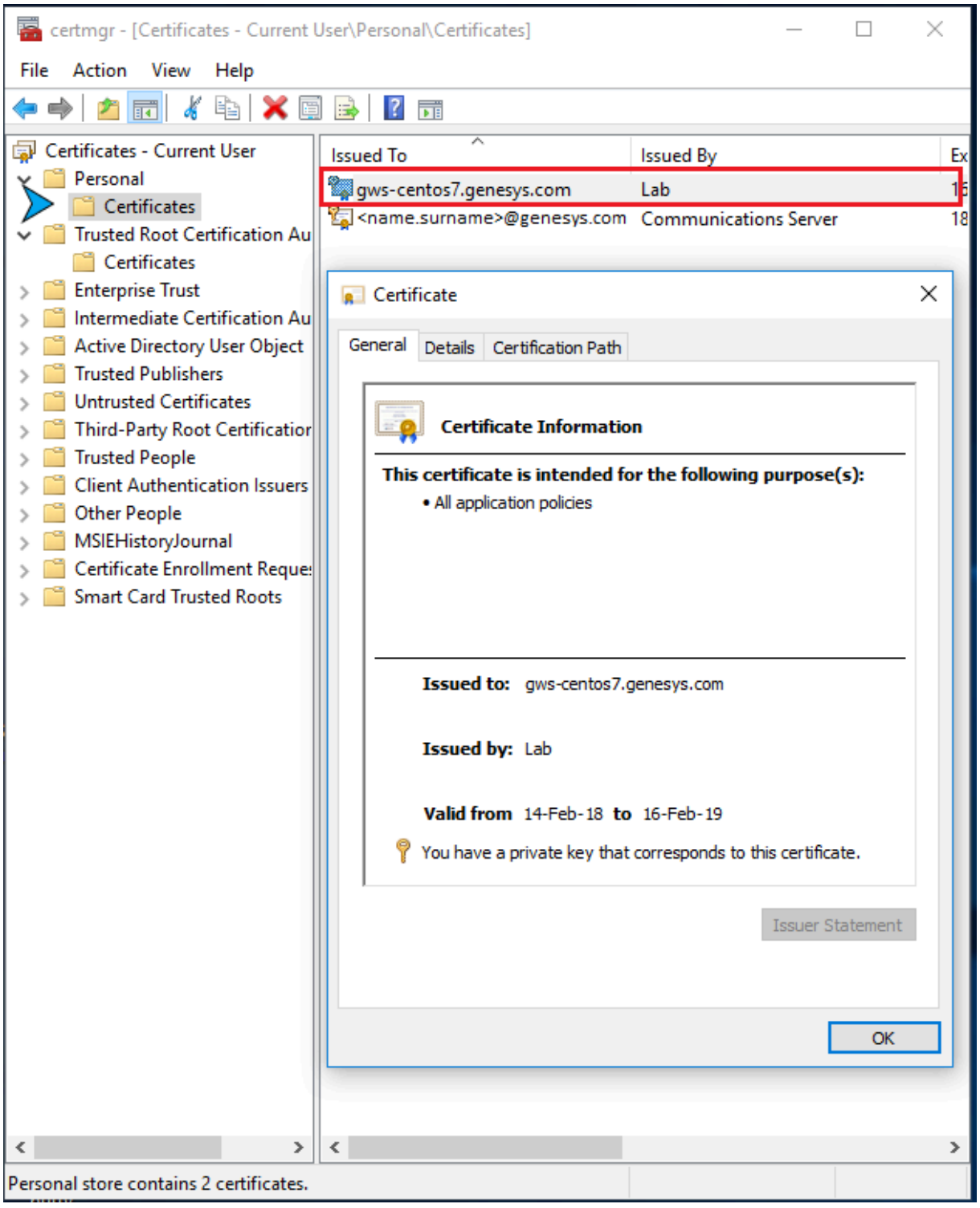
```
openssl pkcs12 -inkey /root/ca/private/rootCA.key.pem -in /root/ca/certs/rootCA.cert.pem
 -export -out rootCA.pfx
```

- Copy <rootCA>.pfx and <keystore>.p12 to Windows host.
- Import the `<keystore>.p12` file by double-clicking on it. Use default configuration and specify the password.
- Import the `<rootCA>.pfx` file, make sure to select “Place all certificates in the following store”. Browse “Trusted Root Certification Authorities”

- Verify that certificates are present using `certmgr.msc`.
  Example:
  - For rootCA certificate:



  - For GWS certificate:


certmgr - [Certificates - Current User\Personal\Certificates]
File Action View Help
Certificates - Current User
Personal
Certificates
Trusted Root Certification Au
Certificates
Enterprise Trust
Intermediate Certification Au
Active Directory User Object
Trusted Publishers
Untrusted Certificates
Third-Party Root Certificatior
Trusted People
Client Authentication Issuers
Other People
MSIEHistoryJournal
Certificate Enrollment Reque
Smart Card Trusted Roots
Issued To
Issued By
gws-centos7.genesys.com
Lab
<name.surname>@genesys.com
Communications Server
Certificate
General
Details
Certification Path
Certificate Information
This certificate is intended for the following purpose(s):
• All application policies
Issued to: gws-centos7.genesys.com
Issued by: Lab
Valid from 14-Feb-18 to 16-Feb-19
You have a private key that corresponds to this certificate.
Issuer Statement
OK
Personal store contains 2 certificates.