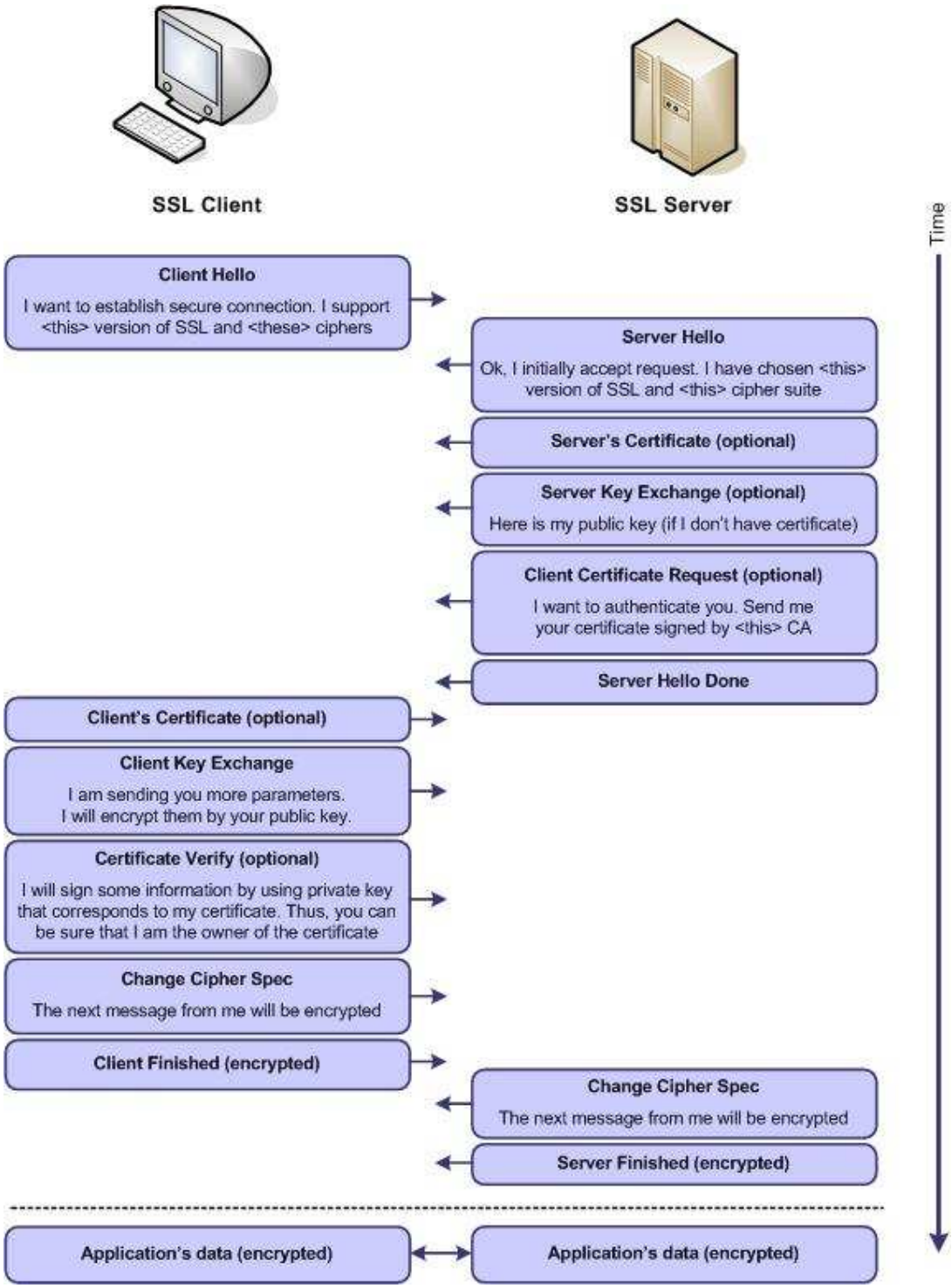
Two Way SSL

In Two Way SSL (mutual authentication) the client verifies the identity of the server, and then the server verifies the credentials of the client. The figure below gives an overview of the Two Way SSL process.



Implementation

Example below shows how to configure Two Way SSL for client connecting to Weblogic/Glassfish Server. Both servers provide default keystore (database of private keys and certificate) which are complete in themselves for SSL implementation in testing environment. In production environment you should implement your own certificate signed by your own CA.

More information on configuring SSL on Weblogic at:

http://download-llnw.oracle.com/docs/cd/E11035_01/wls100/secmanage/ssl.html

Java provides **keytool**, a key and certificate management utility. It enables users to administer their own public/private key pairs and associated certificates for use in self-authentication.

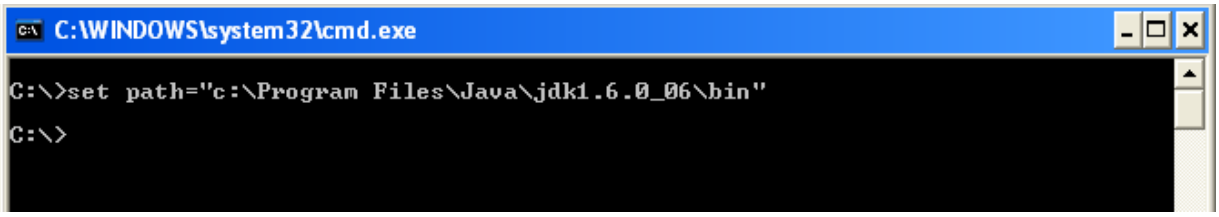
keytool stores the keys and certificates in a so-called *keystore.*

More information on keytool visit:

http://java.sun.com/j2se/1.3/docs/tooldocs/win32/keytool.html

Following are the steps to implement Two Way SSL:

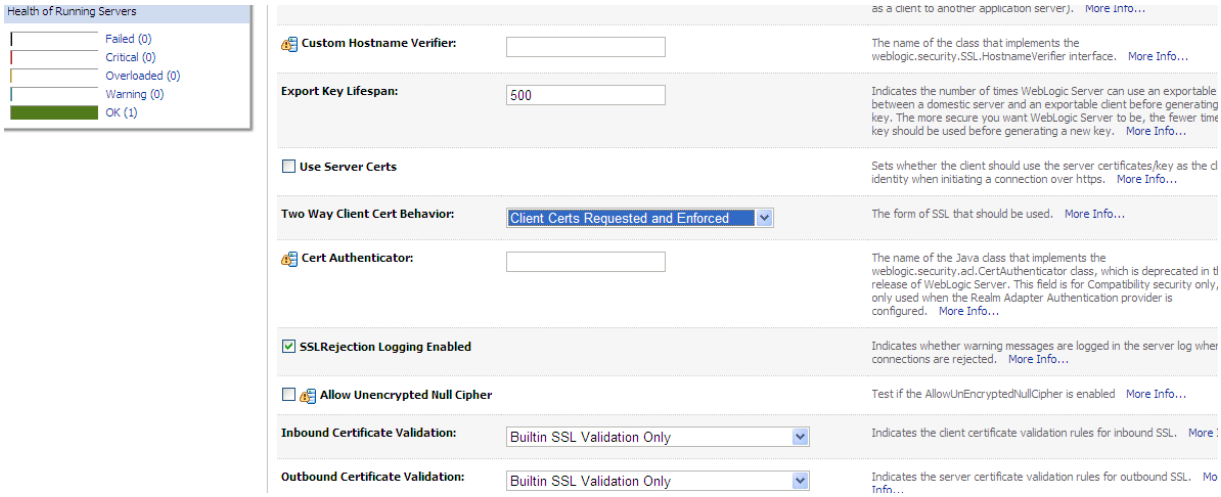
1. Set the path to use keytool: set the path to your jdk



2. Configure the weblogic to implement Two Way SSL

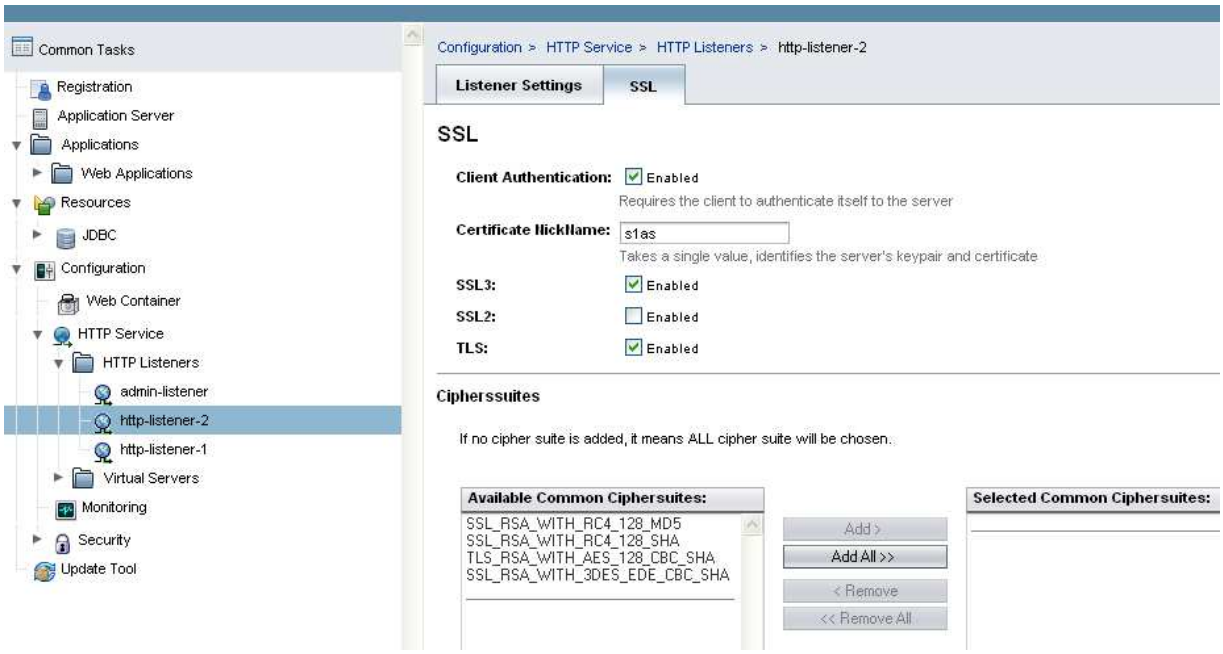
Start Weblogic -> Login to console -> Click on Environment -> Servers -> SSL ->Advanced

Make sure in Two Way Client Cert behavior option **Client Certs Requested and Enforced** is selected



For Glassfish

Make sure that client authentication is enabled



3. To view the information about certificate(s) in default keystore

a) Glassfish Keystore

```
C:\>keytool -list -v -keystore "c:\Program Files\glassfish-v3-prelude\glassfish\domains\domain1\config\keystore.jks
```

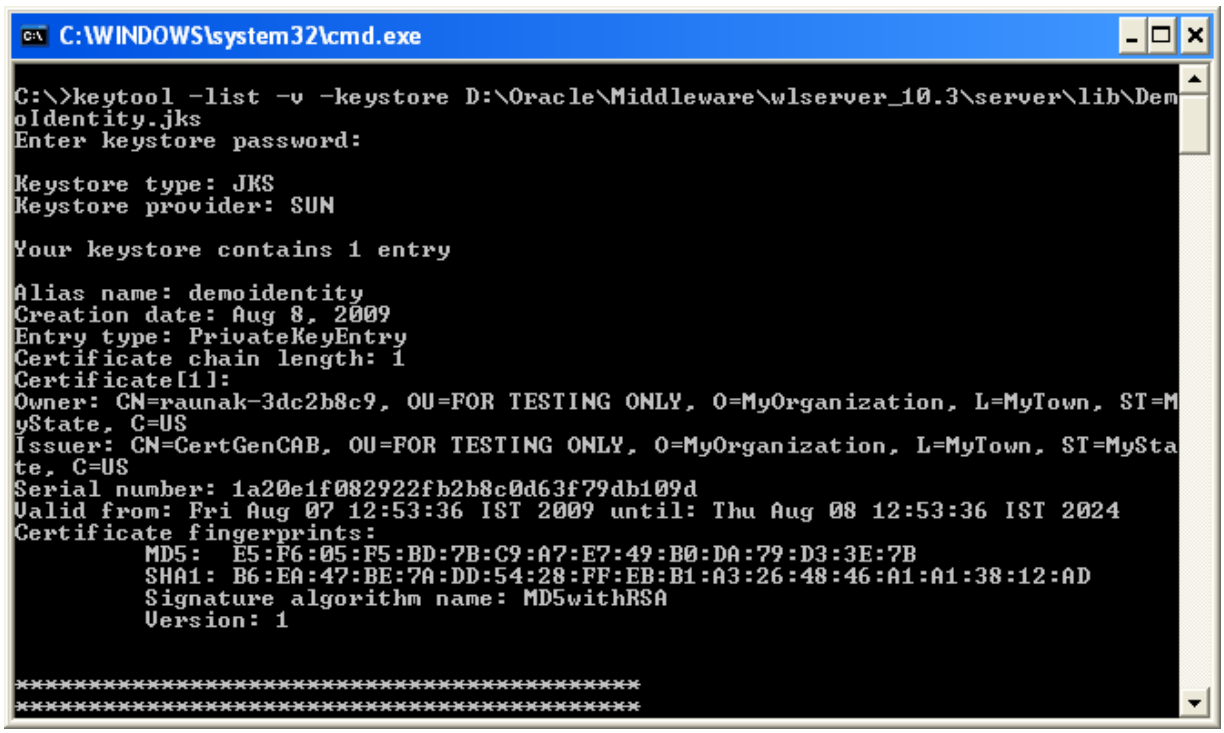
Keystore password is masterpassword of domain that is defined by user during domain creation.
(For netbeans glassfish the password is "changeit")

```
C:\WINDOWS\system32\cmd.exe

C:\>keytool -list -v -keystore "c:\Program Files\glassfish-v3-prelude\glassfish\
domains\domain1\config\keystore.jks"
Enter keystore password:

Keystore type: JKS
Keystore provider: SUN

Your keystore contains 1 entry

Alias name: s1as
Creation date: Oct 31, 2008
Entry type: PrivateKeyEntry
Certificate chain length: 1
Certificate[1]:
Owner: CN=localhost, OU=GlassFish, O=Sun Microsystems, L=Santa Clara, ST=Califor
nia, C=US
Issuer: CN=localhost, OU=GlassFish, O=Sun Microsystems, L=Santa Clara, ST=Califo
rnia, C=US
Serial number: 490a21fe
Valid from: Fri Oct 31 02:37:10 IST 2008 until: Mon Oct 29 02:37:10 IST 2018
Certificate fingerprints:
         MD5:  91:B4:5D:94:F9:5E:10:A0:86:F6:30:03:83:63:88:62
         SHA1: C1:E9:69:A9:B8:A4:B3:97:CD:10:E8:98:66:68:E5:F9:86:0A:14:18
         Signature algorithm name: MD5withRSA
         Version: 3

Extensions:

#1: ObjectId: 2.5.29.14 Criticality=false
SubjectKeyIdentifier [
KeyIdentifier [
0000: 2F 5D F4 AE DE D6 45 FE   E2 37 C1 E2 41 1D AA F0  /]....E..7..A...
0010: 19 5E 73 2E                                        .^s.
]
]
```

b) Weblogic Keystore

```
C:\>keytool -list -v -keystore
D:\Oracle\Middleware\wlserver_10.3\server\lib\DemoIdentity.jks
```

Default Password for DemoIdentity.jks is DemoIdentityKeyStorePassPhrase



```
C:\WINDOWS\system32\cmd.exe

C:\>keytool -list -v -keystore D:\Oracle\Middleware\wlserver_10.3\server\lib\Dem
oIdentity.jks
Enter keystore password:

Keystore type: JKS
Keystore provider: SUN

Your keystore contains 1 entry

Alias name: demoidentity
Creation date: Aug 8, 2009
Entry type: PrivateKeyEntry
Certificate chain length: 1
Certificate[1]:
Owner: CN=raunak-3dc2b8c9, OU=FOR TESTING ONLY, O=MyOrganization, L=MyTown, ST=M
yState, C=US
Issuer: CN=CertGenCAB, OU=FOR TESTING ONLY, O=MyOrganization, L=MyTown, ST=MySta
te, C=US
Serial number: 1a20e1f082922fb2b8c0d63f79db109d
Valid from: Fri Aug 07 12:53:36 IST 2009 until: Thu Aug 08 12:53:36 IST 2024
Certificate fingerprints:
         MD5:  E5:F6:05:F5:BD:7B:C9:A7:E7:49:B0:DA:79:D3:3E:7B
         SHA1: B6:EA:47:BE:7A:DD:54:28:FF:EB:B1:A3:26:48:46:A1:A1:38:12:AD
         Signature algorithm name: MD5withRSA
         Version: 1


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```
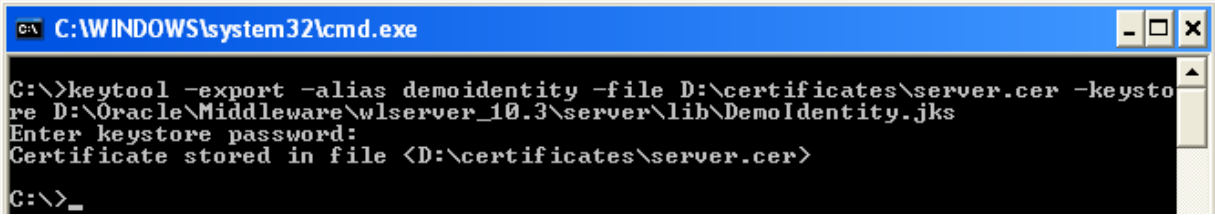

4. Export the certificate in keystore to a file. This certificate file will be imported to client keystore.

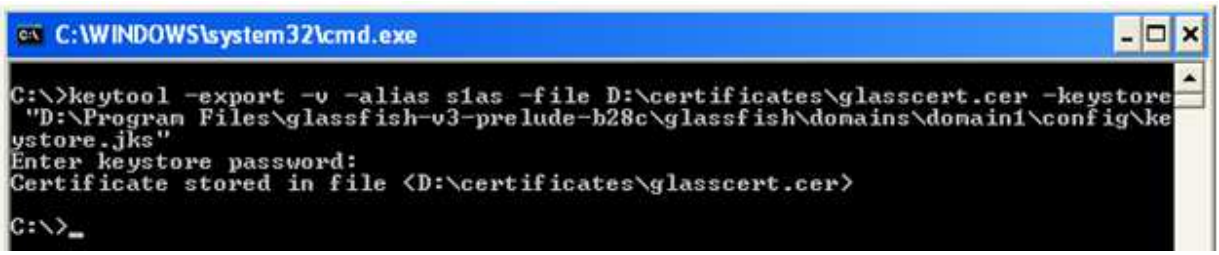
a) Weblogic Certificate

```
C:\>keytool -export -alias demoidentity -file D:\certificates\server.cer –keystore
D:\Oracle\Middleware\wlserver_10.3\server\lib\DemoIdentity.jks
```



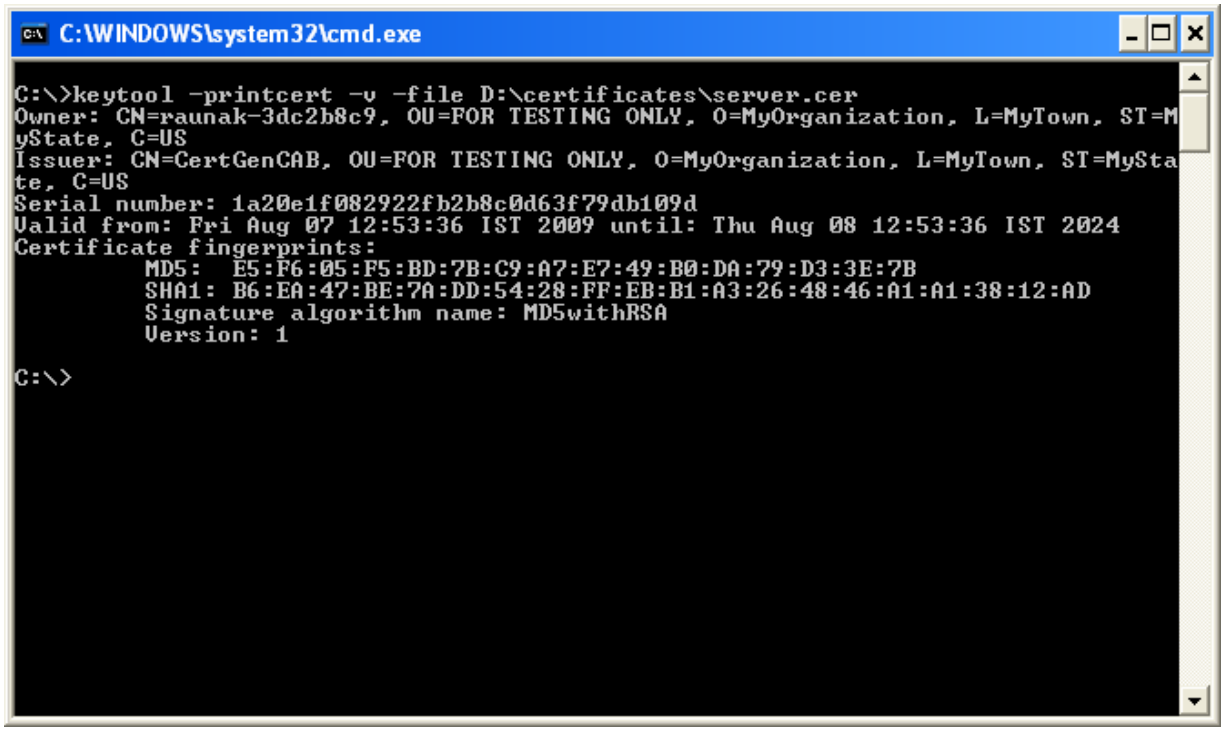
b) Glassfish Certificate

```
C:\> keytool -export -v -alias s1as -file D:\certificates\glasscert.cer –keystore "D:\Program
Files\glassfish-v3-prelude-b28c\glassfish\domains\domain1\config\keystore.jks"
```



5. To print the information about the certificate created

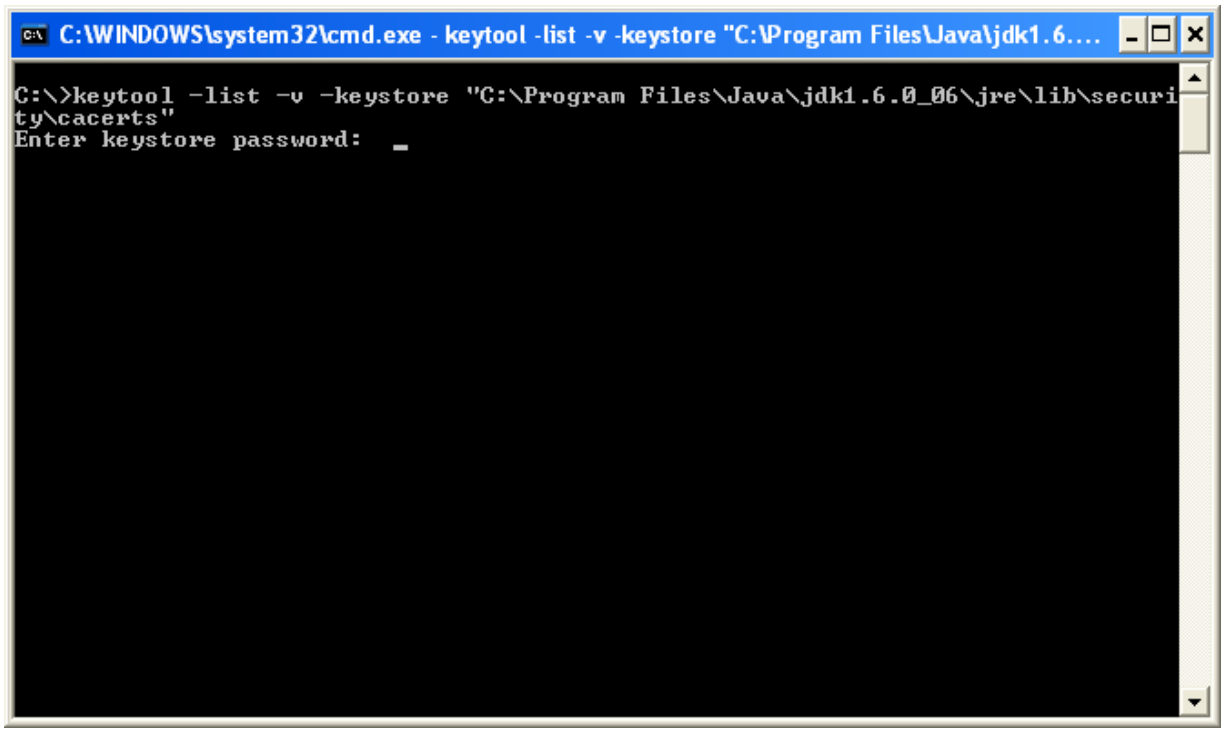
```
C:\>keytool -printcert -v -file D:\certificates\server.cer
```



6. To view the information about certificates in the client keystore

   (Java provides its own truststore which is placed in "C:\Program Files\Java\jdk1.6.0_06\jre\lib\security" directory with name cacerts)

```
C:\>keytool -list -v -keystore "C:\Program Files\Java\jdk1.6.0_06\jre\lib\security\cacerts"
```



```
C:\WINDOWS\system32\cmd.exe
SubjectKeyIdentifier [
KeyIdentifier [
0000: BE A8 A0 74 72 50 6B 44   B7 C9 23 D8 FB A8 FF B3  ...trPkD..#.....
0010: 57 6B 68 6C                                        Wkhl
]
]

#3: ObjectId: 2.16.840.1.113730.1.1 Criticality=false
NetscapeCertType [
   SSL CA
   S/MIME CA
   Object Signing CA]

#4: ObjectId: 2.5.29.35 Criticality=false
AuthorityKeyIdentifier [
KeyIdentifier [
0000: BE A8 A0 74 72 50 6B 44   B7 C9 23 D8 FB A8 FF B3  ...trPkD..#.....
0010: 57 6B 68 6C                                        Wkhl
]

]



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C:\>
```
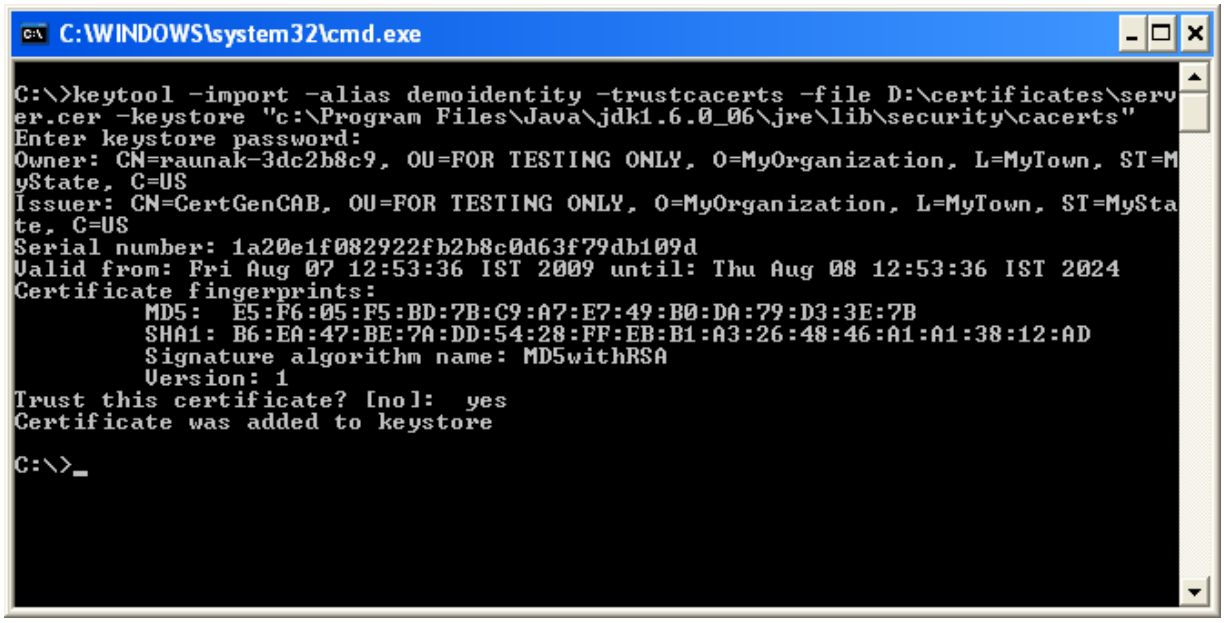

7. Import the server certificate into the client cacert

a) Weblogic Certificate

```
C:\>keytool -import -alias demoidentity -trustcacerts -file D:\certificates\server.cer -
keystore "c:\Program Files\Java\jdk1.6.0_06\jre\lib\security\cacerts"
```



b) Glassfish Certificate

```
C:\>keytool -import -v -trustcacerts -alias s1as -keystore "C:\Program Files\Jav
a\jdk1.6.0_06\jre\lib\security\cacerts" -file D:\certificates\glasscert.cer
```

C:\WINDOWS\system32\cmd.exe

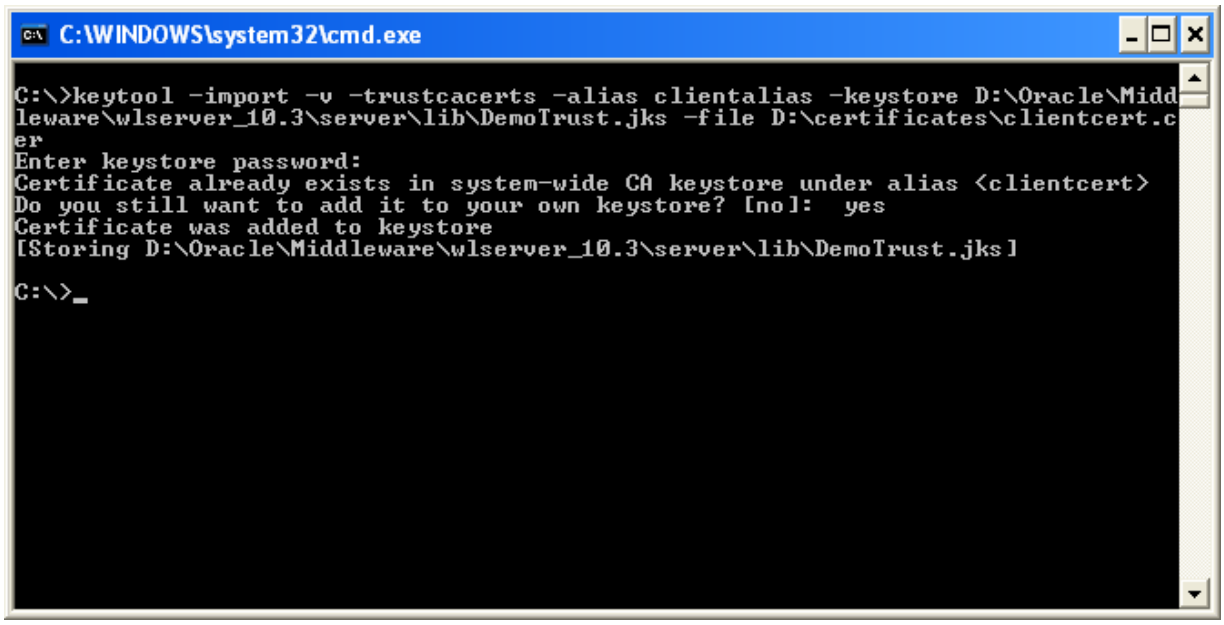
```
C:\>keytool -import -v -trustcacerts -alias s1as -keystore "C:\Program Files\Jav
a\jdk1.6.0_06\jre\lib\security\cacerts" -file D:\certificates\glasscert.cer
Enter keystore password:
Owner: CN=localhost, OU=GlassFish, O=Sun Microsystems, L=Santa Clara, ST=Califor
nia, C=US
Issuer: CN=localhost, OU=GlassFish, O=Sun Microsystems, L=Santa Clara, ST=Califo
rnia, C=US
Serial number: 48ffe311
Valid from: Thu Oct 23 08:06:01 IST 2008 until: Sun Oct 21 08:06:01 IST 2018
Certificate fingerprints:
         MD5:  6C:19:37:05:6B:F6:96:2D:D1:22:3F:B3:D8:9B:60:B3
         SHA1: 00:89:E8:22:9B:5C:0C:CA:0F:11:7C:A3:30:FC:A1:F5:8B:03:3C:D9
         Signature algorithm name: MD5withRSA
         Version: 3

Extensions:

#1: ObjectId: 2.5.29.14 Criticality=false
SubjectKeyIdentifier [
KeyIdentifier [
0000: 30 14 E0 BD 00 EF 9E 71   DB E8 3E B0 81 B6 30 D3  0......q..>...0.
0010: 8A A9 6A BB                                        ..j.
]
]

Trust this certificate? [no]:  yes
Certificate was added to keystore
[Storing C:\Program Files\Java\jdk1.6.0_06\jre\lib\security\cacerts]
```

8. Import the client certificate into the server cacert

a) Importing to Weblogic truststore

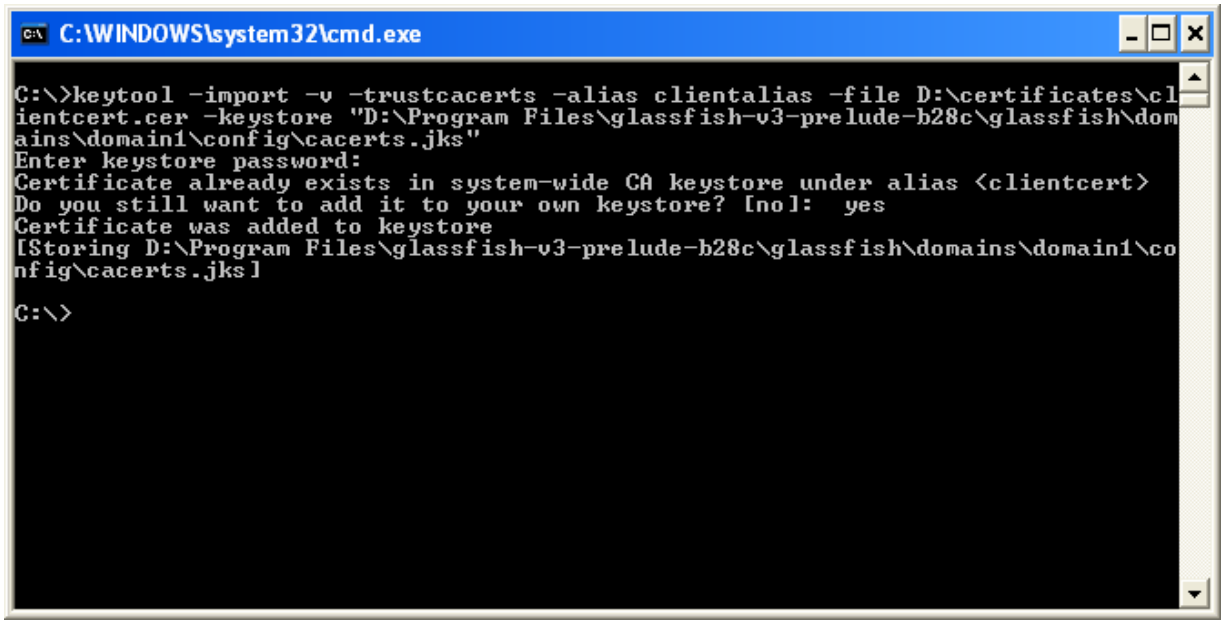
(Note: Default password for DemoTrust.jks is DemoTrustKeyStorePassPhrase)

```
C:\>keytool -import -v -trustcacerts -alias clientalias -keystore
D:\Oracle\Middleware\wlserver_10.3\server\lib\DemoTrust.jks -file D:\certificates\clientcert.cer
```



b) Importing to Glassfish truststore

```
keytool -import -v -trustcacerts -alias clientalias -file D:\certificates\clientcert.cer -keystore "D:\Program
Files\glassfish-v3-prelude-b28c\glassfish\domains\domain1\config\cacerts.jks"
```


C:\WINDOWS\system32\cmd.exe
C:\>keytool -import -v -trustcacerts -alias clientalias -file D:\certificates\cl
ientcert.cer -keystore "D:\Program Files\glassfish-v3-prelude-b28c\glassfish\dom
ains\domain1\config\cacerts.jks"
Enter keystore password:
Certificate already exists in system-wide CA keystore under alias <clientcert>
Do you still want to add it to your own keystore? [no]: yes
Certificate was added to keystore
[Storing D:\Program Files\glassfish-v3-prelude-b28c\glassfish\domains\domain1\co
nfig\cacerts.jks]
C:\>

Additional Information

Note: If you are using self-signed certificate include following property in JAVA_OPTIONS of setDomainEnv of weblogic else weblogic will show Basic CA constraint error and restart the server.

-Dweblogic.security.SSL.enforceConstraints=off

```
set JAVA_OPTIONS=%JAVA_OPTIONS% %JAVA_PROPERTIES% -
Dweblogic.security.SSL.enforceConstraints=off
```

Error

If you get the following error while running the client for the web service

```
javax.xml.ws.WebServiceException: Failed to access the WSDL at: https://localhos
t:7002/BasicOperations/BasicOperationService?wsdl. It failed with:
        Received fatal alert: handshake_failure.
        at com.sun.xml.internal.ws.wsdl.parser.RuntimeWSDLParser.tryWithMex(Unkn
own Source)
        at com.sun.xml.internal.ws.wsdl.parser.RuntimeWSDLParser.parse(Unknown S
ource)
        at com.sun.xml.internal.ws.client.WSServiceDelegate.parseWSDL(Unknown So
urce)
        at com.sun.xml.internal.ws.client.WSServiceDelegate.<init>(Unknown Sourc
e)
        at com.sun.xml.internal.ws.client.WSServiceDelegate.<init>(Unknown Sourc
e)
        at com.sun.xml.internal.ws.spi.ProviderImpl.createServiceDelegate(Unknow
n Source)
        at javax.xml.ws.Service.<init>(Unknown Source)
        at basicoperationservice.wsdl.BasicOperationService.<init>(BasicOperatio
nService.java:46)
        at client.ClientMain.subtraction(ClientMain.java:51)
        at client.ClientMain.main(ClientMain.java:91)
Caused by: javax.net.ssl.SSLHandshakeException: Received fatal alert: handshake_
failure
        at com.sun.net.ssl.internal.ssl.Alerts.getSSLException(Unknown Source)
        at com.sun.net.ssl.internal.ssl.Alerts.getSSLException(Unknown Source)
        at com.sun.net.ssl.internal.ssl.SSLSocketImpl.recvAlert(Unknown Source)
        at com.sun.net.ssl.internal.ssl.SSLSocketImpl.readRecord(Unknown Source)

        at com.sun.net.ssl.internal.ssl.SSLSocketImpl.performInitialHandshake(Un
known Source)
        at com.sun.net.ssl.internal.ssl.SSLSocketImpl.startHandshake(Unknown Sou
rce)
        at com.sun.net.ssl.internal.ssl.SSLSocketImpl.startHandshake(Unknown Sou
rce)
        at sun.net.www.protocol.https.HttpsClient.afterConnect(Unknown Source)
        at sun.net.www.protocol.https.AbstractDelegateHttpsURLConnection.connect
(Unknown Source)
        at sun.net.www.protocol.http.HttpURLConnection.getInputStream(Unknown So
urce)
        at sun.net.www.protocol.https.HttpsURLConnectionImpl.getInputStream(Unkn
own Source)
        at java.net.URL.openStream(Unknown Source)
        at com.sun.xml.internal.ws.wsdl.parser.RuntimeWSDLParser.createReader(Un
known Source)
        at com.sun.xml.internal.ws.wsdl.parser.RuntimeWSDLParser.resolveWSDL(Unk
nown Source)
        ... 9 more
```

Solution

Make sure that certificates are imported correctly on both client and server side. Error signifies that either server hello or client hello was incomplete.

To check for detailed debug information for SSL include the following property during invocation of client

```
-Djavax.net.debug=ssl or –Djavax.net.debug=handshake

java -Djavax.net.debug=ssl <client class>

or

You can include it in your code also

System.setProperty("javax.net.debug","ssl");
```

Error

```
javax.xml.ws.WebServiceException: Failed to access the WSDL at: https://localhos
t:7002/BasicOperations/BasicOperationService?wsdl. It failed with:
        sun.security.validator.ValidatorException: PKIX path building failed: su
n.security.provider.certpath.SunCertPathBuilderException: unable to find valid c
ertification path to requested target.
        at com.sun.xml.internal.ws.wsdl.parser.RuntimeWSDLParser.tryWithMex(Unkn
own Source)
        at com.sun.xml.internal.ws.wsdl.parser.RuntimeWSDLParser.parse(Unknown S
ource)
        at com.sun.xml.internal.ws.client.WSServiceDelegate.parseWSDL(Unknown So
urce)
        at com.sun.xml.internal.ws.client.WSServiceDelegate.<init>(Unknown Sourc
e)
        at com.sun.xml.internal.ws.client.WSServiceDelegate.<init>(Unknown Sourc
e)
        at com.sun.xml.internal.ws.spi.ProviderImpl.createServiceDelegate(Unknow
n Source)
        at javax.xml.ws.Service.<init>(Unknown Source)
        at basicoperationservice.wsdl.BasicOperationService.<init>(BasicOperatio
nService.java:46)
        at client.ClientMain.subtraction(ClientMain.java:51)
        at client.ClientMain.main(ClientMain.java:91)
Caused by: javax.net.ssl.SSLHandshakeException: sun.security.validator.Validator
Exception: PKIX path building failed: sun.security.provider.certpath.SunCertPath
BuilderException: unable to find valid certification path to requested target
        at com.sun.net.ssl.internal.ssl.Alerts.getSSLException(Unknown Source)
        at com.sun.net.ssl.internal.ssl.SSLSocketImpl.fatal(Unknown Source)
        at com.sun.net.ssl.internal.ssl.Handshaker.fatalSE(Unknown Source)
        at com.sun.net.ssl.internal.ssl.Handshaker.fatalSE(Unknown Source)
        at com.sun.net.ssl.internal.ssl.ClientHandshaker.serverCertificate(Unkno
wn Source)
        at com.sun.net.ssl.internal.ssl.ClientHandshaker.processMessage(Unknown
Source)
        at com.sun.net.ssl.internal.ssl.Handshaker.processLoop(Unknown Source)
        at com.sun.net.ssl.internal.ssl.Handshaker.process_record(Unknown Source
)
        at com.sun.net.ssl.internal.ssl.SSLSocketImpl.readRecord(Unknown Source)
```

```
        at com.sun.net.ssl.internal.ssl.SSLSocketImpl.performInitialHandshake(Un
known Source)
        at com.sun.net.ssl.internal.ssl.SSLSocketImpl.startHandshake(Unknown Sou
rce)
        at com.sun.net.ssl.internal.ssl.SSLSocketImpl.startHandshake(Unknown Sou
rce)
        at sun.net.www.protocol.https.HttpsClient.afterConnect(Unknown Source)
        at sun.net.www.protocol.https.AbstractDelegateHttpsURLConnection.connect
(Unknown Source)
        at sun.net.www.protocol.http.HttpURLConnection.getInputStream(Unknown So
urce)
        at sun.net.www.protocol.https.HttpsURLConnectionImpl.getInputStream(Unkn
own Source)
        at java.net.URL.openStream(Unknown Source)
        at com.sun.xml.internal.ws.wsdl.parser.RuntimeWSDLParser.createReader(Un
known Source)
        at com.sun.xml.internal.ws.wsdl.parser.RuntimeWSDLParser.resolveWSDL(Unk
nown Source)
        ... 9 more
Caused by: sun.security.validator.ValidatorException: PKIX path building failed:
 sun.security.provider.certpath.SunCertPathBuilderException: unable to find vali
d certification path to requested target
        at sun.security.validator.PKIXValidator.doBuild(Unknown Source)
        at sun.security.validator.PKIXValidator.engineValidate(Unknown Source)
        at sun.security.validator.Validator.validate(Unknown Source)
        at com.sun.net.ssl.internal.ssl.X509TrustManagerImpl.validate(Unknown So
urce)
        at com.sun.net.ssl.internal.ssl.X509TrustManagerImpl.checkServerTrusted(
Unknown Source)
        at com.sun.net.ssl.internal.ssl.X509TrustManagerImpl.checkServerTrusted(
Unknown Source)
        ... 24 more
Caused by: sun.security.provider.certpath.SunCertPathBuilderException: unable to
 find valid certification path to requested target
        at sun.security.provider.certpath.SunCertPathBuilder.engineBuild(Unknown
 Source)
        at java.security.cert.CertPathBuilder.build(Unknown Source)
        ... 30 more
```

Solution

Error signifies that the client was not able to find a valid certificate keystore path. Include the following properties during client invocation

```
-Djavax.net.ssl.keyStore="C:\Program Files\Java\jdk1.6.0_06\jre\lib\security\cacerts" -
Djavax.net.ssl.keyStorePassword=changeit -Djavax.net.ssl.trustStore="C:\Program
Files\Java\jdk1.6.0_06\jre\lib\security\cacerts" -
Djavax.net.ssl.trustStorePassword=changeit
```

For example:

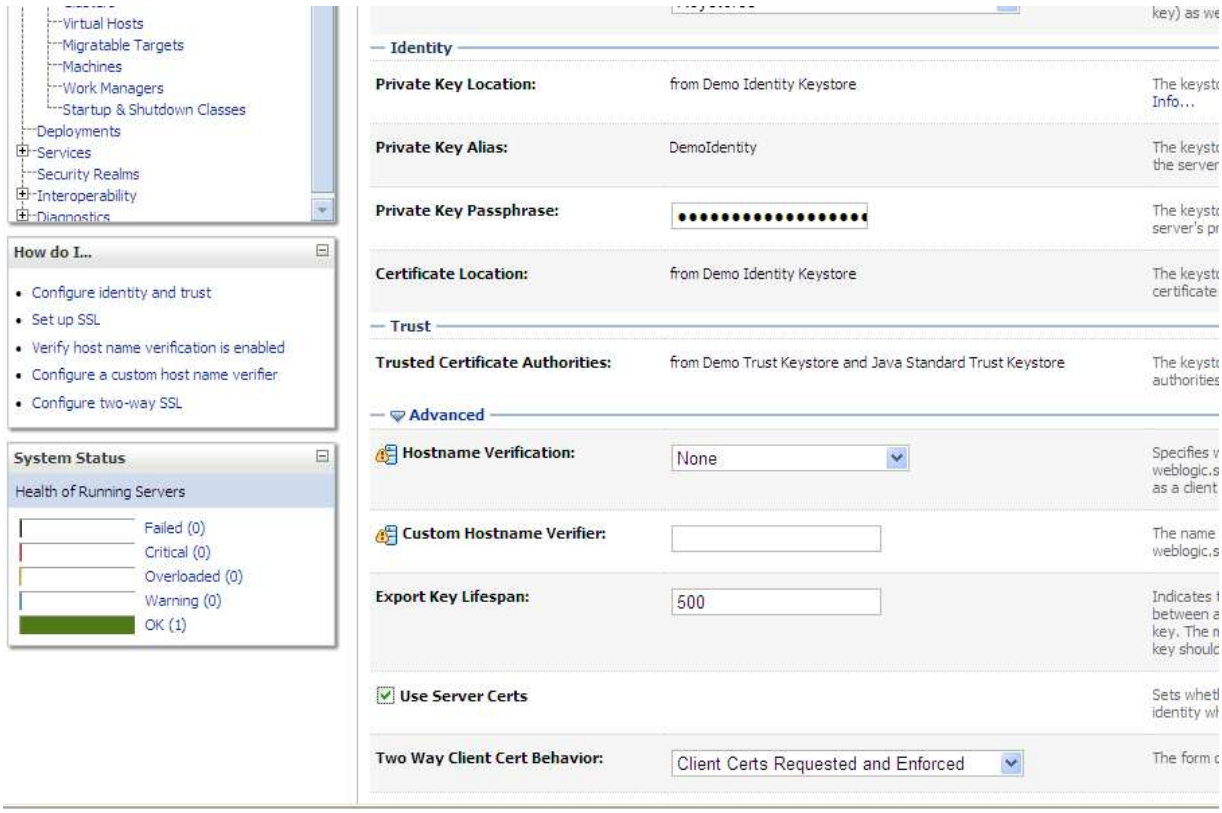
```
java -Djavax.net.ssl.keyStore="C:\Program Files\Java\jdk1.6.0_06\jre\lib\security\cacerts"
-Djavax.net.ssl.keyStorePassword=changeit -Djavax.net.ssl.trustStore="C:\Program
Files\Java\jdk1.6.0_06\jre\lib\security\cacerts" -
Djavax.net.ssl.trustStorePassword=changeit <client class>
```

Error:

When Weblogic is acting as client (i.e. when service deployed on weblogic is accessing the service deployed on another server) in Two Way SSL, you may get the following error **"No suitable identity certificate chain has been found."**

Solution

Go to SSL tab of your server where application is deployed and enable **Use Server Certs**



Error

If you get the following error while running your client:

```
javax.xml.ws.WebServiceException: Failed to access the WSDL at: https://localhos
t:7002/BasicOperations/BasicOperationService?wsdl. It failed with:
      java.security.cert.CertificateException: No subject alternative names present.
      at com.sun.xml.internal.ws.wsdl.parser.RuntimeWSDLParser.tryWithMex(RuntimeWSDLParser.java:136)
      at com.sun.xml.internal.ws.wsdl.parser.RuntimeWSDLParser.parse(RuntimeWSDLParser.java:122)
      at com.sun.xml.internal.ws.client.WSServiceDelegate.parseWSDL(WSServiceDelegate.java:226)
      at com.sun.xml.internal.ws.client.WSServiceDelegate.<init>(WSServiceDelegate.java:189)
      at com.sun.xml.internal.ws.client.WSServiceDelegate.<init>(WSServiceDelegate.java:159)
      at com.sun.xml.internal.ws.spi.ProviderImpl.createServiceDelegate(ProviderImpl.java:81)
```

Solution:

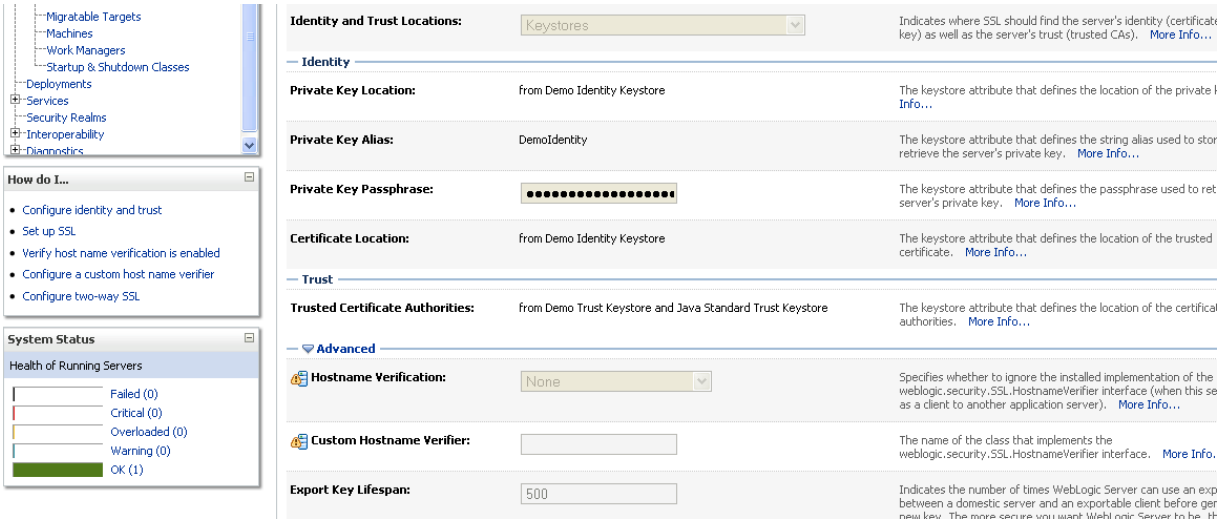
Include the following code in your code

```
static {
      //WORKAROUND. TO BE REMOVED.

      javax.net.ssl.HttpsURLConnection.setDefaultHostnameVerifier(new
javax.net.ssl.HostnameVerifier() {

         public boolean verify(String hostname,
               javax.net.ssl.SSLSession sslSession) {
            return true;
         }
      });

   }
```

Or

In weblogic

Start Weblogic -> Login to console -> Click on Environment -> Servers -> SSL ->Advanced


Migratable Targets
Machines
Work Managers
Startup & Shutdown Classes
Deployments
Services
Security Realms
Interoperability
Diagnostics
How do I...
Configure identity and trust
Set up SSL
Verify host name verification is enabled
Configure a custom host name verifier
Configure two-way SSL
System Status
Health of Running Servers
Failed (0)
Critical (0)
Overloaded (0)
Warning (0)
OK (1)
Identity and Trust Locations:
Keystores
Indicates where SSL should find the server's identity (certificate
key) as well as the server's trust (trusted CAs). More Info...
Identity
Private Key Location:
from Demo Identity Keystore
The keystore attribute that defines the location of the private
Info...
Private Key Alias:
DemoIdentity
The keystore attribute that defines the string alias used to stor
retrieve the server's private key. More Info...
Private Key Passphrase:
The keystore attribute that defines the passphrase used to ret
server's private key. More Info...
Certificate Location:
from Demo Identity Keystore
The keystore attribute that defines the location of the trusted
certificate. More Info...
Trust
Trusted Certificate Authorities:
from Demo Trust Keystore and Java Standard Trust Keystore
The keystore attribute that defines the location of the certifical
authorities. More Info...
Advanced
Hostname Verification:
None
Specifies whether to ignore the installed implementation of the
weblogic.security.SSL.HostnameVerifier interface (when this se
as a client to another application server). More Info...
Custom Hostname Verifier:
The name of the class that implements the
weblogic.security.SSL.HostnameVerifier interface. More Info.
Export Key Lifespan:
500
Indicates the number of times WebLogic Server can use an exp
between a domestic server and an exportable client before ger

Client Run

```
C:\Documents and Settings\Raunak\Desktop\client>java -
Djavax.net.ssl.keyStore="C
:\Program Files\Java\jdk1.6.0_06\jre\lib\security\cacerts" -Djavax.net.ssl.keySt
orePassword=changeit -Djavax.net.ssl.trustStore="C:\Program
Files\Java\jdk1.6.0_
06\jre\lib\security\cacerts" -Djavax.net.ssl.trustStorePassword=changeit client.
ClientMain
Enter your choice:
 1. Addition
 2. Subtraction
2
Enter the first number for the operation..
32
Enter the second number for the operation..
28
Client subtract Port is JAX-WS RI 2.1.6 in JDK 6: Stub for https://localhost:700
2/BasicOperations/BasicOperationService
Result = 4
Result of subtraction is 4
```