CloudPOS Remote Key Injection

Demo System

V1.1

目录

Version	Author	Date	Description
1.0	Hans	2018-03-02	

1 Summary

The cloudPOS remotely key injection mechanism support mutual authentication between POS terminal and Key Injector.

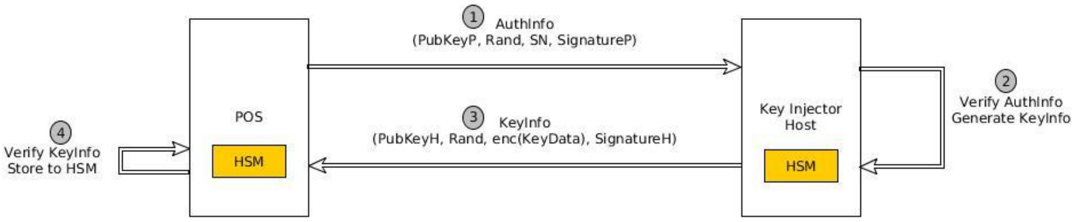
2 Definitions

Host	Key Injector Host
POS Root Key	Private key of root asymmetric key pair, stored in HSM of POS terminal.
POS Root Public Key	Public key of root asymmetric key pair, stored in host.
Host Root Key	Private key of host asymmetric key pair, stored in host.
Host Root Public Key	Public key of root asymmetric key pair, stored in terminal.

3 Key Injection

3.1 Core Process

Basically, the key injecting process includes 4 steps:



POS Send AuthInfo: The application in POS gets the AuthInfo via the HSM API, then sends it to host. AuthInfo contains:

PubKeyP: The public key of each POS. It is stored in a certificate file signed by POS Root Key. So it can be verified by the POS Root Public Key.

Rand: The 32 bytes random data generated by the HSM of POS. It’s unique for each key injection transaction.

SN: The hardware serial number. It’s unique for each POS terminal.

SignatureP: The signature of the data including SN and Rand. The algorithm is SHA256withRSA.

Host Verify AuthInfo: Host verify the AuthInfo data, after the host receive them. Host use the POS Root Public Key to verify the PubKeyP, then use the PubKeyP to verify the SignatureP. So the Host will know if the AuthInfo is come from a trusted POS terminal.

Host Send KeyInfo: The Host generate the KeyInfo data and send to POS terminal. The KeyInfo data contains:

PubKeyH: The public key of the Host. It is stored in a certificate file signed by Host Root Key and it can be already injected in the POS when initializing POS terminal.

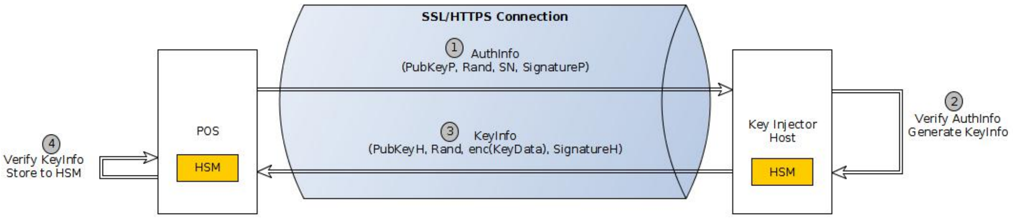
Rand: The 32 bytes random data which is received from POS terminal in the AuthInfo data.

ENC(KeyData): The encrypted data of KeyInfo. It' s encrypted by PubKeyP (the public key of the POS terminal). The algorithm is RSA/ECB/PKCS1Padding.

SignatureH: The signature of the data including Rand and ENC(KeyData). The algorithm is SHA256withRSA.

POS terminal Verify KeyInfo: The application in POS terminal will inject the KeyInfo, after it get it from Host. The HSM model of the POS terminal will verify the PubKeyH by the existing Host Root Public Key, and verify the SignatureH by the PubKeyH. If success, the HSM get the decryption data the KeyInfo by its own POS terminal PrivKey and store the data.

3.2 Connection Protection



The POS terminal and the Key Injector Host can connect each other in internet. So the application in POS terminal can use SSL/HTTPS connection with Host.

3.3 POS terminal Initialization

The Host Root Public Key should be stored in the POS terminal as the trusted key at the beginning. cloudPOS terminal is designed to use simple certificate file to protect and store the trusted Host Root Public Key.

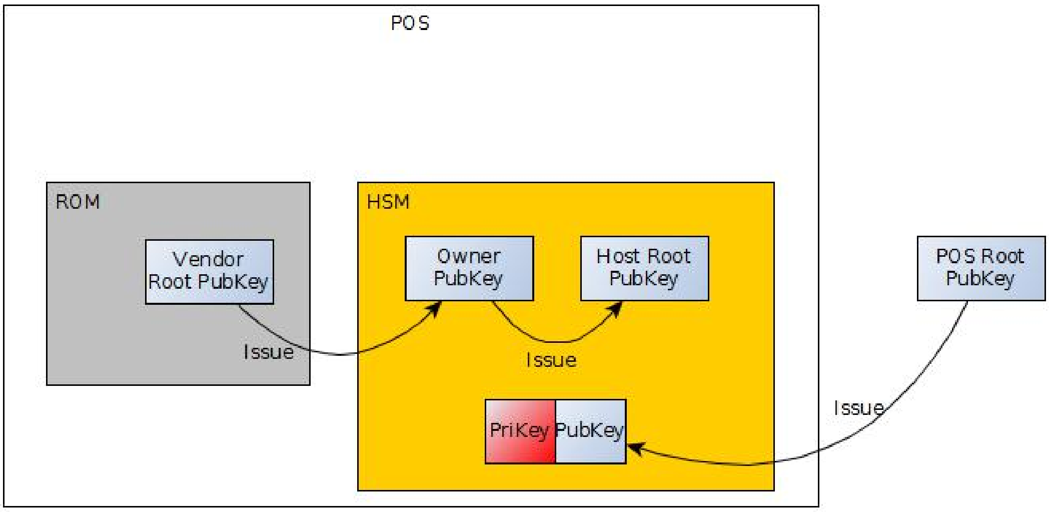


Figure 1.

Vendor Root PubKey: Verndor Root Public Key. The public key of the vendor. It is been initialized in the ROM of the POS terminal. It is used to verify the POS terminal Owner PubKey.

Owner PubKey: Owner Public Key. The public key of the POS terminal owner who buy the POS terminal. It controls what the public key of which Key Injector Host can be loaded to POS terminal.

Host Root PubKey: Host Root Public Key. The public key stored in POS terminal to authenticate the Key Injector Host.

PriKey/PubKey: The private/public key pair is unique of each POS terminal. And the private key is only stored in one POS terminal.

POS terminal Root PubKey: POS Root Public Key. This public key is used to authenticate the POS terminal PubKey. It can be used by Key Injector Host.

The PriKey and PubKey of POS terminal are already initialized when terminal is in factory. We as the POS vendor will help the POS terminal owner to initialize the Host Root Public Key to POS terminal.

4 Generate Public Keys

There are many tools to generate the public keys, including OPENSSL, XCA... In this document, we use XCA GUI tool to demonstrate how to generate the public keys.

4.1 Create an XCA DB

To create an XCA DB, follow these steps:

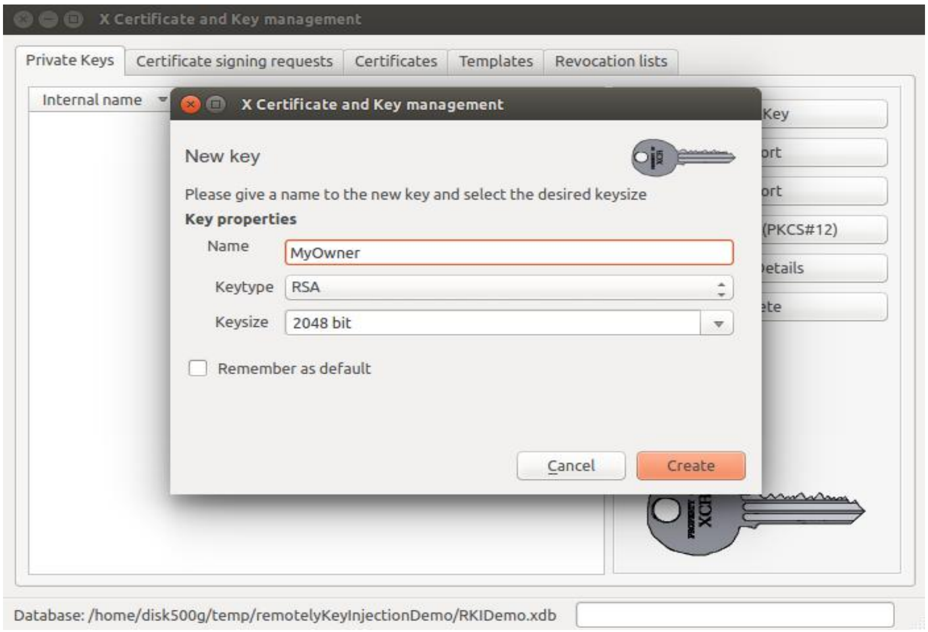
1. Launching the XCA.

2. Select **File** > **New Database**, input the db name, to create your owner public keys database. Please keep it safely and privately.

4.2 Create Owner Key Pair

To create the Owner Key Pair, follow these steps:

1. In **Private Keys** tab, click New **Key** to create the key pair with 2048 bit size.
2. In **New Key** window, input the name, select 2048 bit, click **Create**.



X Certificate and Key management

New key

Please give a name to the new key and select the desired keysize

Key properties

Name: MyOwner

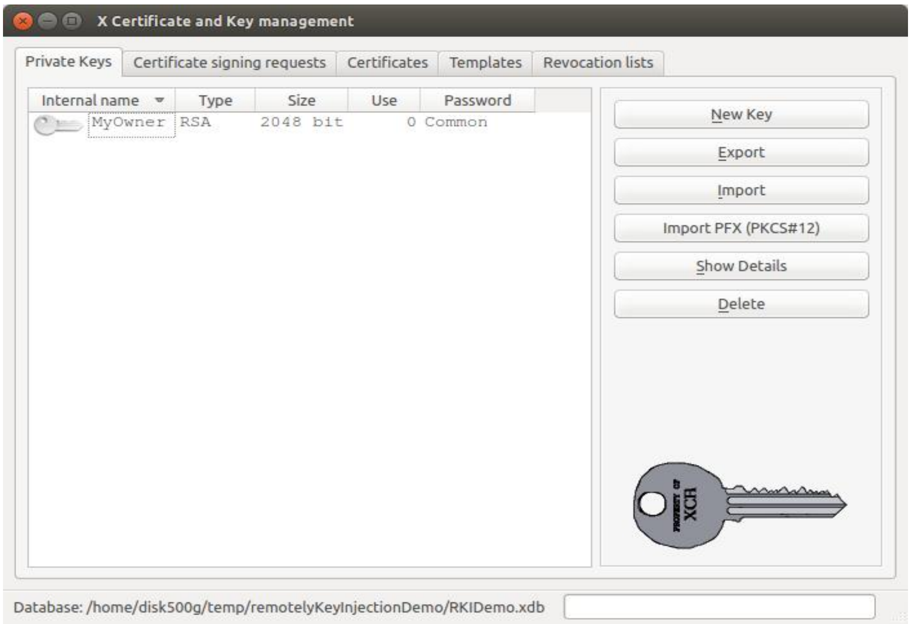
Keytype: RSA

Keysize: 2048 bit

☐ Remember as default

Database: /home/disk500g/temp/remotelyKeyInjectionDemo/RKIDemo.xdb

Figure 2. New Key



Internal name	Type	Size	Use	Password
MyOwner	RSA	2048 bit	0	Common

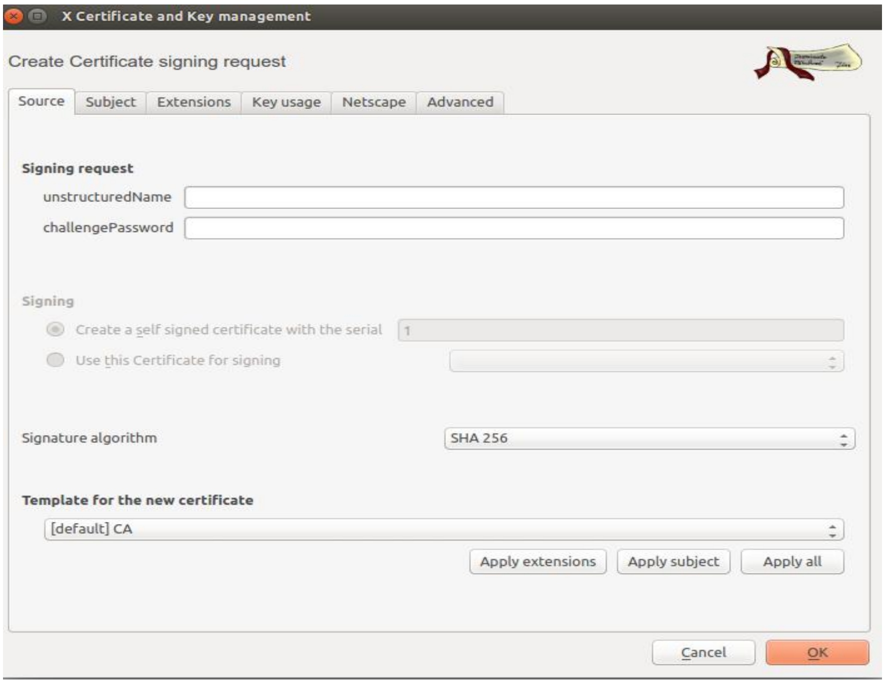
Database: /home/disk500g/temp/remotelyKeyInjectionDemo/RKIDemo.xdb

Figure 3. Private Keys of Main window after key created

Then generate the CSR for Owner Key. This CSR file will be used to generate self-signed certificate in XCA, and it will be submit to us. We will issue the new owner certificate

To Create the Owner CSR and send to us, follow these steps:

1. In **Certificate signing requests** tab, click **New Request**.
2. In **Source** tab, set signature algorithm as SHA 256.



X Certificate and Key management

Create Certificate signing request

Signing request

unstructuredName:

challengePassword:

Signing

○ Create a self signed certificate with the serial: 1

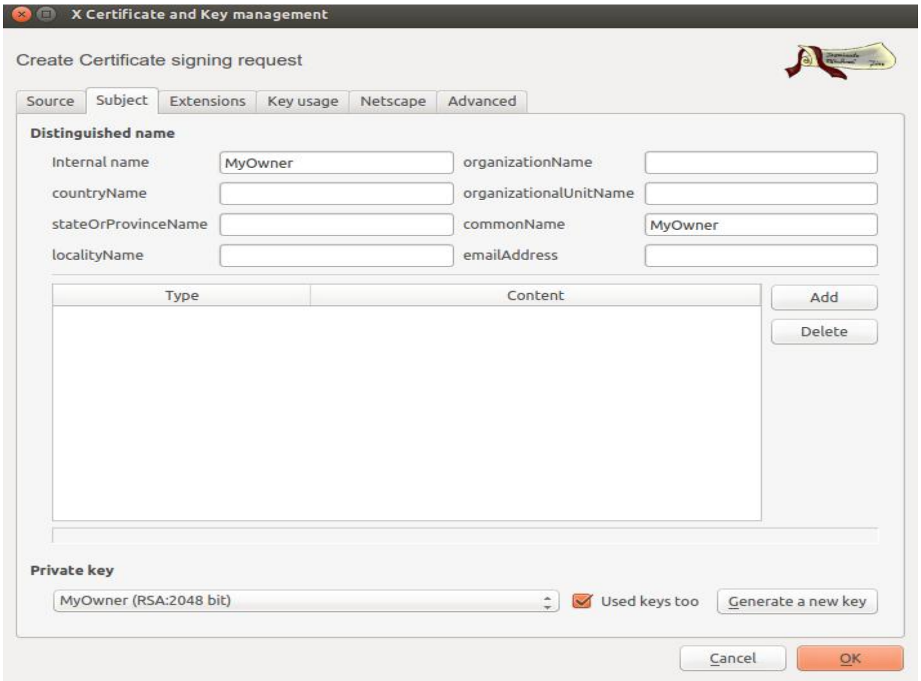
○ Use this Certificate for signing

Signature algorithm: SHA 256

Template for the new certificate: [default] CA

Figure 4. Source of Create Certificate signing request

3. In **Subject** tab, set Subject's distinguished name as your company information. Please set the internal name, organizationName, countryName, organizationUnitName, stateOrProvinceName, commonName, localityName, emailAddress to your real information. Select the private key created just now.



X Certificate and Key management

Create Certificate signing request

Distinguished name

Internal name	MyOwner	organizationName	
countryName		organizationalUnitName	
stateOrProvinceName		commonName	MyOwner
localityName		emailAddress	

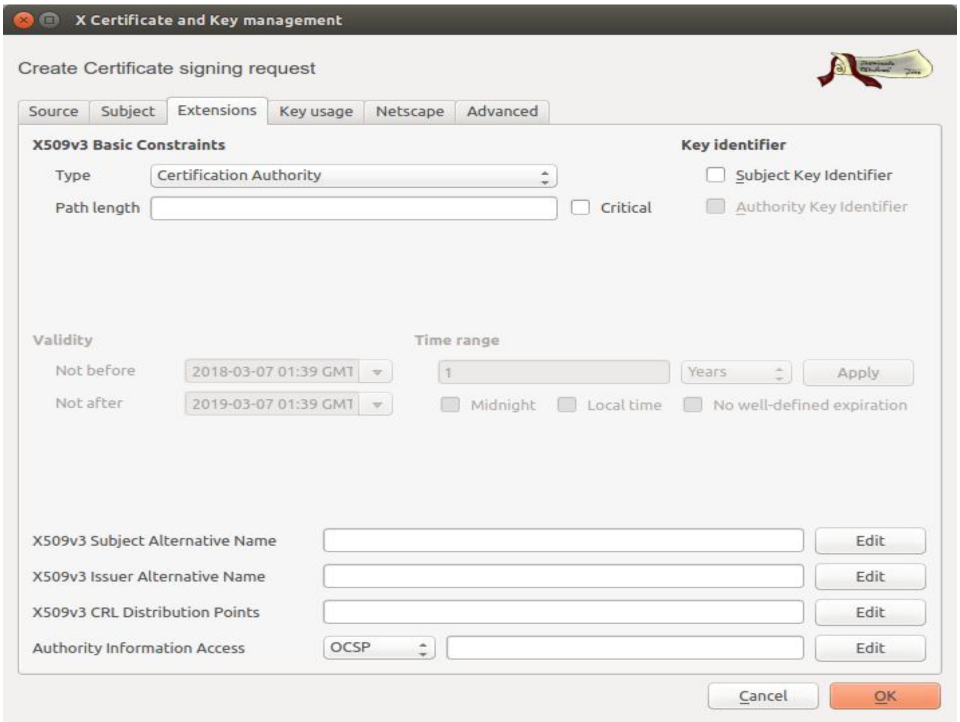
Type	Content

Private key: MyOwner (RSA:2048 bit)

☑ Used keys too

Figure 5. Subject of Create Certificate signing request

4. In Extension tab, set type as certificate authority (actually your certificate needn't to be CA, it's just for XCA manage the certificate easily).



X Certificate and Key management

Create Certificate signing request

Source | Subject | Extensions | Key usage | Netscape | Advanced

X509v3 Basic Constraints

Type: Certification Authority

Path length: □ Critical

Key identifier

□ Subject Key Identifier

□ Authority Key Identifier

Validity

Not before: 2018-03-07 01:39 GMT

Not after: 2019-03-07 01:39 GMT

Time range

1 Years Apply

□ Midnight □ Local time □ No well-defined expiration

X509v3 Subject Alternative Name — Edit

X509v3 Issuer Alternative Name — Edit

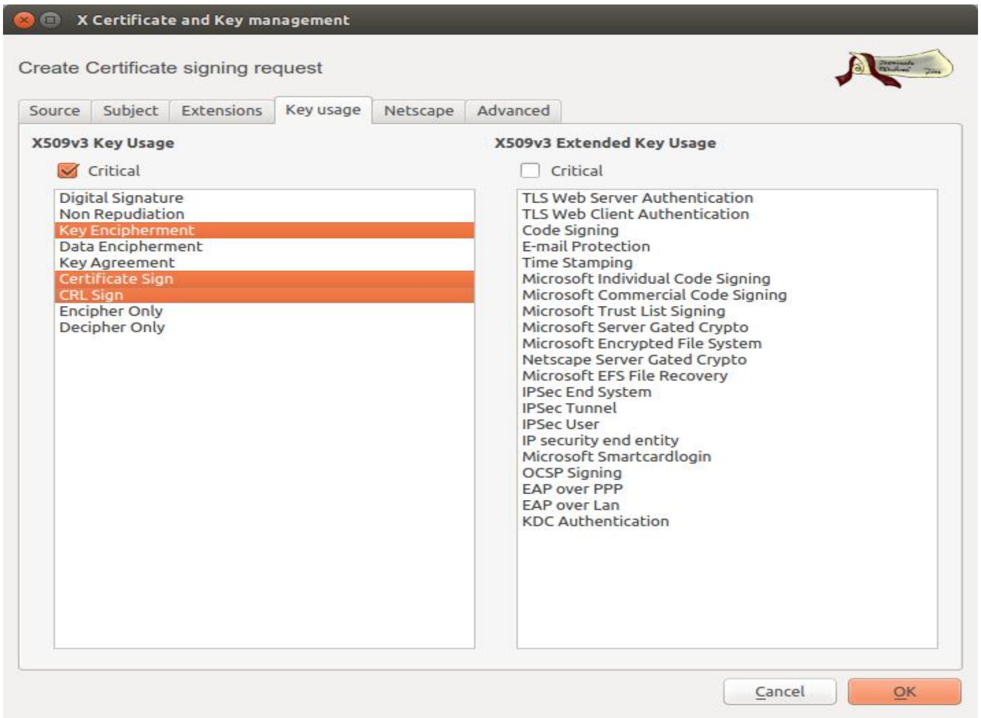
X509v3 CRL Distribution Points — Edit

Authority Information Access: OCSP — Edit

Cancel OK

Figure 6. Extensions of Create Certificate signing request

5. In Key Usage tab, set the proper key usage flag for owner key according TerminalCertificateGuide_en.pdf.



X Certificate and Key management

Create Certificate signing request

Source | Subject | Extensions | Key usage | Netscape | Advanced

X509v3 Key Usage

☑ Critical

- Digital Signature
- Non Repudiation
- Key Encipherment (selected)
- Data Encipherment
- Key Agreement
- Certificate Sign (selected)
- CRL Sign (selected)
- Encipher Only
- Decipher Only

X509v3 Extended Key Usage

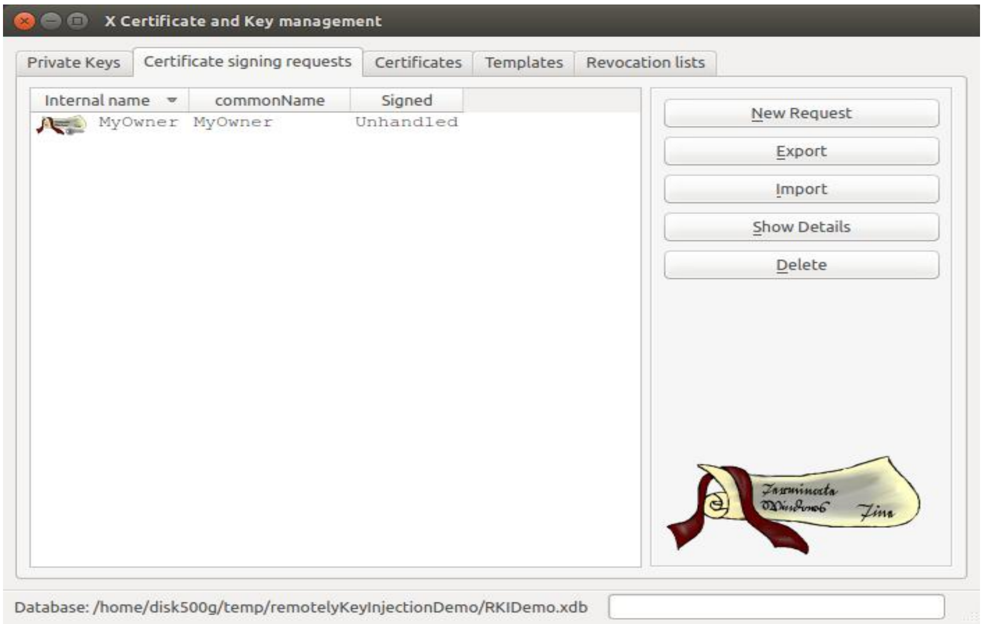
□ Critical

- TLS Web Server Authentication
- TLS Web Client Authentication
- Code Signing
- E-mail Protection
- Time Stamping
- Microsoft Individual Code Signing
- Microsoft Commercial Code Signing
- Microsoft Trust List Signing
- Microsoft Server Gated Crypto
- Microsoft Encrypted File System
- Netscape Server Gated Crypto
- Microsoft EFS File Recovery
- IPSec End System
- IPSec Tunnel
- IPSec User
- IP security end entity
- Microsoft Smartcardlogin
- OCSP Signing
- EAP over PPP
- EAP over Lan
- KDC Authentication

Cancel OK

Figure 7. Key usage of Create Certificate signing request

6. Click **OK** to create the owner CSR.

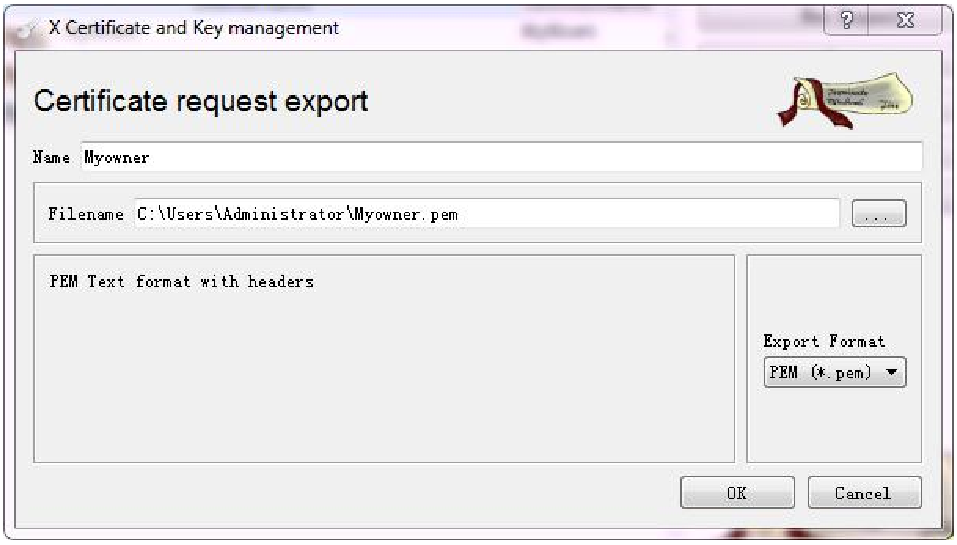


Internal name	commonName	Signed
MyOwner	MyOwner	Unhandled

Database: /home/disk500g/temp/remotelyKeyInjectionDemo/RKIDemo.xdb

Figure 8. Certificate signing requests of Main window after create owner CSR

7. In Certificate signing requests tab, click **Export**.



Name Myowner

Filename C:\Users\Administrator\Myowner.pem

PEM Text format with headers

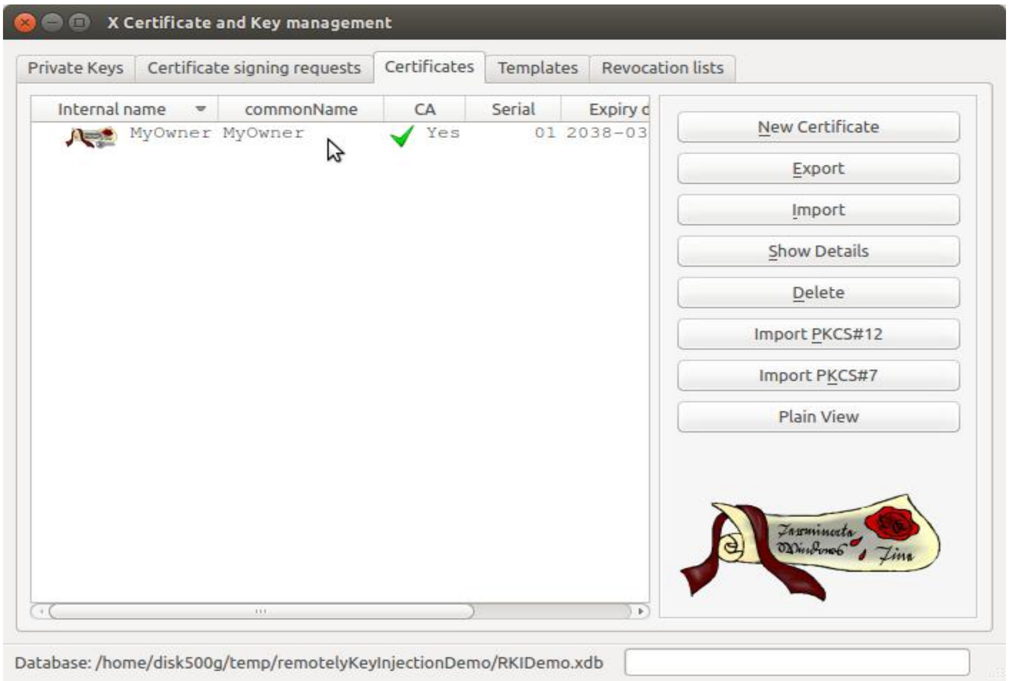
Export Format PEM (*.pem)

Figure 9. Certificate request export

8. Click **OK** to export the CSR. Then send it to support@wizarpos.com, and wait the reply.

To Import the certificate replied, follow these steps:

1. In **Certificates** tab, click **Import**.
2. Select the replied certificate to import.



Internal name	commonName	CA	Serial	Expiry d
MyOwner	MyOwner	✓ Yes	01	2038-03

Database: /home/disk500g/temp/remotelyKeyInjectionDemo/RKIDemo.xdb

Figure 10. Certificates of Main window after import certificate

4.3 Create Key Injector Host Key Pair

Assume the Key Injector Host Key Pair will be used in a Tomcat server, so we generate the key in a JKS keystore.

To get and export the host certificate, follow these steps:

1. Use follow command to generate the key pair in myhost.jks file:

```
keytool -genkeypair -keystore myhost.jks -keyalg RSA -keysize 2048 -alias myHost -dname "CN=MyHost,EMAILADDRESS=myname@abc.com" -validity 7300
```

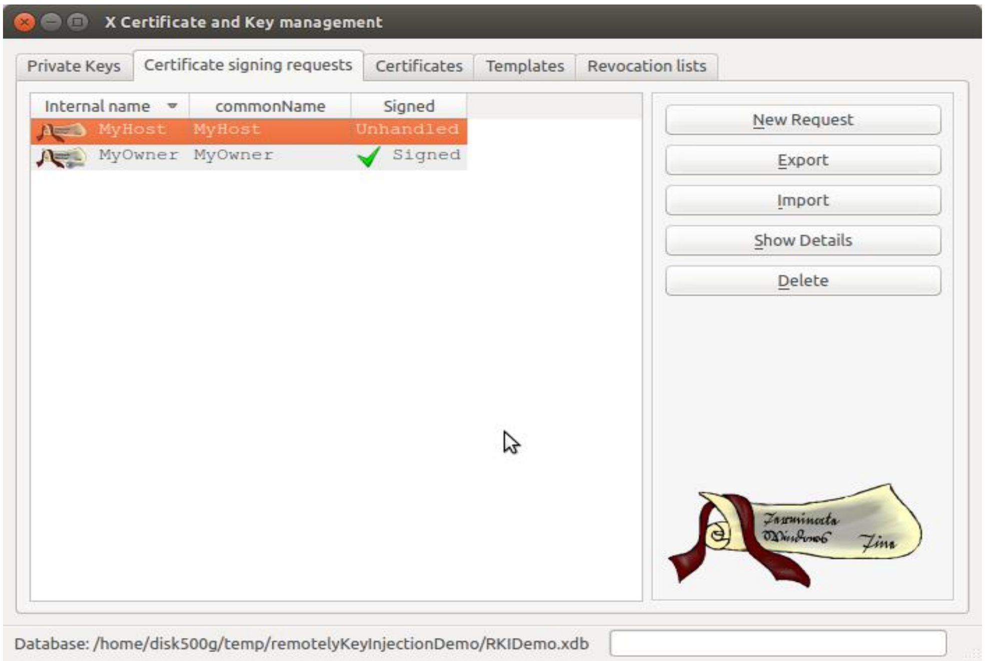
In the command, bold part should be modified to real information. We only write CN and EMAIL in -dname, you can write other option dname information. -validity is to set valid days, default is 90 days.

2. Use follow command to generate the CSR of host key:

```
keytool -certreq -keystore myhost.jks -alias myHost > myHost.csr
```

In the command, key alias name, myHost, should same with the key alias in step 1.

3. In **Certificate signing requests** tab, click **Import** to import the myHost.csr to RKIDemo.xdb created before.

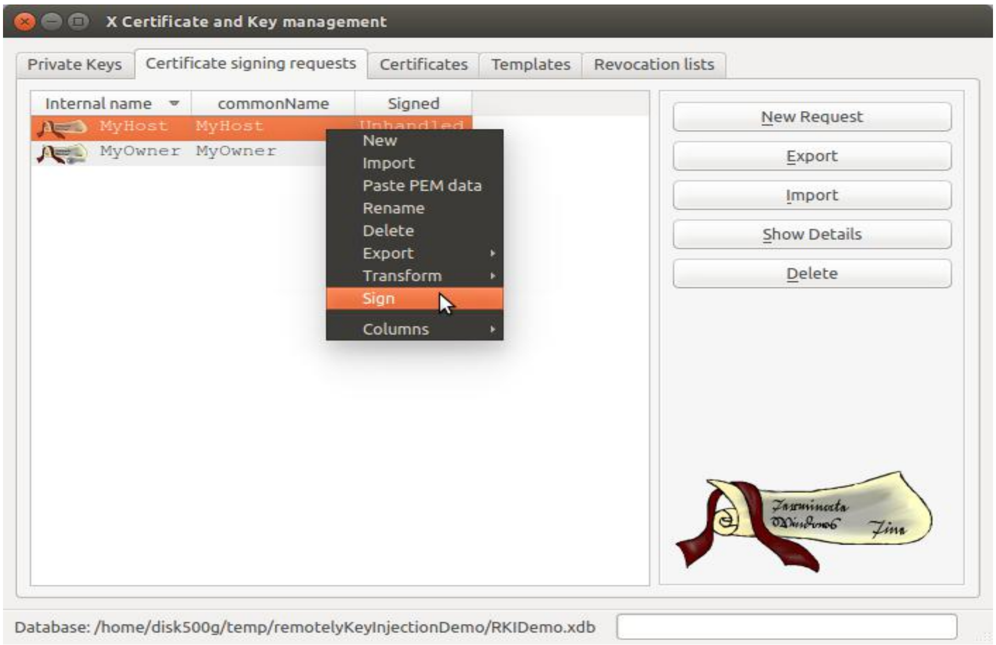


Internal name	commonName	Signed
MyHost	MyHost	Unhandled
MyOwner	MyOwner	✓ Signed

Database: /home/disk500g/temp/remotelyKeyInjectionDemo/RKIDemo.xdb

Figure 11. Certificate signing requests of Main window after import host CSR

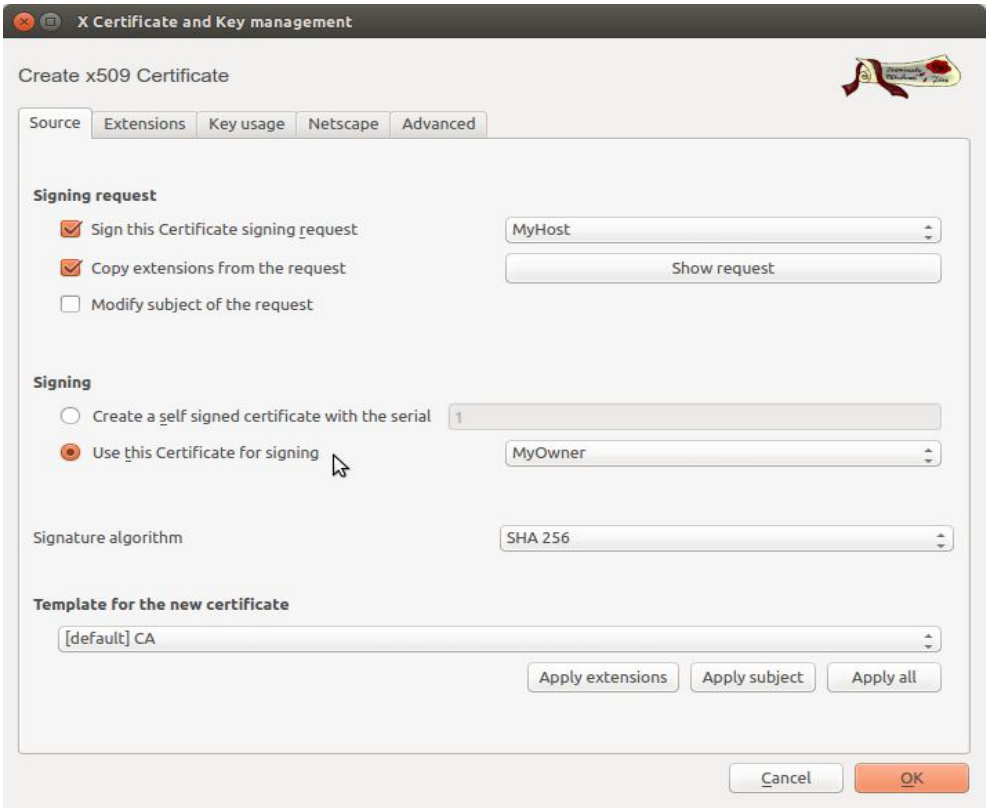
4. Sign the MyHost CSR by MyOwner. Set the proper valid time and the key usage flag according key loader root cert in TerminalCertificateGuide_en.pdf, as follows:



Internal name	commonName	Signed
MyHost	MyHost	Unhandled
MyOwner	MyOwner	

Database: /home/disk500g/temp/remotelyKeyInjectionDemo/RKIDemo.xdb

Figure 12. Sign of Right click menu



X Certificate and Key management

Create x509 Certificate

Signing request

☑ Sign this Certificate signing request — MyHost

☑ Copy extensions from the request — Show request

□ Modify subject of the request

Signing

○ Create a self signed certificate with the serial — 1

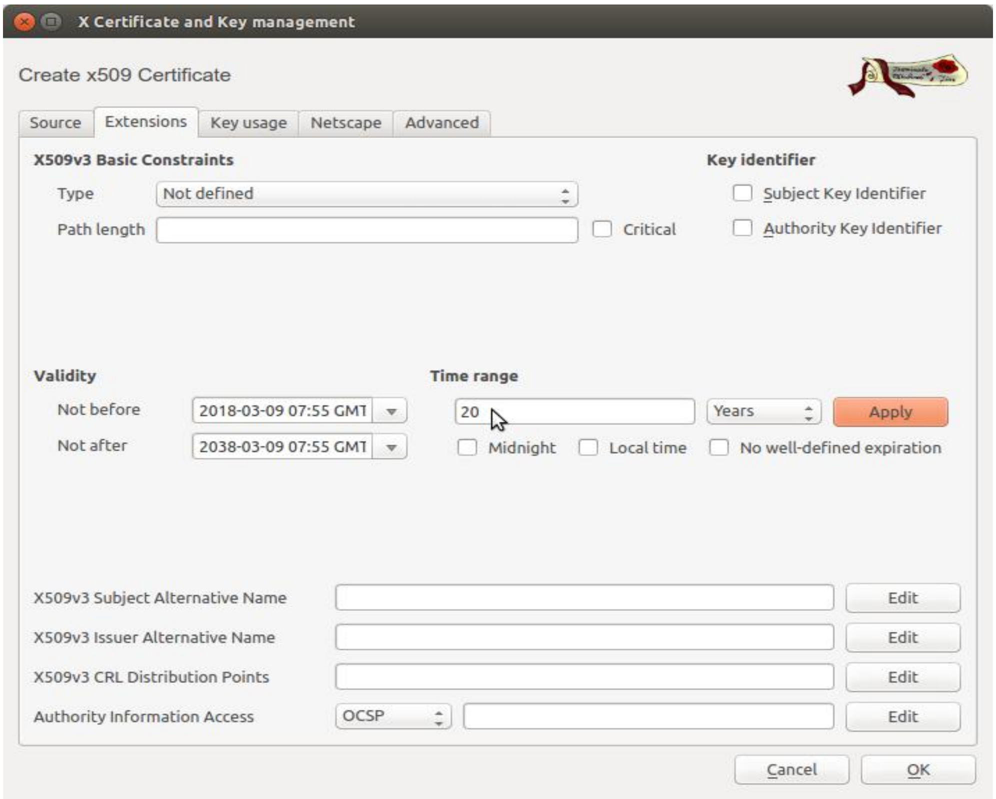
● Use this Certificate for signing — MyOwner

Signature algorithm — SHA 256

Template for the new certificate

[default] CA

Figure 13. Source of Create X509 Certificate



X Certificate and Key management

Create x509 Certificate

X509v3 Basic Constraints

Type — Not defined

Path length — □ Critical

Key identifier

□ Subject Key Identifier

□ Authority Key Identifier

Validity

Not before — 2018-03-09 07:55 GMT

Not after — 2038-03-09 07:55 GMT

Time range

20 — Years — Apply

□ Midnight □ Local time □ No well-defined expiration

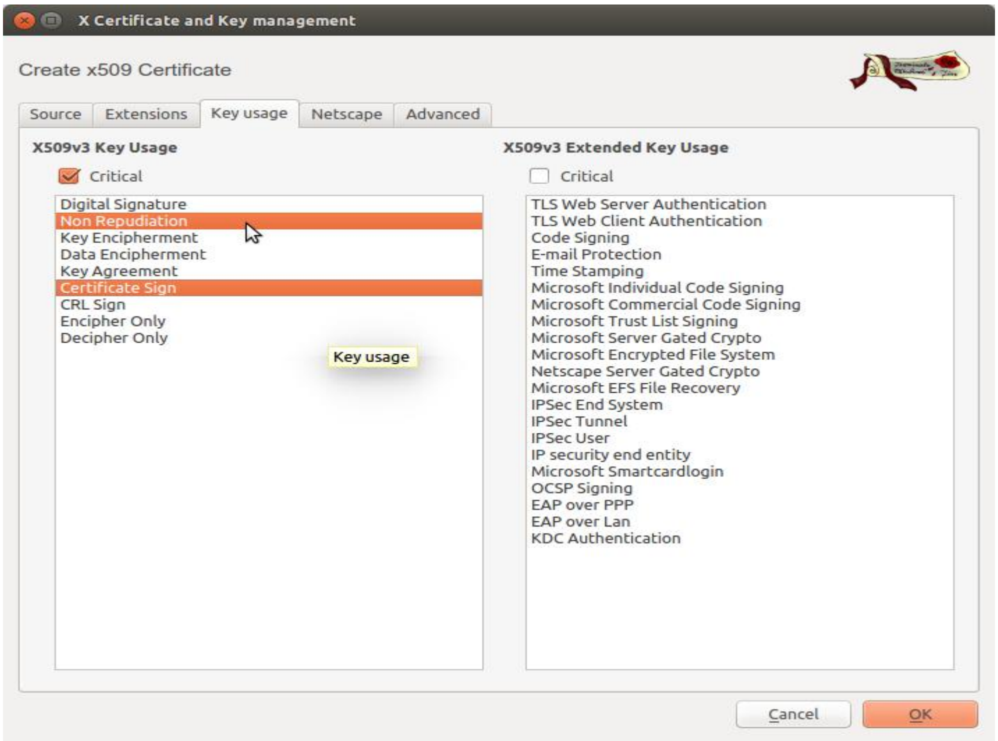
X509v3 Subject Alternative Name — Edit

X509v3 Issuer Alternative Name — Edit

X509v3 CRL Distribution Points — Edit

Authority Information Access — OCSP — Edit

Figure 14. Extensions of Create X509 Certificate



Create x509 Certificate

X509v3 Key Usage

☑ Critical

- Digital Signature
- Non Repudiation
- Key Encipherment
- Data Encipherment
- Key Agreement
- Certificate Sign
- CRL Sign
- Encipher Only
- Decipher Only

X509v3 Extended Key Usage

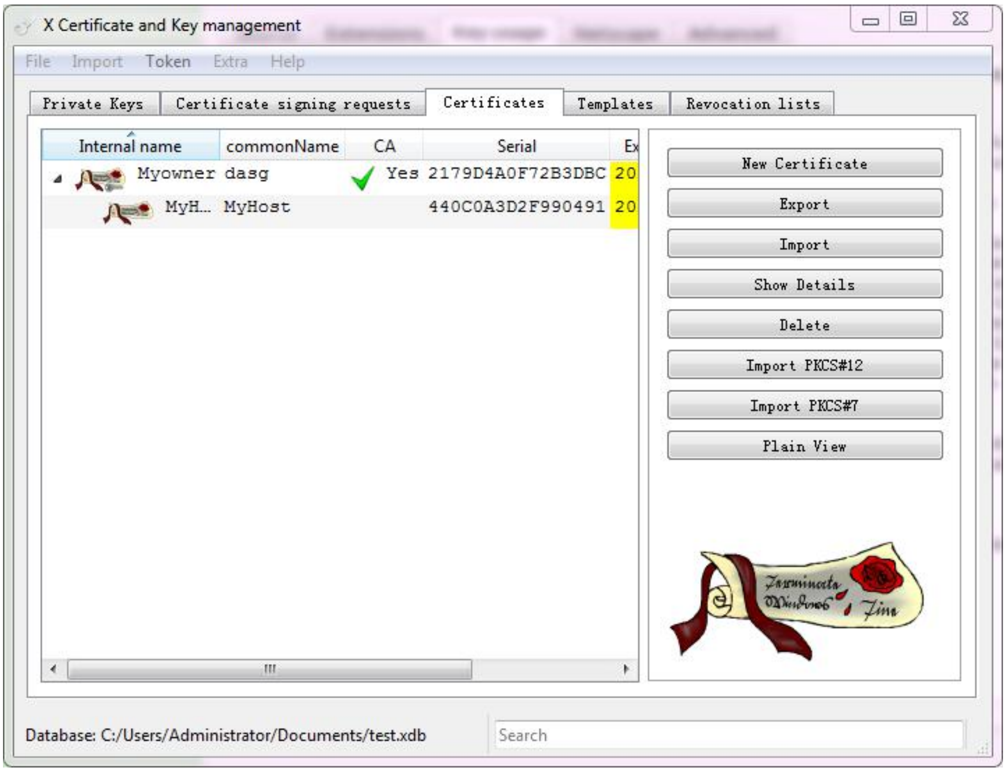
□ Critical

- TLS Web Server Authentication
- TLS Web Client Authentication
- Code Signing
- E-mail Protection
- Time Stamping
- Microsoft Individual Code Signing
- Microsoft Commercial Code Signing
- Microsoft Trust List Signing
- Microsoft Server Gated Crypto
- Microsoft Encrypted File System
- Netscape Server Gated Crypto
- Microsoft EFS File Recovery
- IPSec End System
- IPSec Tunnel
- IPSec User
- IP security end entity
- Microsoft Smartcardlogin
- OCSP Signing
- EAP over PPP
- EAP over Lan
- KDC Authentication

Figure 15. Key usage of Create X509 Certificate

Click OK, the signing process has finished and the host certificate has been created.

5. Click Certificates tab, find MyHost certificate.

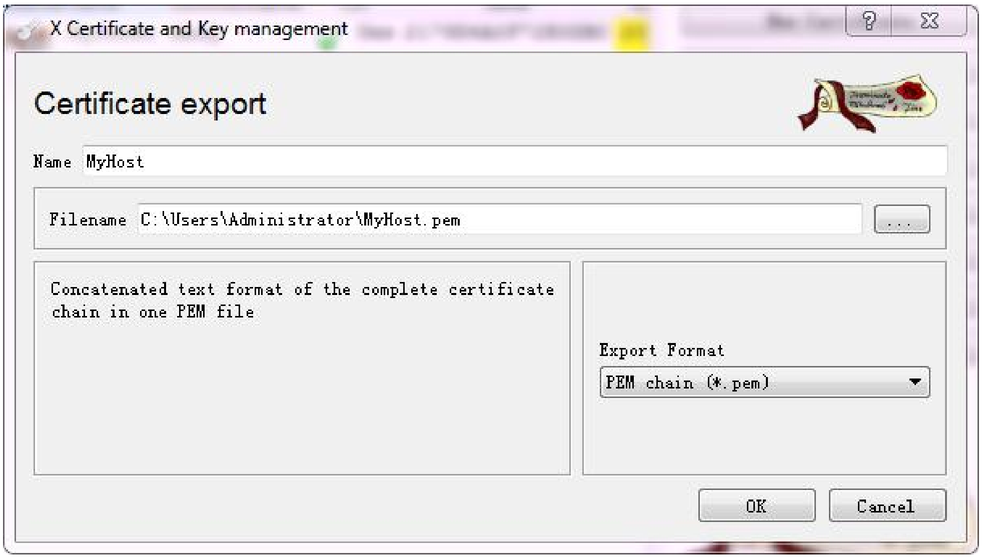


Internal name	commonName	CA	Serial	Ex
Myowner	dasg	✓ Yes	2179D4A0F72B3DBC	20
MyH...	MyHost		440C0A3D2F990491	20

Database: C:/Users/Administrator/Documents/test.xdb

Figure 16. Certificates of Main window after host certificate created

6. Select MyHost certificate, click Export



Name MyHost

Filename C:\Users\Administrator\MyHost.pem

Concatenated text format of the complete certificate chain in one PEM file

Export Format
PEM chain (*.pem)

Figure 17. Certificate export

7. Click OK, then get the host certificate.

4.4 Prepare For POS terminal Initialization

There are two ways to do certificates initialization:

1. Configure the new owner cert file and host key loader cert file from wizarview, after the POS terminal restart and connect to network, it will get the new owner and host key loader cert file.
2. Send the owner cert file and host key loader cert to us, we will create an initialize APK. Run the APK to do initialization.

Normally, customer use wizarview to do the initialization.

5 Initialization

After initialize the POS terminal , it is ready to remotely key injection.

6 Demo System

Please prepare certificates for POS terminal and remote injector according as chapter 4

The server application: **RemoteKeyInjectServer (eclipse project)**

The client application: **InjectKeyDemo (android-studio project)**

6.1 Functions

- POS terminal Agent(client) ask Host to inject the MK/SK or DUKPT keys to termnal.

- POS terminal Agent(client) ask Host to get check data to check the key injecting.
- MK/SK or DUKPT initial key component could be updated in Host's configure file,

6.2 Running RemoteKeyInjectServer

1. Import RemoteKeyInjectServer into eclipse
2. Find class **com.cloudpos.rki.Starter.java**
3. Edit **keylist.txt** file, and add your key information.Such as

```
## key type: 1 dukpt key 2 master key 3 transport key
##
## dukpt key
## 1.sn = key_index, usage, counter, ksn, initial key
##
## usage, 0:PIN Key, 1:MAC Key, 2:Data Key
##
## master key
## 2.sn = key_index, hex_master_key(length: 32 or 48)
##
## transport key
## 3.sn = key_index, hex_transport_key(length: 32 or 48)
##

1.WP15461Q00002422 = 2, 2, 0, FFFF9876543210E0,
6AC292FAA1315B4D858AB3A3D7D5933A
2.WP15461Q00002422 = 9, 38383838383838383838383838383838
```

4. Click the right mouse button --> Run As --> Java Application

6.3 Running InjectKeyDemo

1. Import InjectKeyDemo into Android-Studio
2. Edit **SSLConnect.java** file, and enter your own IP address as host value

```
// Change to your own host address
private String host = "121.199.23.212";
// Change to your own host port
private int port = 11060;
```

3. Connect terminal to your computer
4. Runing the project and install it into terminal.
5. The terminal screenshot:

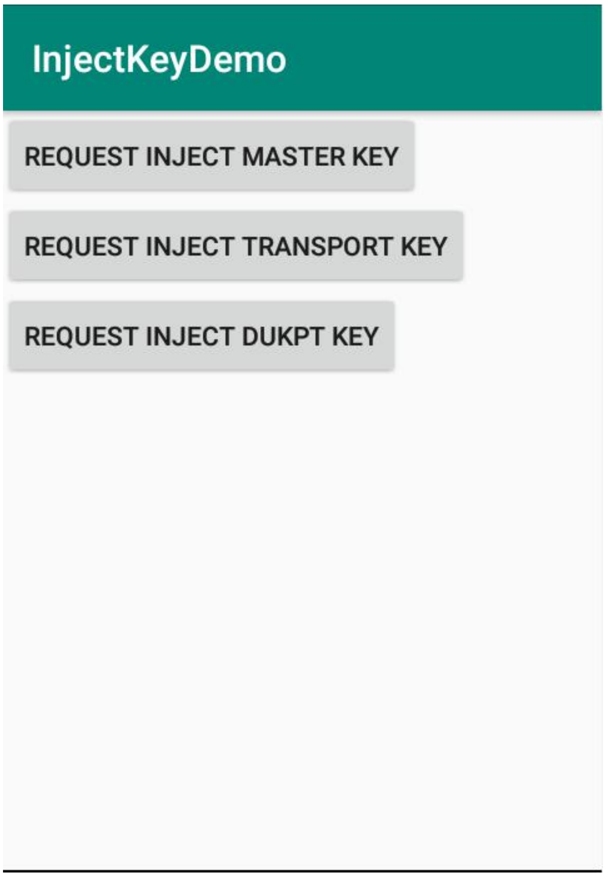


Figure 18.

Click "REQUEST INJECT MASTER KEY" button will trigger following activities:

- Read AuthInfo from HSM
- Send AuthInfo to remote server
- Read master key from remote server
- Import key information into HSM
- Request cipher data information which is encrypted by key from remote server

Click "REQUEST INJECT TRANSPORT KEY" button will trigger following activities:

- Read AuthInfo from HSM
- Send AuthInfo to remote server
- Read transport key from remote server
- Import key information into HSM
- Request cipher data information which is encrypted by key from remote server

Click "REQUEST INJECT DUKPT KEY" button will trigger following activities:

- Read AuthInfo from HSM
- Send AuthInfo to remote server
- Read dukpt key from remote server
- Import key information into HSM

6.4 Secure Communication

In order to ensure the security of communication, the demo application uses **two-way SSL**

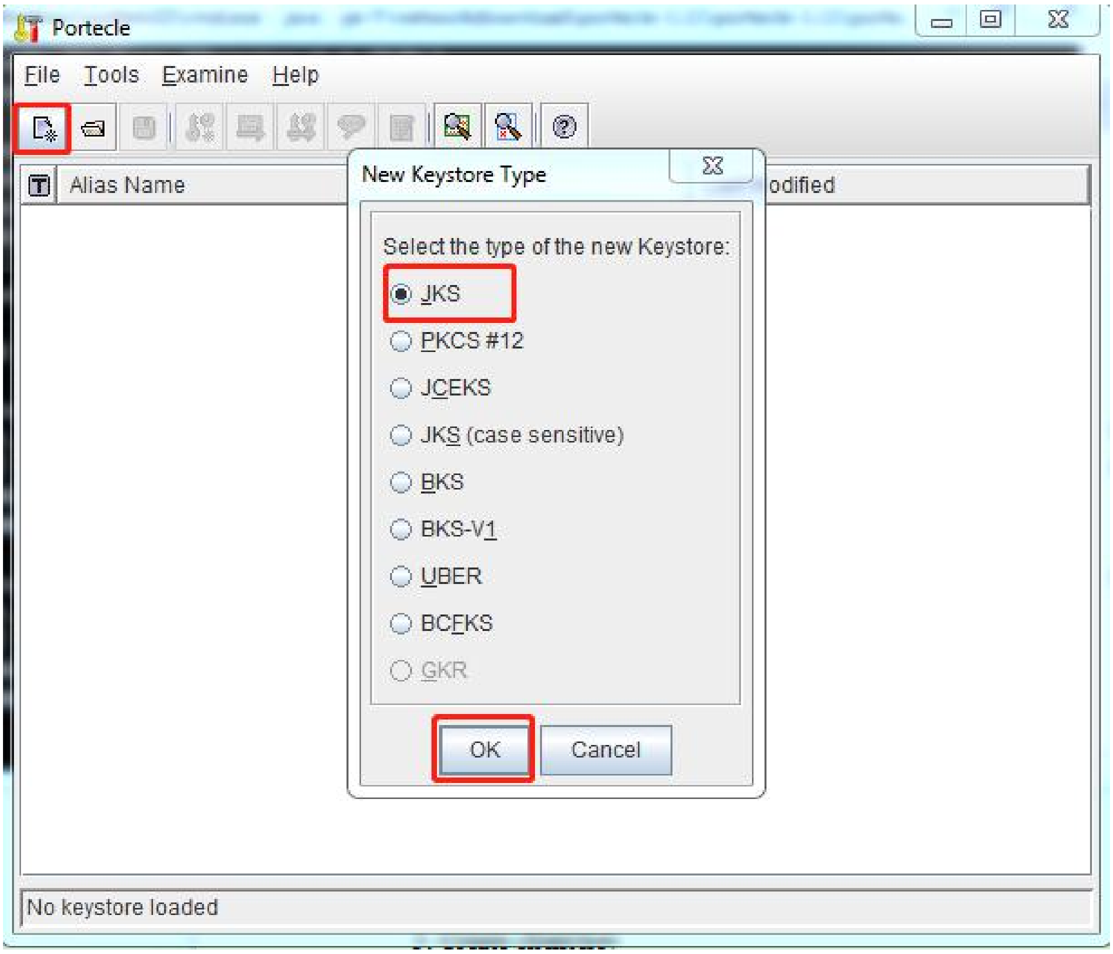
links and TLSv1.2 protocol.
The server-side key store: ks-server.jks and ts-server.jks
The ks-server.jks path: RemoteKeyInjectServer/ks-server.jks
The ts-server.jks path: RemoteKeyInjectServer/ts-server.jks

The client-side key store: ks-client.bks and ts-client.bks
The ks-client.bks path: KeyInjectDemo/app/src/main/assets/ks-client.bks
The ts-client.bks path: KeyInjectDemo/app/src/main/assets/ts-client.bks

Notice:
When the application running in production, please replace key store files to ensure security.

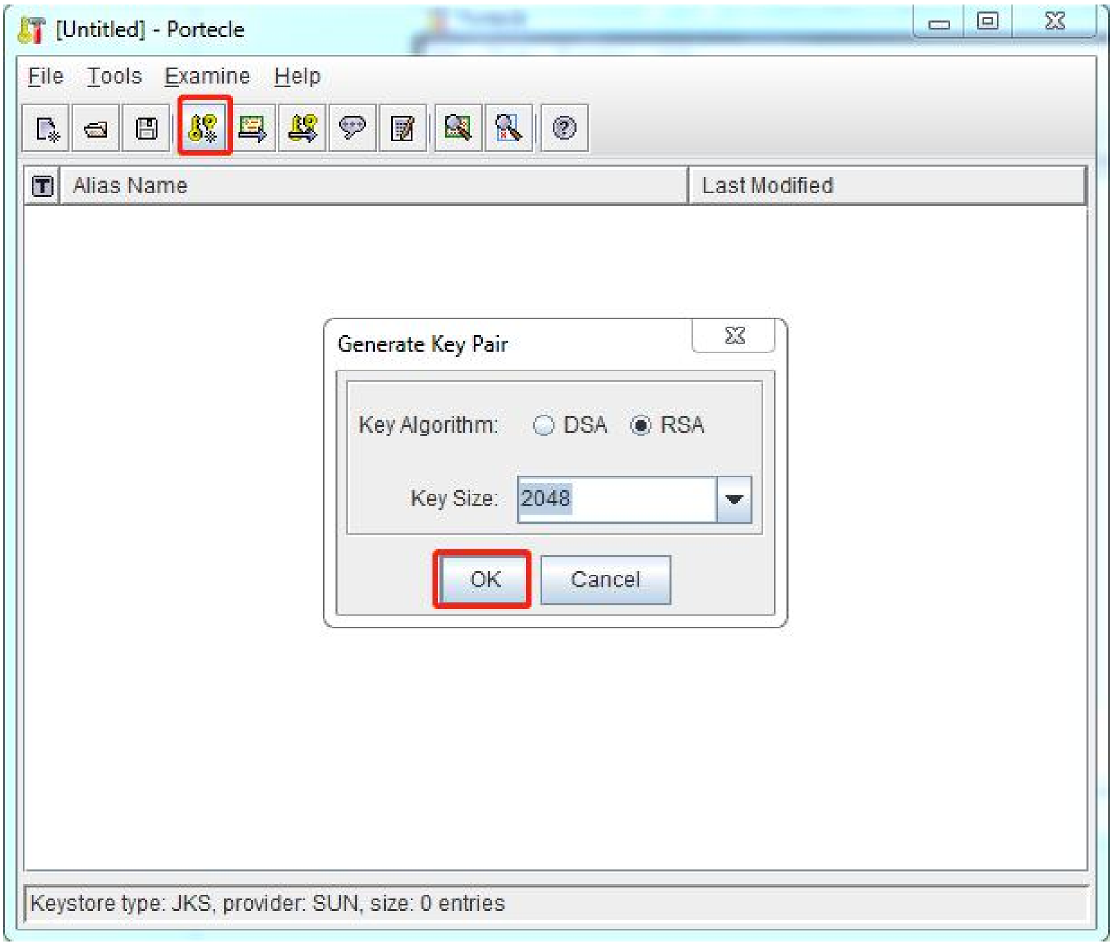
6.4.1 Portecle Usage

Key store tool recommendation: Portecle
Download url: https://sourceforge.net/projects/portecle/
Running tool: java -jar portecle.jar
1. Crate server-side key store: ks-server.jks
    This process create keystore that server project used.



Select the type of the new Keystore:
● JKS
○ PKCS #12
○ JCEKS
○ JKS (case sensitive)
○ BKS
○ BKS-V1
○ UBER
○ BCFKS
○ GKR

Figure 19.

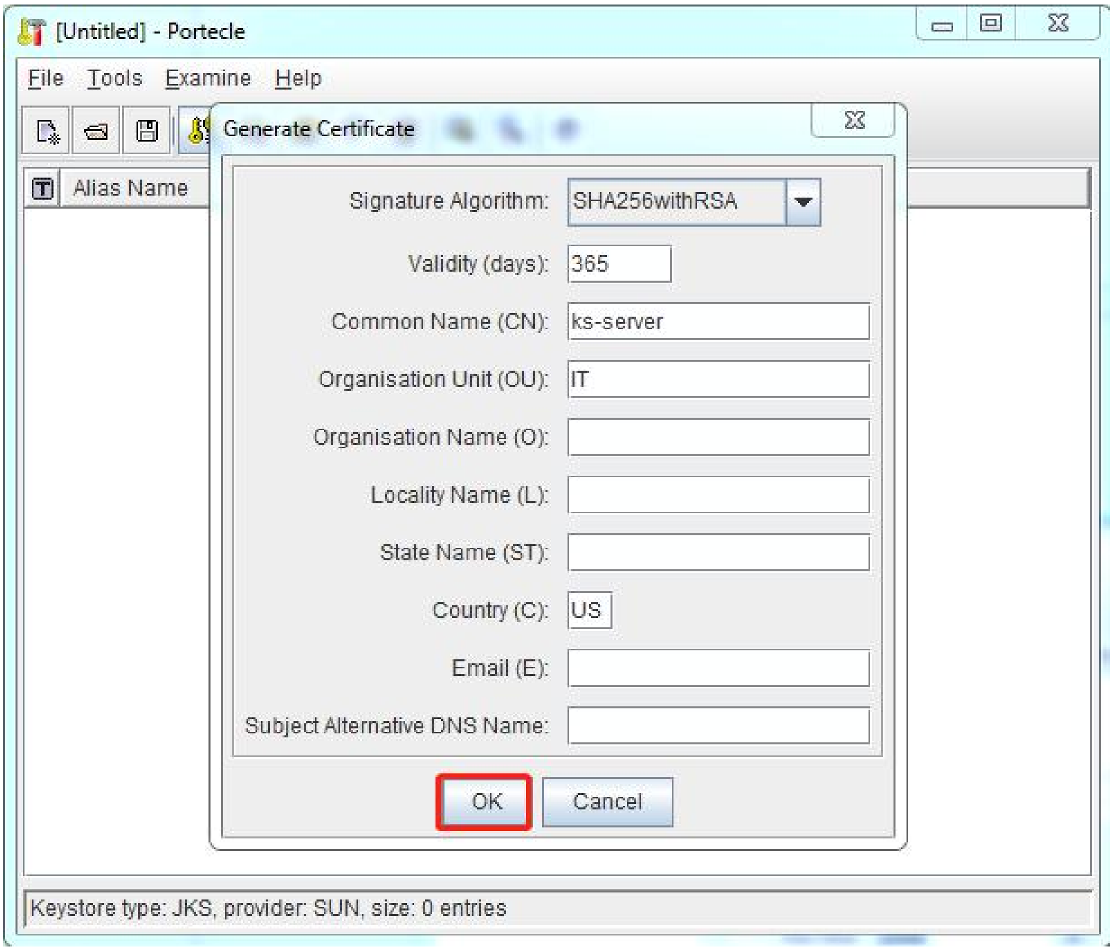


Key Algorithm: ○ DSA ● RSA

Key Size: 2048

Keystore type: JKS, provider: SUN, size: 0 entries

Figure 20.



Signature Algorithm: SHA256withRSA

Validity (days): 365

Common Name (CN): ks-server

Organisation Unit (OU): IT

Organisation Name (O):

Locality Name (L):

State Name (ST):

Country (C): US

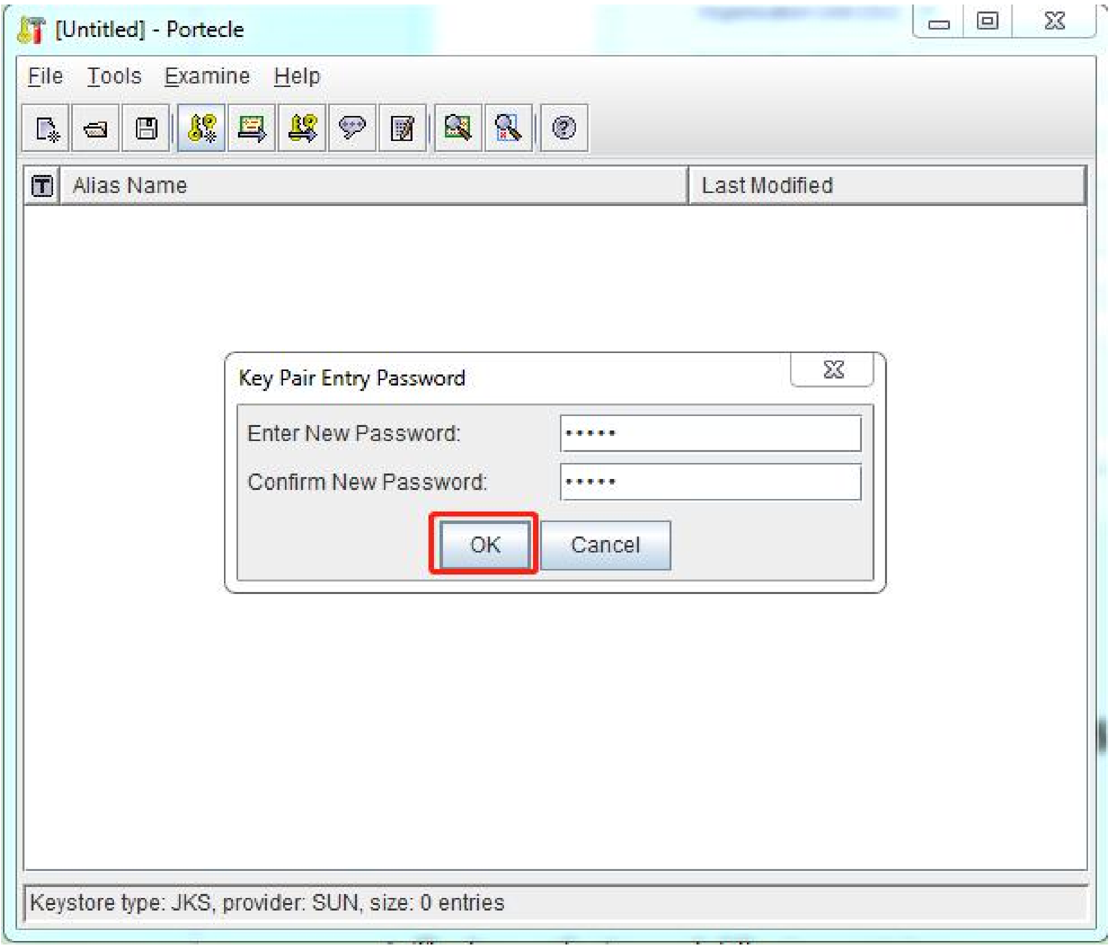
Email (E):

Subject Alternative DNS Name:

Keystore type: JKS, provider: SUN, size: 0 entries

Figure 21.

Edit the certificate contents at above picture:



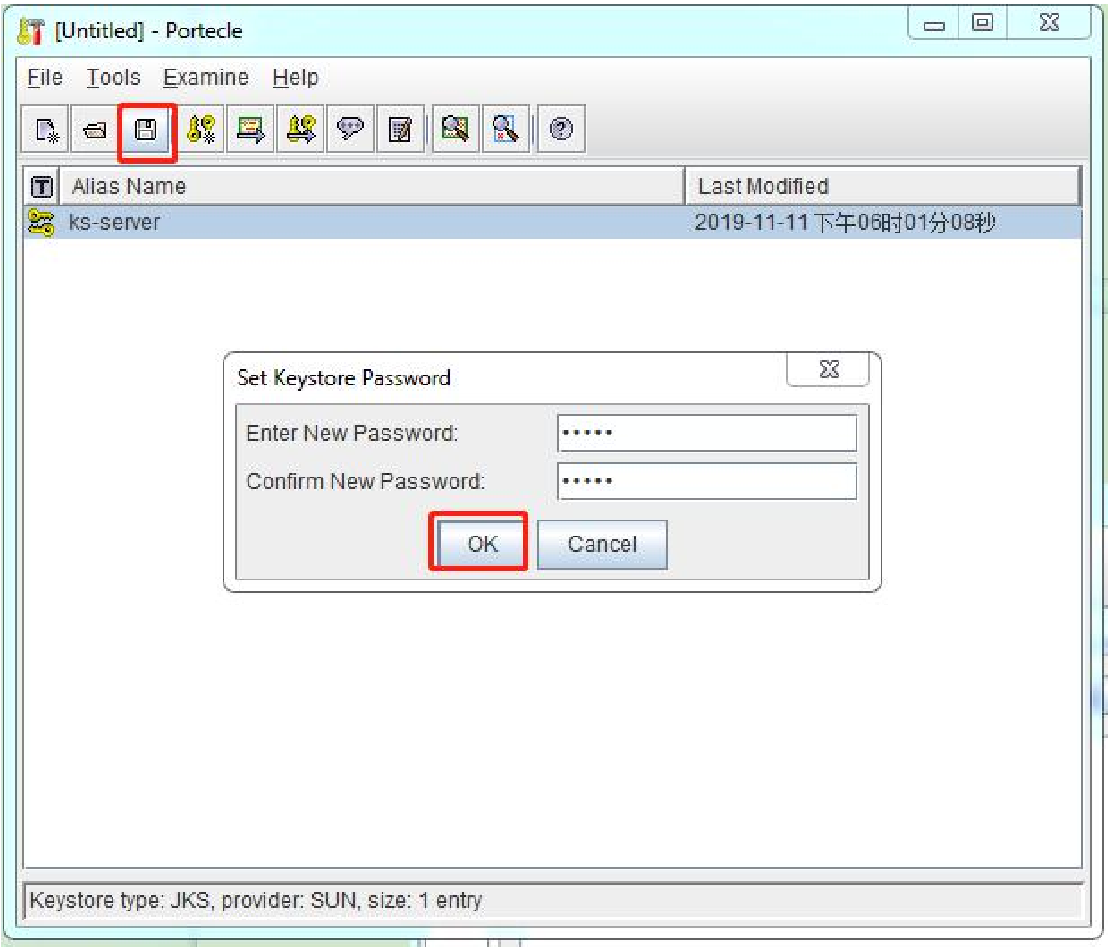
Enter New Password: •••••

Confirm New Password: •••••

Keystore type: JKS, provider: SUN, size: 0 entries

Figure 22.

ks-server.jks has created.



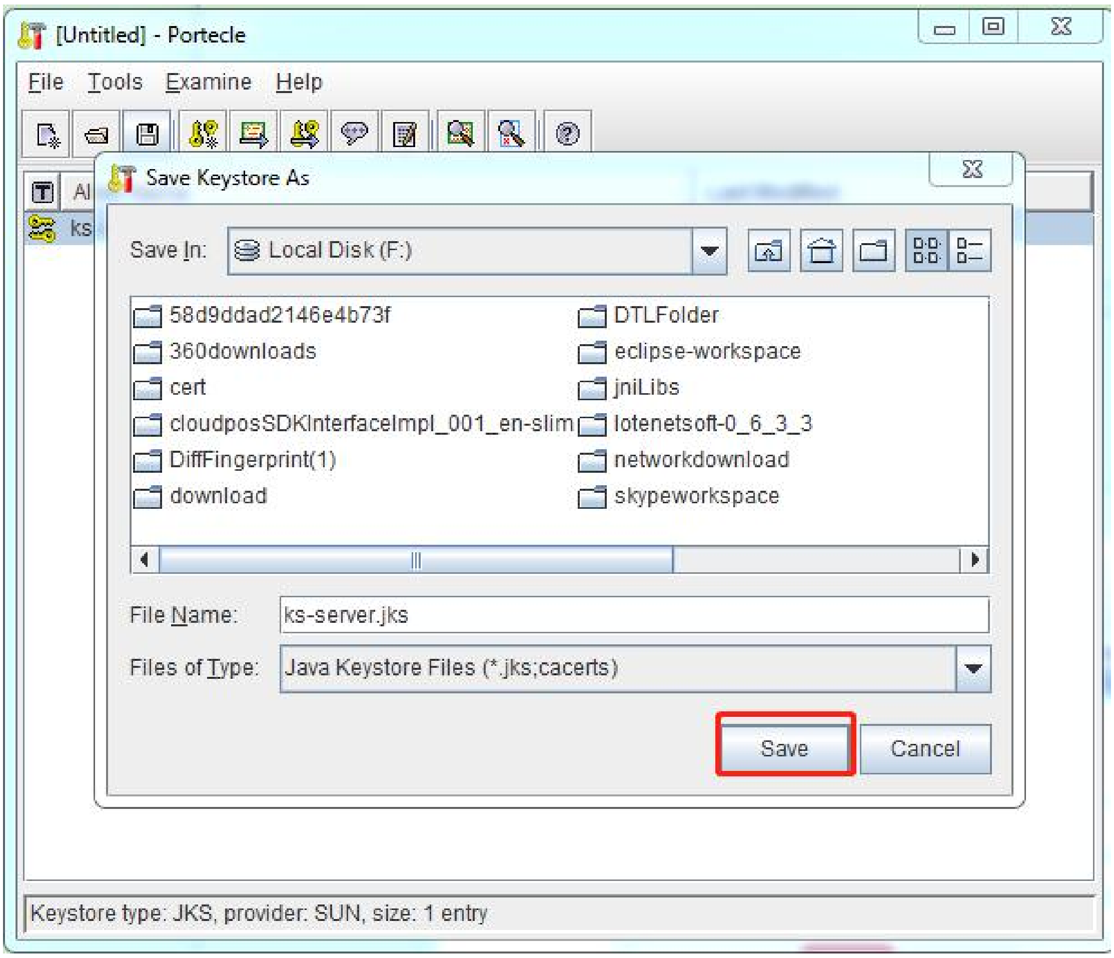
Alias Name	Last Modified
ks-server	2019-11-11 下午06时01分08秒

Enter New Password: •••••

Confirm New Password: •••••

Keystore type: JKS, provider: SUN, size: 1 entry

Figure 23.



Save Keystore As

Save In: Local Disk (F:)

58d9ddad2146e4b73f
360downloads
cert
cloudposSDKInterfaceImpl_001_en-slim
DiffFingerprint(1)
download
DTLFolder
eclipse-workspace
jniLibs
lotenetsoft-0_6_3_3
networkdownload
skypeworkspace

File Name: ks-server.jks

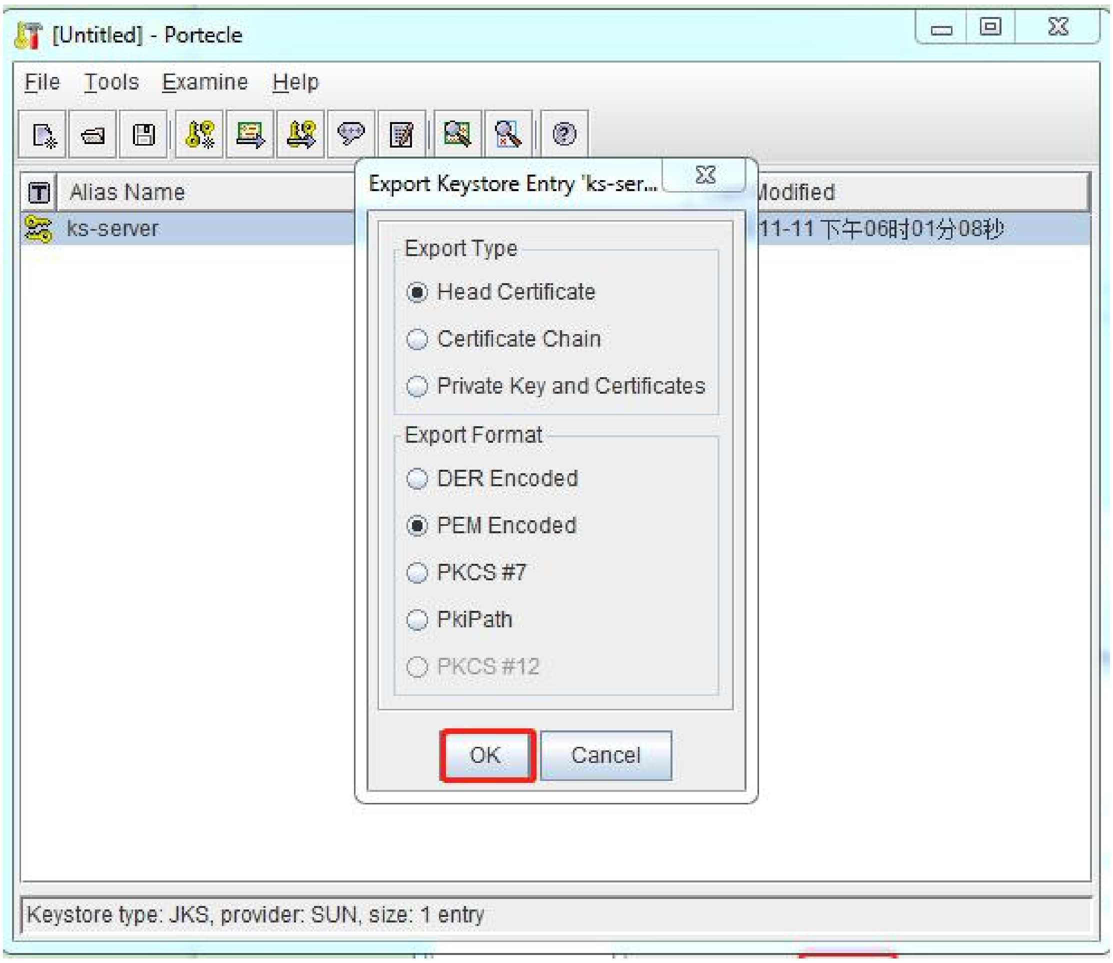
Files of Type: Java Keystore Files (*.jks;cacerts)

Keystore type: JKS, provider: SUN, size: 1 entry

Figure 24.

2. Create ts-client.bks

This process export certificate from server keystore, put it to trust store of client app. Right click ks-server, click export,



Export Type

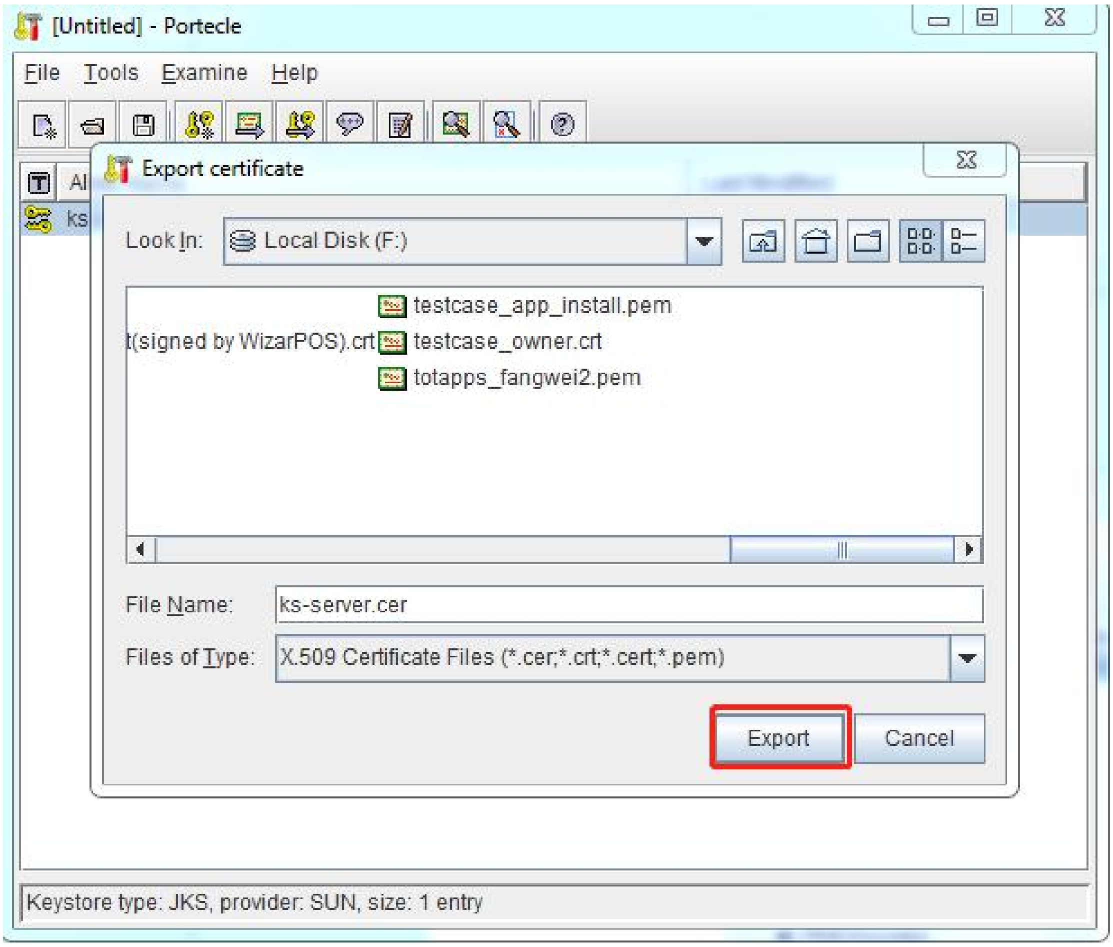
● Head Certificate
○ Certificate Chain
○ Private Key and Certificates

Export Format

○ DER Encoded
● PEM Encoded
○ PKCS #7
○ PkiPath
○ PKCS #12

Keystore type: JKS, provider: SUN, size: 1 entry

Figure 25.


[Untitled] - Portecle

Export certificate

Look In: Local Disk (F:)

testcase_app_install.pem

t(signed by WizarPOS).crt

testcase_owner.crt

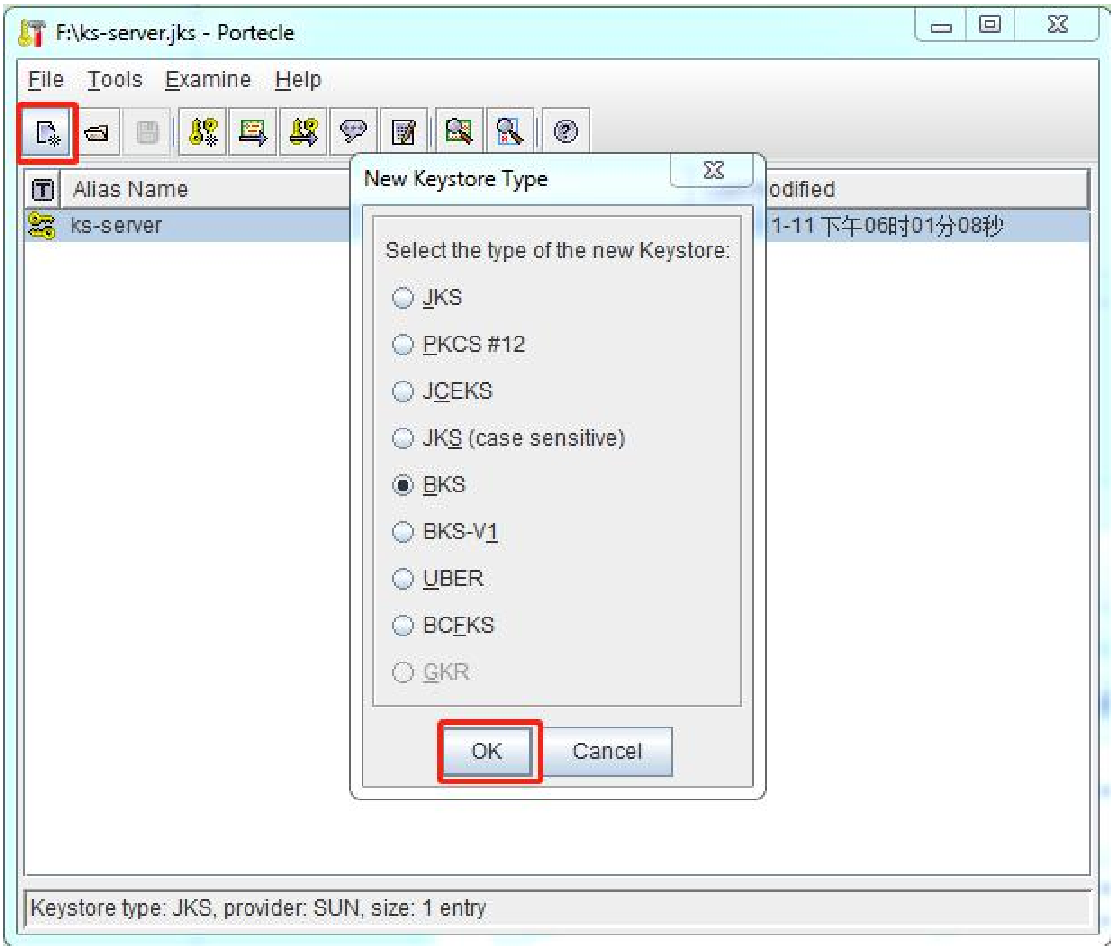
totapps_fangwei2.pem

File Name: ks-server.cer

Files of Type: X.509 Certificate Files (*.cer;*.crt;*.cert;*.pem)

Keystore type: JKS, provider: SUN, size: 1 entry

Figure 26.



Select the type of the new Keystore:

○ JKS

○ PKCS #12

○ JCEKS

○ JKS (case sensitive)

● BKS

○ BKS-V1

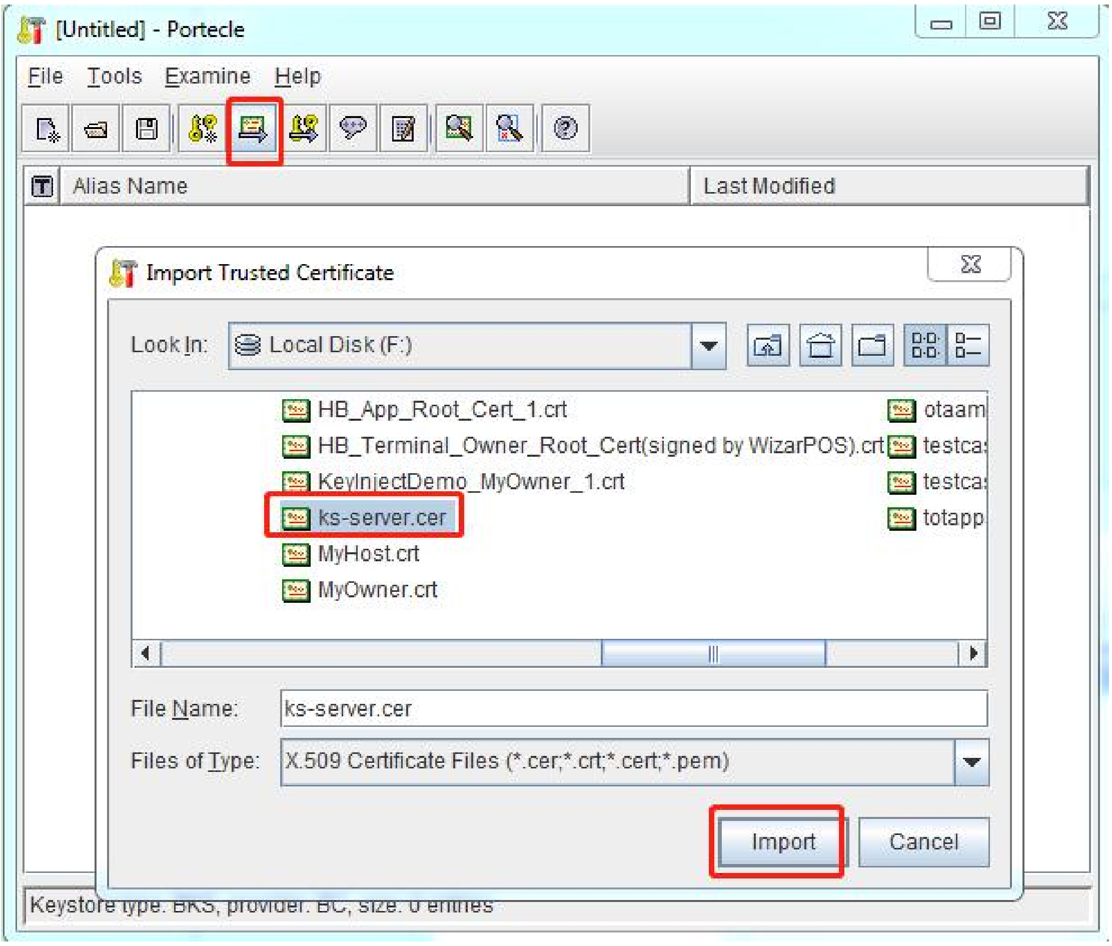
○ UBER

○ BCFKS

○ GKR

Keystore type: JKS, provider: SUN, size: 1 entry

Figure 27.

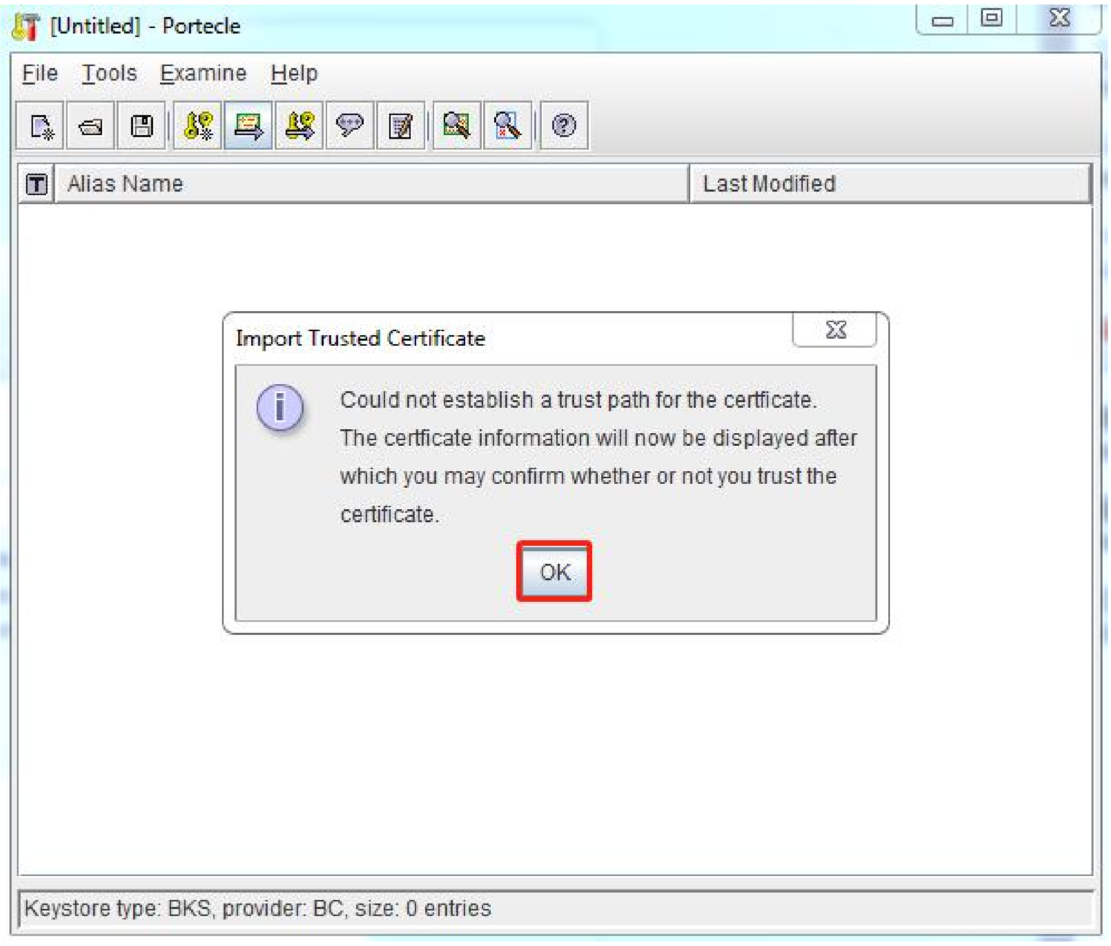


File Name: ks-server.cer

Files of Type: X.509 Certificate Files (*.cer;*.crt;*.cert;*.pem)

Keystore type: BKS, provider: BC, size: 0 entries

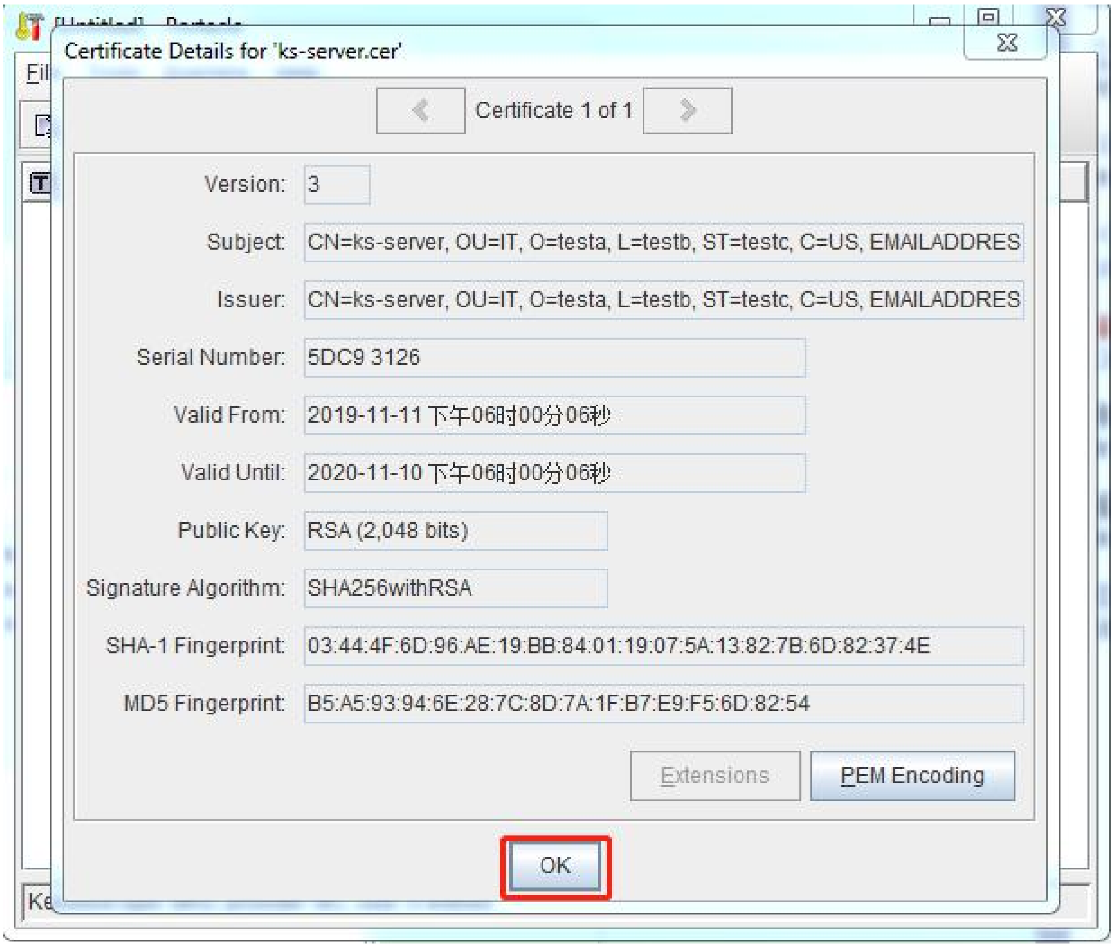
Figure 28.



Could not establish a trust path for the certficate. The certficate information will now be displayed after which you may confirm whether or not you trust the certificate.

Keystore type: BKS, provider: BC, size: 0 entries

Figure 29.



Certificate Details for 'ks-server.cer'

Version: 3

Subject: CN=ks-server, OU=IT, O=testa, L=testb, ST=testc, C=US, EMAILADDRES

Issuer: CN=ks-server, OU=IT, O=testa, L=testb, ST=testc, C=US, EMAILADDRES

Serial Number: 5DC9 3126

Valid From: 2019-11-11 下午06时00分06秒

Valid Until: 2020-11-10 下午06时00分06秒

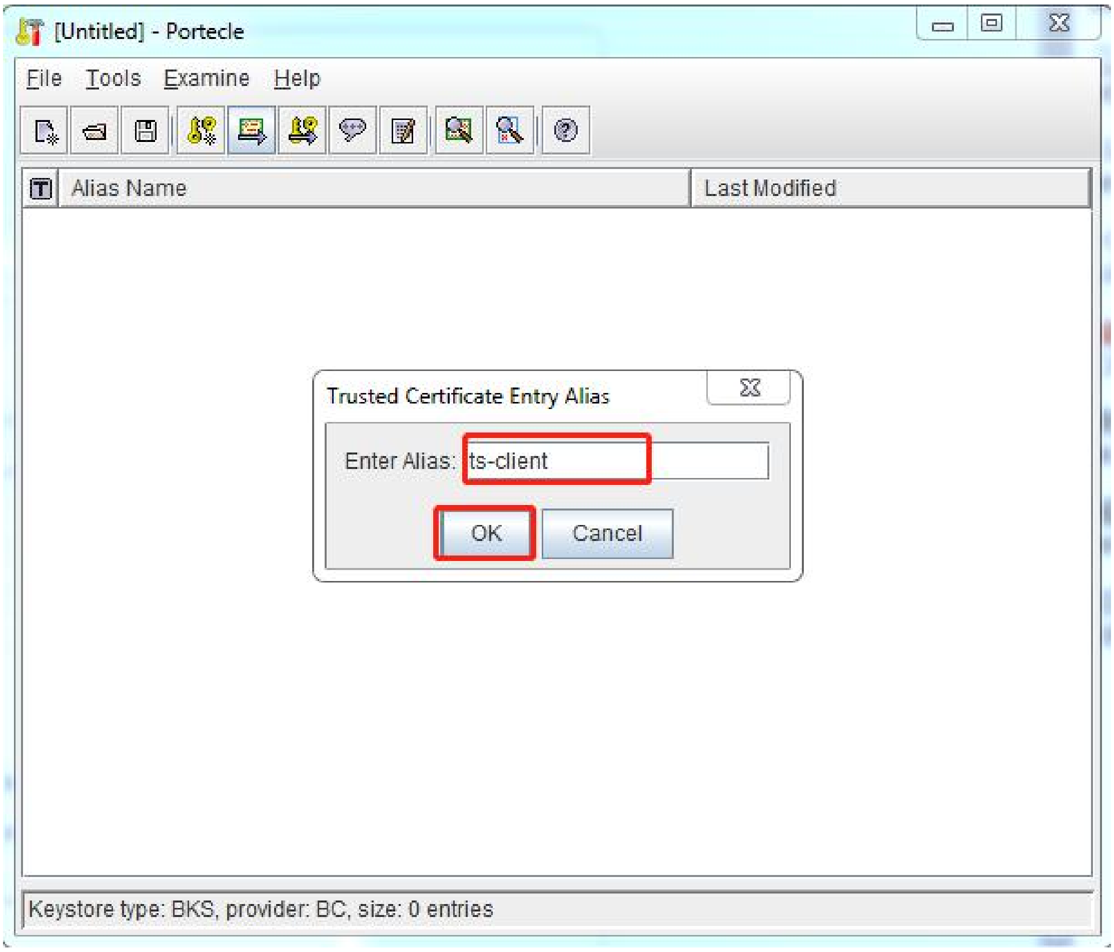
Public Key: RSA (2,048 bits)

Signature Algorithm: SHA256withRSA

SHA-1 Fingerprint: 03:44:4F:6D:96:AE:19:BB:84:01:19:07:5A:13:82:7B:6D:82:37:4E

MD5 Fingerprint: B5:A5:93:94:6E:28:7C:8D:7A:1F:B7:E9:F5:6D:82:54

Figure 30.



Enter Alias: ts-client

Keystore type: BKS, provider: BC, size: 0 entries

Figure 31.

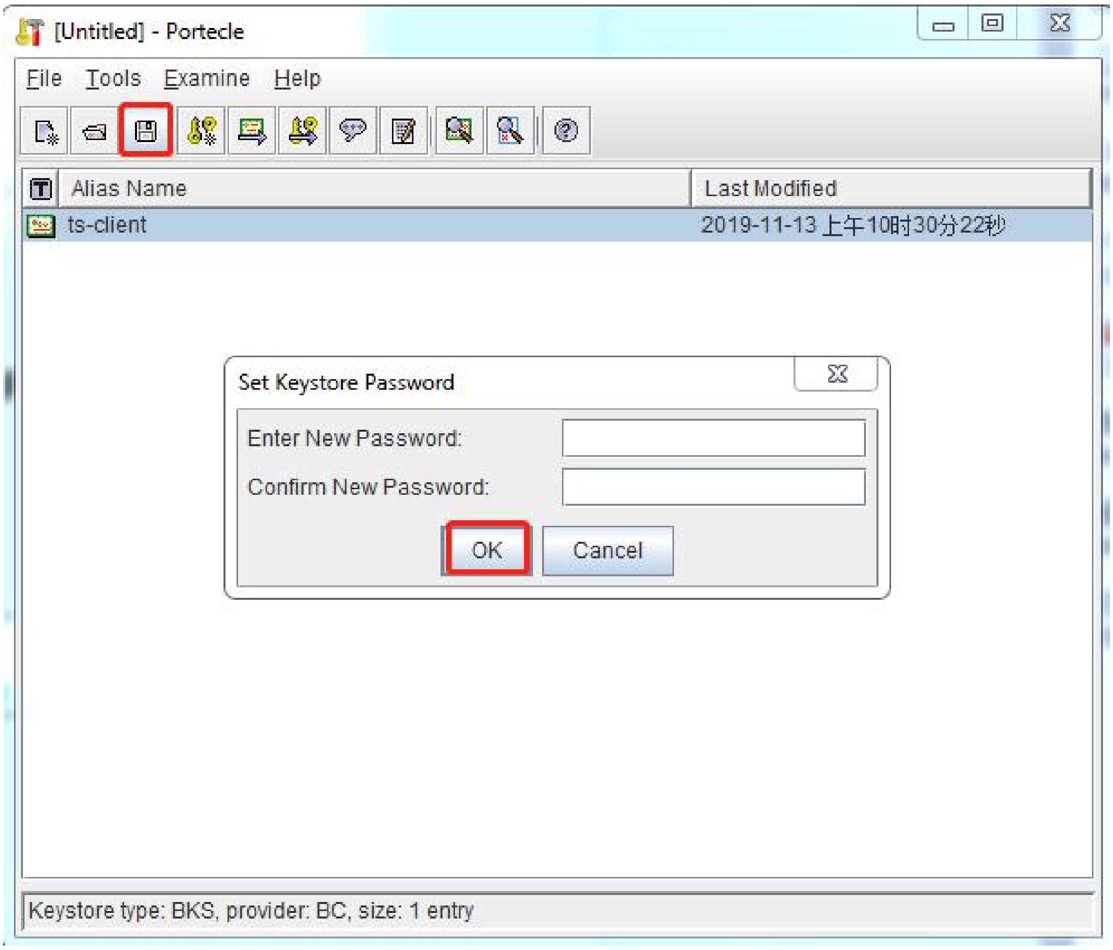
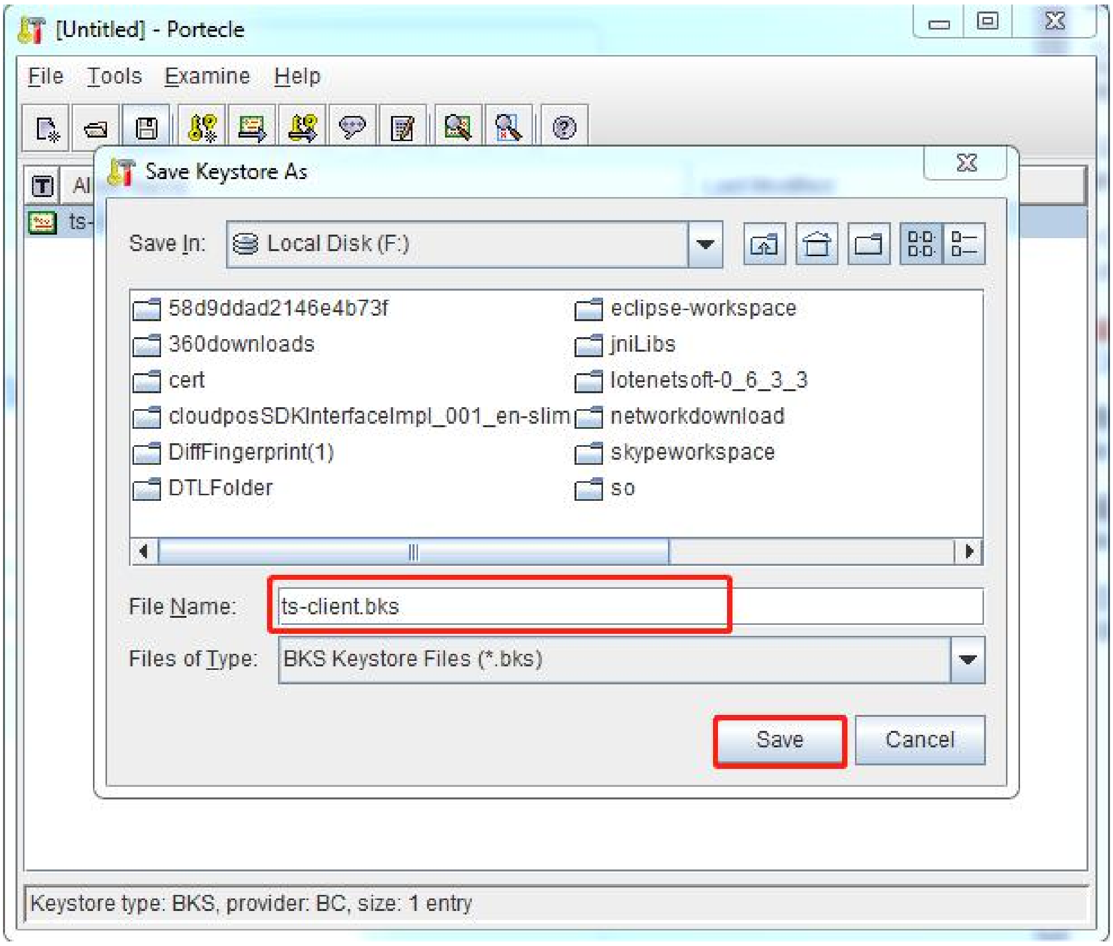

[Untitled] - Portecle
File Tools Examine Help
Alias Name
Last Modified
ts-client
2019-11-13 上午10时30分22秒
Set Keystore Password
Enter New Password:
Confirm New Password:
OK
Cancel
Keystore type: BKS, provider: BC, size: 1 entry

Figure 32.



Save In: Local Disk (F:)

File Name: ts-client.bks

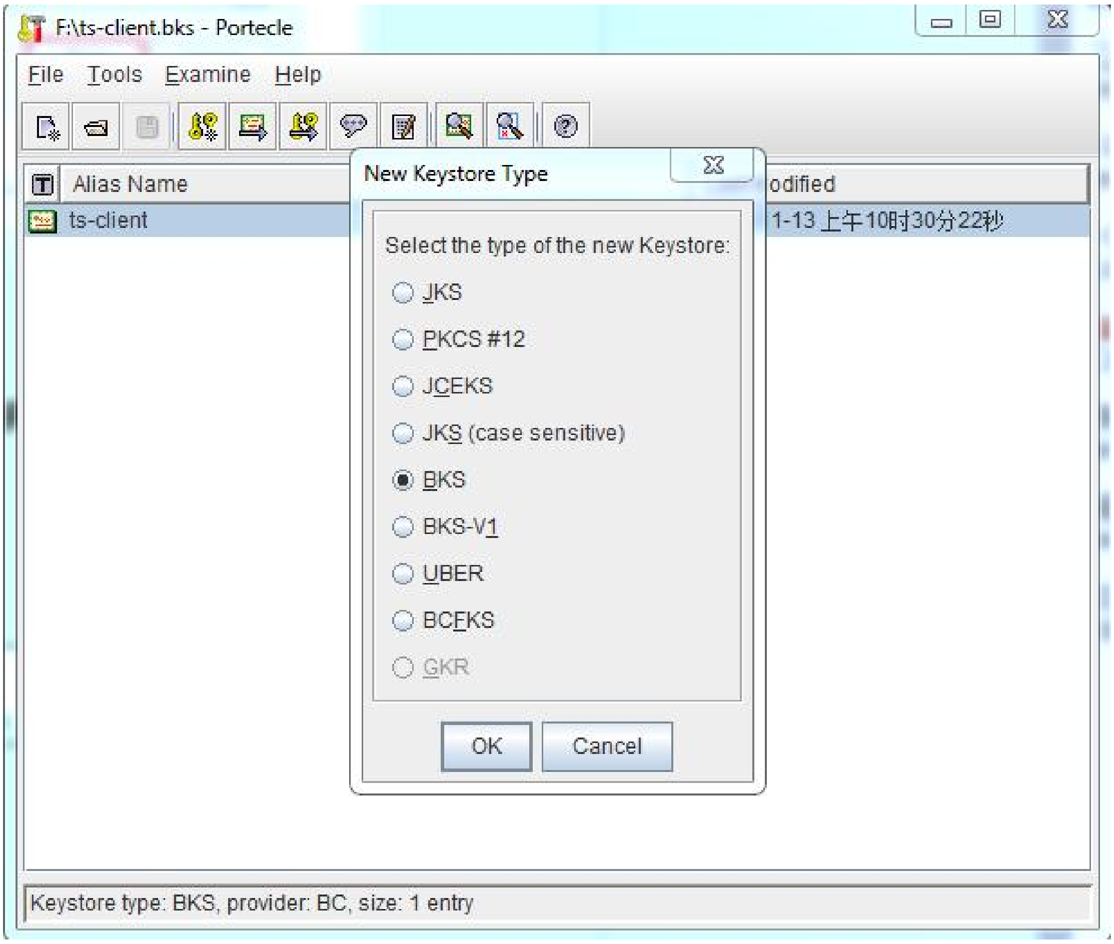
Files of Type: BKS Keystore Files (*.bks)

Keystore type: BKS, provider: BC, size: 1 entry

Figure 33.

3. Create client-side key store: ks-client.bks

This process create keystore that client app used.



Alias Name	odified
ts-client	1-13 上午10时30分22秒

New Keystore Type

Select the type of the new Keystore:

○ JKS
○ PKCS #12
○ JCEKS
○ JKS (case sensitive)
● BKS
○ BKS-V1
○ UBER
○ BCFKS
○ GKR

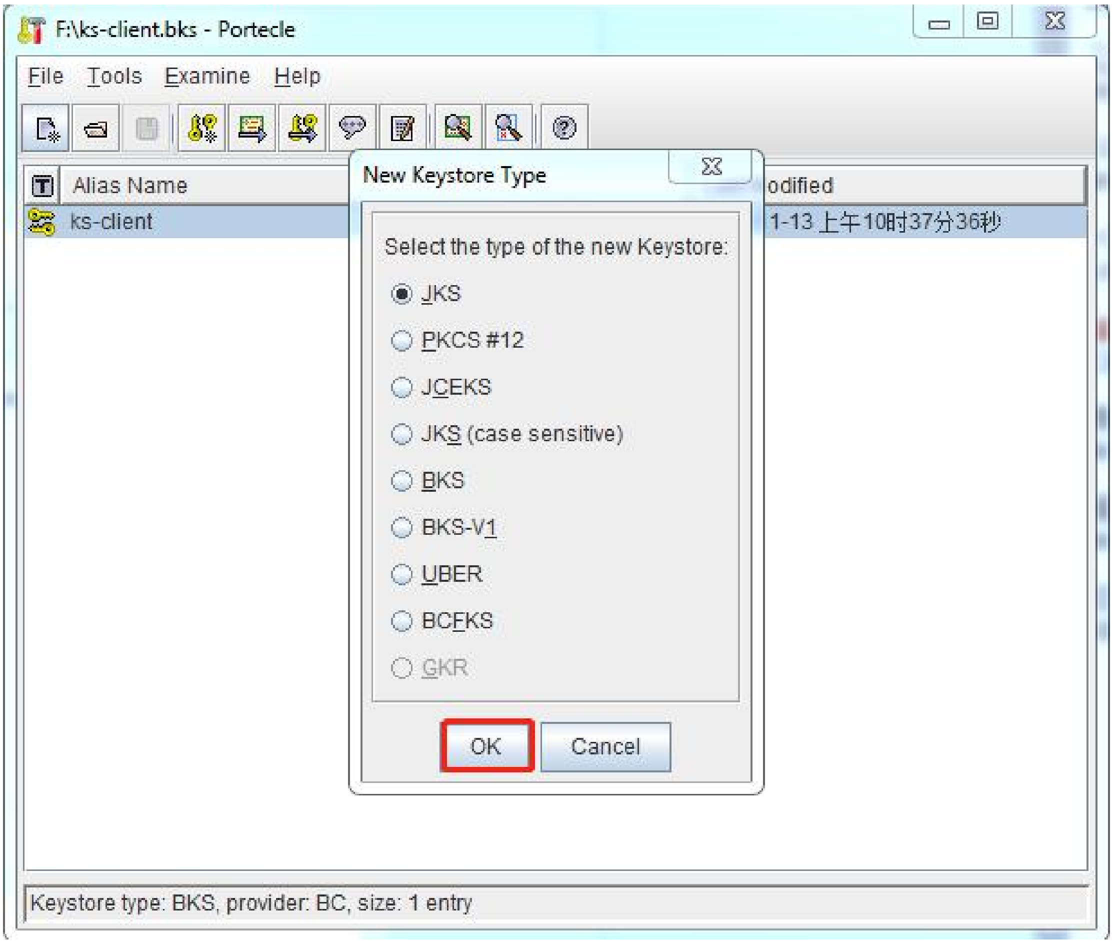
Keystore type: BKS, provider: BC, size: 1 entry

Figure 34.

Select BKS at this window, then click OK, the other process is like create ks-server.jks.

4. Create ts-server.jks

This process export the client certificate, put it to trust store of server project.



ks-client 1-13 上午10时37分36秒

New Keystore Type

Select the type of the new Keystore:

● JKS

○ PKCS #12

○ JCEKS

○ JKS (case sensitive)

○ BKS

○ BKS-V1

○ UBER

○ BCFKS

○ GKR

Keystore type: BKS, provider: BC, size: 1 entry

Figure 35.

Select JKS at this window, the other process is like Create ts-client.bks.

6.5 Agent in POS terminal (InjectKeyDemo)

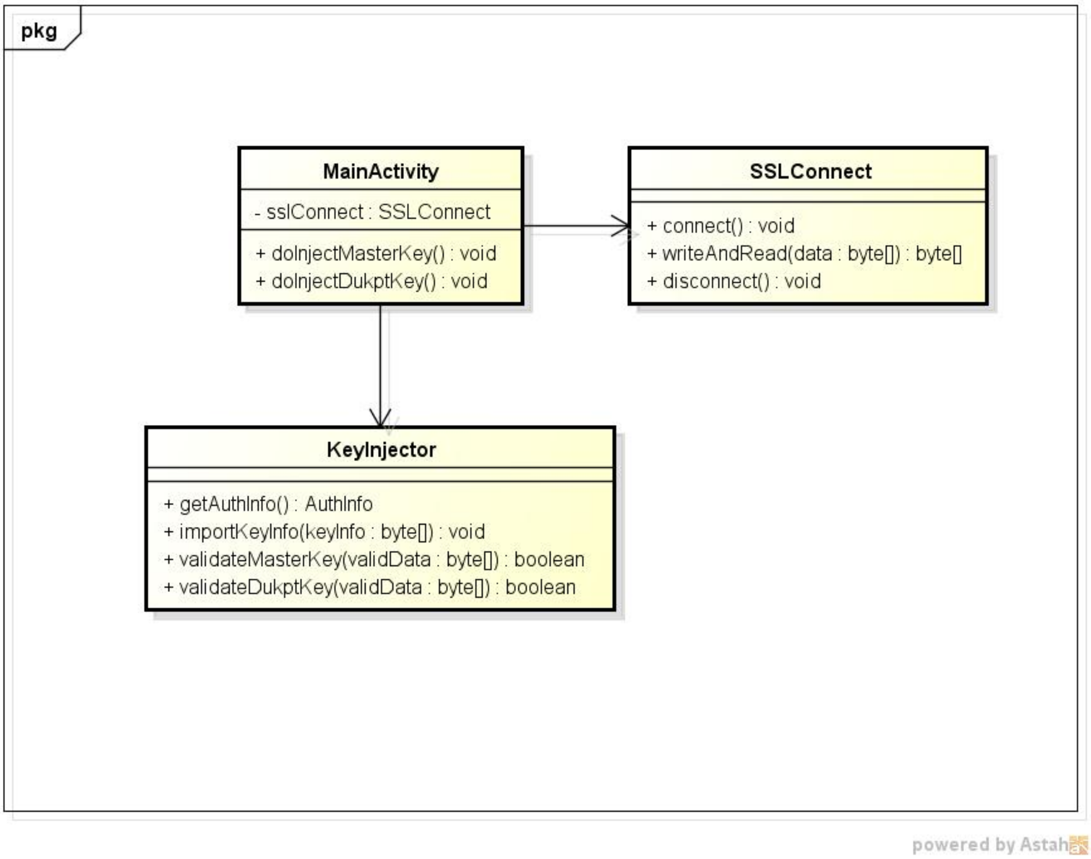
6.5.1 Manifest and Permissions

The demo application needs following permissions:

```
<!-- Access inject key service permission  -->
<uses-permission
android:name="android.permission.CLOUDPOS_REMOTE_KEY_INJECTION" />
```

6.5.2 Source Code Structure

The main class diagram


pkg
MainActivity
- sslConnect : SSLConnect
+ doInjectMasterKey() : void
+ doInjectDukptKey() : void
SSLConnect
+ connect() : void
+ writeAndRead(data : byte[]) : byte[]
+ disconnect() : void
KeyInjector
+ getAuthInfo() : AuthInfo
+ importKeyInfo(keyInfo : byte[]) : void
+ validateMasterKey(validData : byte[]) : boolean
+ validateDukptKey(validData : byte[]) : boolean
powered by Astah

MainActivity.java

It provides a demo UI which can operate by user.

Click “REQUEST INJECT MASTER KEY” will call doInjectMasterKey method.

Click “REQUEST INJECT TRANSPORT KEY” will call doInjectTransportKey method.

Click “REQUEST INJECT DUKPT KEY” will call doInjectDukptKey method.

SSLConnect.java

It provides a secure connection to remote inject server. If you want to running application and connect to your own remote inject server, you must modify the host and port information in SSLConnect.java. Such as:

```
// Change to your own host address
private String host = “121.199.23.212”;
// Change to your own host port
private int port = 11060;
```

The aidl interface, IKeyLoaderService provides an enter to operate PIN Pad. Example code:

```
interface IKeyLoaderService {
    int importKeyInfo(in byte[] keyInfo);
    byte[] getAuthInfo();
}
//bind aidl service
private boolean startInjectKeyService(Context context){
    ComponentName comp = new ComponentName(
            "com.wizarpos.security.injectkey",
            "com.wizarpos.security.injectkey.service.MainService");
    boolean isSuccess = startConnectService(this,comp, this);
    return isSuccess;
}
protected synchronized boolean startConnectService(Context context, ComponentName comp,
ServiceConnection connection) {
        Intent intent = new Intent();
        intent.setPackage(comp.getPackageName());
        intent.setComponent(comp);

        boolean isSuccess = context.bindService(intent, connection,
Context.BIND_AUTO_CREATE);
        Logger.debug("(%s)bind service (%s, %s)", isSuccess, comp.getPackageName(),
comp.getClassName());
        return isSuccess;
    }
```

6.6 Host Application(RemoteKeyInjectServer)

6.6.1 Main data structure

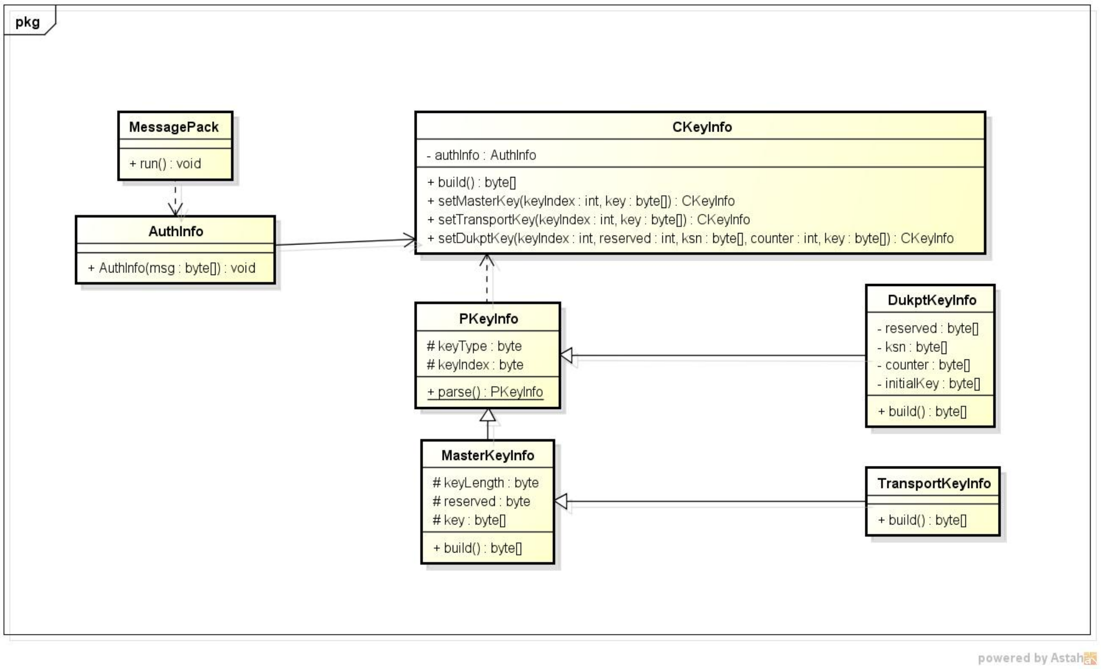


Figure 36.

MessagePack.java

It’s the enter class that communication with POS terminal.

AuthInfo.java

There is an same name AuthInfo file in host with Agent in POS terminal. It’s used to parse auth info from POS terminal. The class file full name: **com.cloudpos.rki.pinpad.AuthInfo**.

Example:

```
byte[] data = {};
```

```
AuthInfo authInfo = new AuthInfo(data);
```

CKeyInfo.java

Create cipher key info such as master key that will be injected into POS terminal can use **CKeyInfo**. The class file full name: **com.cloudpos.rki.pinpad.CKeyInfo**

Example about master key:

```
CKeyInfo cKeyInfo = new CKeyInfo(authInfo);
byte[] data = cKeyInfo.setMasterKey(keyIndex, key).build();
```

Example about dukpt key:

```
CKeyInfo cKeyInfo = new CKeyInfo(authInfo);
byte[] data = cKeyInfo.setDukptKey(keyIndex, ksn, int counter, key).build();
```

6.6.2 Configuration file

Path: RemoteKeyInjectServer/config.properties

Content

```
# Inject server port
localPort=11060

# The ssl key store
keystore.path=ks-server.jks
keystore.pass=wizarpos

# The ssl trust key store
truststore.path=ts-server.jks
truststore.pass=wizarpos

# PINPad key store
pinpad.keystore=MyHostSelf.p12
pinpad.keystore.passwd=myhost
pinpad.key.alias=MyHostSelf
pinpad.key.passwd=myhost

# key length
key.len.q2=32
key.len.q1v2=32
key.len.k2=32
```

7 POS terminal Key Injection API Guide

7.1 Key Injection AIDL Java API

7.1.1 getAuthInfo

byte[] getAuthInfo()

This API let the application to get the authentication information buffer from HSM module. The AuthInfo buffer format is described below.

Field	PubKeyP Length	PubKeyP	Random	SN length	SN	Signature
Length (byte)	4	4096	32	1	31	256

PubKeyP Length: 4 bytes little-endian. It’s the real length of the contents in next PubKey field.

PubKeyP: Fixed 4096 bytes buffer to store the PubKey in simple certificate in PEM format.

Random: Fixed 32 bytes random number.

SN Length: The real length of contents in next SN field.

SN: Fixed 31 bytes buffer to store the SN.

Signature: Fixed 256 bytes buffer to store the signature.

7.1.2 importKeyInfo

int importKeyInfo(in **byte**[] KeyInfo)

This API let the application to import the KeyInfo which is transferred from Host.The KeyInfo buffer format is described below.

Field	PubKeyH Length	PubKeyH	Random	Cipher KeyInfo	Signature
Length (byte)	4	4096	32	256	256

PubKeyH Length: 4 bytes little-endian. It’s the real length of the contents in next PubKey field.

PubKeyH: Fixed 4096 bytes buffer to store the Host public key in simple certificate in PEM format.

Random: Fixed 32 bytes random number.

Cipher KeyInfo: The fixed 256 bytes buffer. It store the cipher text of the KeyInfo data, which is encrypted by POS terminal public key. The plain text of the KeyInfo buffer has two format. The format depends on the first byte(KeyType) of the KeyInfo:

KeyType=1. DUKPT schema:

Field	KeyType	KeyIndex	Reserved	KSN	Counter	Initial Key
Length (byte)	1	1	2	8	4	16

KeyType: 1 means DUKPT key.

KeyIndex: The index number of this DUKPT key. We support 3 suit of DUKPT.

KSN: The Initially Loaded Key Serial Number.

Counter: The initially counter.

Initial Key: The initially loaded PIN entry device key.

Reserved: Two bytes, byte[1] is for key usage, 0:PIN Key, 1:MAC Key, 2:Data Key, byte[0] is reserved. From our demo server, we set 0xFF, that means, the dukpt key has not designated use, so you can use it to calculate pinblock, or mac....

KeyType=2, 3. Master Key/Session schema:

Field	KeyType	KeyIndex	Key Length	Reserved	Key
Length (byte)	1	1	1	1	24/32

KeyType: 2 means master key, 3 means transport key.

KeyIndex: The index of this master key. We support 10 suit of master key/session key.

Key Length: The real length of the Key field. It can be 16 or 24.

Key: The fixed 24 or 32 bytes buffer to store master key or transport key. For Q1-4G and Q2/K2, the length is 32, for Q1, the length is 24.

Reserved: Not used, please set 0.

Signature: Fixed 256 bytes buffer to store the signature of the Random + Cipher KeyInfo.

7.2 Permission

To access the key injector API, the application should declare the proper permission in its AndroidManifest file.

```
<!--  Access inject key service permission -->
<uses-permission android:name="android.permission.CLOUDPOS_REMOTE_KEY_INJECTION"/>
```