ssl_ca实验过程

注意：centos系统会报错，建议换一个环境。

1 创建自签名根CA密钥

运行脚本./new-root-ca.sh，产生CA密钥（私钥）ca.key。输入身份信息，产生自签名证书ca.crt

自签名SSL证书是指用户自己利用工具创建的证书，而不是通过受信任的CA机构签发.

其中`Enter pass phrase for ca.key:yjqlovemhy`

```
root@hspEdu01 /u/l/ssl.ca-0.1# ./new-root-ca.sh
No Root CA key round. Generating one
Generating RSA private key, 1024 bit long modulus
..........................++++++
............++++++
e is 65537 (0x10001)
Enter pass phrase for ca.key:
Verifying - Enter pass phrase for ca.key:

Self-sign the root CA...
Enter pass phrase for ca.key:
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.
-----
Country Name (2 letter code) [MY]:CN
State or Province Name (full name) [Perak]:ShanXi
Locality Name (eg, city) [Sitiawan]:XiAn
Organization Name (eg, company) [My Directory Sdn Bhd]:XiAn JiaoTong University
Organizational Unit Name (eg, section) [Certification Services Division]:XJTU
Common Name (eg, MD Root CA) []:MD Root CA
Email Address []:XJTU@163.com

```

产生密钥文件`ca.key`:

```
[root@localhost ssl.ca-0.1]# cat ca.key
-----BEGIN RSA PRIVATE KEY-----
Proc-Type: 4,ENCRYPTED
DEK-Info: DES-EDE3-CBC,26B4E4F966062B51

```

```
ur0MSp/bd+tNiQp2hByHhrIPXNbCQtSUWtYxcaRVSPiIneQUZfa04RPd2v9CDrgd
gcDlTjF6vUfXhqJRFghGy16ayriqOyqLDrQwQ+4d6yC/K8F0AWDp1eWKiYB5uopI
u2JeOedsnYvju4w8vr/7TqGTqChq1sEDky6LEhOr36qjBoMqhdb1UeJ1Yf4H4OH7
Bt4uD+ddhZMr87mmHLShDrs1OvxqfK1pEdAjTFr1Mk/RD/z/FcrZF3rRfWcXpsLe
cxQVLRHBHVVhr5uQC9g2INBWocmtt/m28eweRLuD2/gObQH9CZuc5+Y8WyawnlYU
LXxf5dnIyI4eC7vfKconBQnueikpz2sW3W8Ejsqu1K5TVhErlPZ50/9eir2Rn9rA
D9zahmhOzBNaAElNZMTUlxL2v9tDmwm9h1fZsn1K/dSN/AB6jmUjLV26PGhOWNpE
TPzuovp2O0MSfR/98l+IbXNM8XBCaF9Gt/nqb5xTtqLJDTEk20RIIl4BFsEoHkIX
y5w/n6E8G/cSw/rWTJg4KiymW1xsmACJV197dYZauhN72T+7eBN6n96Pncx2z9Nw
R2gTRvq576Za6teki6APt7PQQy091xW1N/FUEClXsqVAhxypeoaKw6iPwiPL7dof
d9HVl6IJZR+Y6fvTysSgJUCMmiLhC0IcamH8dfd0NAk1i6Ph1orntwEWnqoaFJJz
178MsgSvPAlQ6R61s94NuovaIUM8NmAsyQQZBSDlC3JRhOzZa/u19/CjAAWiq4Q9
xRlhbbkmbZdVX2Pn2u+K358yxZQmomXaV1F56sGYAE3TR+iEDc4K1A==
-----END RSA PRIVATE KEY-----
```

产生自签名证书文件`ca.crt`：

```
[root@localhost ssl.ca-0.1]# cat ca.crt
-----BEGIN CERTIFICATE-----
MIIC1DCCAj2gAwIBAgIJAJ2o/f8qIV9RMA0GCSqGSIb3DQEBBQUAMIGRMQswCQYD
VQQGEwJDTjEPMA0GA1UECBMGU2hhblhpMQ0wCwYDVQQHEwRYaUFuMSEwHwYDVQQK
ExhYaUFuIEppYW90b25nIFVuaXZlcnNpdHkxDTALBgNVBAsTBFhKVFUxEzARBgNV
BAMTCk1EIFJPT1QgQ0ExGzAZBgkqhkiG9w0BCQEWDHhqdHVAMTYzLmNvbTAeFw0y
MjA2MDcxNjAwMTBaFw0zMjA2MDQxNjAwMTBaMIGRMQswCQYDVQQGEwJDTjEPMA0G
A1UECBMGU2hhblhpMQ0wCwYDVQQHEwRYaUFuMSEwHwYDVQQKExhYaUFuIEppYW90
b25nIFVuaXZlcnNpdHkxDTALBgNVBAsTBFhKVFUxEzARBgNVBAMTCk1EIFJPT1Qg
Q0ExGzAZBgkqhkiG9w0BCQEWDHhqdHVAMTYzLmNvbTCBnzANBgkqhkiG9w0BAQEF
AAOBjQAwgYkCgYEAwlVcUH5WmnB5n70EjguZMe03PIu1tnPoVsZHDl8GYNl2HsVz
B04Pj7Cc6ONxX+o4aMqGXcXumwyqLX59w9aUvxmLjyHbEz1Oga7+vSnFahXVcx67
fYO3i1YBBA2MvEG7WesXZVo8ftsOpmyqHOX85h/JC+ZW2X9CR1NpqLdS5xECAwEA
AaMyMDAwDwYDVR0TAQH/BAUwAwEB/zAdBgNVHQ4EFgQUsdqZ7dfhXZBryRRWcv3O
W/8lZQEwDQYJKoZIhvcNAQEFBQADgYEAJH6Kq5w1Tkwe2RXcPHni4ThVSV1ay+BA
IrFGKGLDu+jFZA/j0Qh90+zeJydyFoLcUgbBBtAHgI104wowTx5KuD3200AK/oxi
yLPUHuERFam/LdXAAdUH3CMnQSOo9PChBDcJGipjgncC2QFJMqweEs1vh7+QyOvF
kEMYRaC1a7A=
-----END CERTIFICATE-----
```

2　创建服务器证书

使用`/new-server-cert.sh www.yjqlovemhy.com`命令，产生服务器密钥；输入身份信息，产生自签名证书。

```
root@hspEdu01 /u/l/ssl.ca-0.1# ./new-server-cert.sh www.yjqlovemhy.com
No www.yjqlovemhy.com.key round. Generating one
Generating RSA private key, 1024 bit long modulus
...++++++
..........++++++
e is 65537 (0x10001)

Fill in certificate data
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.
-----
Country Name (2 letter code) [MY]:CN
State or Province Name (full name) [Perak]:ShanXi
Locality Name (eg, city) [Sitiawan]:XiAn
Organization Name (eg, company) [My Directory Sdn Bhd]:shiji
Organizational Unit Name (eg, section) [Secure Web Server]:sj
Common Name (eg, www.domain.com) []:www.yjqlovemhy.com
Email Address []:yjqlovemhy@163.com

You may now run ./sign-server-cert.sh to get it signed
```

自签名证书文件`www.yjqlovemhy.com.csr`中的信息如下：

```
[root@localhost ssl.ca-0.1]# cat www.yjqlovemhy.com.csr
-----BEGIN CERTIFICATE REQUEST-----
MIIB/TCCAWYCAQAwgYoxCzAJBgNVBAYTAkNOMQ8wDQYDVQQIEwZTaGFuWGkxDTAL
BgNVBAcTBFhpQW4xDjAMBgNVBAoTBVNoaUppMQswCQYDVQQLEwJTSjEbMBkGA1UE
AxMSd3d3LnlqcWxvdmVtaHkuY29tMSEwHwYJKoZIhvcNAQkBFhJ5anFsb3ZlbWh5
QDE2My5jb20wgZ8wDQYJKoZIhvcNAQEBBQADgY0AMIGJAoGBAM09Ynu/2TzFVg0v
+lu/bDPfSWJ5Fg/ajq94PZya7LpxwwZIEyusdjw7J4pwFyehrAPxmyiLI5g16peG
t+/jUi3Ai+X8uWqgsFiFQpKoBSW+UnguJMhZlyuzlysvjUEB8nTWpG6Sl3KPneOp
ElymrSO3i47ZnbGFtEBRb5VO27lvAgMBAAGgMjAwBgkqhkiG9w0BCQ4xIzAhMBEG
CWCGSAGG+EIBAQQEAwIGQDAMBgNVHRMBAf8EAjAAMA0GCSqGSIb3DQEBBQUAA4GB
AIQrp/fe+gIsqWp8eYjJtzBoQynwF8hbHMzSHe2SiUO1Wj7GwwIWJQJpYvbX1vNj
ClF0QKFkPdGf/JUMv48EzkBehQVhtP8+Ewr95Z53LzUmAZ3Ocd2X1Ob6R1w8KdNh
NJqR5Q3s5Vync5xk6RhWtUF5V3uynIr8TuWNPGGoM0aK
-----END CERTIFICATE REQUEST-----
```

3 签署服务器证书

使用`./sign-server-cert.sh  www.yjqlovemhy.com`，CA给服务器www.yjqlovemhy.com颁发证书。

```
[root@localhost ssl.ca-0.1]# ./sign-server-cert.sh  www.yjqlovemhy.com
CA signing: www.yjqlovemhy.com.csr -> www.yjqlovemhy.com.crt:
Using configuration from ca.config
Enter pass phrase for ./ca.key:
Check that the request matches the signature
```

```
Signature ok
The Subject's Distinguished Name is as follows
countryName           :PRINTABLE:'CN'
stateOrProvinceName   :PRINTABLE:'ShanXi'
localityName          :PRINTABLE:'XiAn'
organizationName      :PRINTABLE:'ShiJi'
organizationalUnitName:PRINTABLE:'SJ'
commonName            :PRINTABLE:'www.yjqlovemhy.com'
emailAddress          :IA5STRING:'yjqlovemhy@163.com'
Certificate is to be certified until Jun  7 16:02:27 2023 GMT (365 days)
Sign the certificate? [y/n]:y


1 out of 1 certificate requests certified, commit? [y/n]y
Write out database with 1 new entries
Data Base Updated
CA verifying: www.yjqlovemhy.com.crt <-> CA cert
www.yjqlovemhy.com.crt: OK
```

可见，证书颁发成功。

`www.yjqlovemhy.com.crt` 文件信息如下：

```
[root@localhost ssl.ca-0.1]# cat www.yjqlovemhy.com.crt
Certificate:
    Data:
        Version: 3 (0x2)
        Serial Number: 1 (0x1)
        Signature Algorithm: md5WithRSAEncryption
        Issuer: C=CN, ST=ShanXi, L=XiAn, O=XiAn Jiaotong University, OU=XJTU, CN=MD ROOT CA/emailAddress=xjtu@163.com
        Validity
            Not Before: Jun  7 16:02:27 2022 GMT
            Not After : Jun  7 16:02:27 2023 GMT
        Subject: C=CN, ST=ShanXi, L=XiAn, O=ShiJi, OU=SJ, CN=www.yjqlovemhy.com/emailAddress=yjqlovemhy@163.com
        Subject Public Key Info:
            Public Key Algorithm: rsaEncryption
            RSA Public Key: (1024 bit)
                Modulus (1024 bit):
                    00:cd:3d:62:7b:bf:d9:3c:c5:56:0d:2f:fa:5b:bf:
                    6c:33:df:49:62:79:16:0f:da:8e:af:78:3d:9c:9a:
                    ec:ba:71:c3:06:48:13:2b:ac:76:3c:3b:27:8a:70:
                    17:27:a1:ac:03:f1:9b:28:8b:23:98:35:ea:97:86:
                    b7:ef:e3:52:2d:c0:8b:e5:fc:b9:6a:a0:b0:58:85:
                    42:92:a8:05:25:be:52:78:2e:24:c8:59:97:2b:b3:
                    97:2b:2f:8d:41:01:f2:74:d6:a4:6e:92:97:72:8f:
                    9d:e3:a9:12:5c:a6:ad:23:b7:8b:8e:d9:9d:b1:85:
```

```
                    b4:40:51:6f:95:4e:db:b9:6f
                Exponent: 65537 (0x10001)
        X509v3 extensions:
            X509v3 Authority Key Identifier:
                keyid:B1:DA:99:ED:D7:E1:5D:90:6B:C9:14:56:72:FD:CE:5B:FF:25:65:01

            X509v3 Extended Key Usage:
                TLS Web Server Authentication, TLS Web Client Authentication, Microsoft Server Gated Crypto, Netscape Server Gated Crypto
            X509v3 Basic Constraints: critical
                CA:FALSE
    Signature Algorithm: md5WithRSAEncryption
        c1:d1:f2:a6:31:45:f7:03:2e:23:6a:64:5c:42:f0:5e:e6:7e:
        c6:83:21:e6:c5:59:21:84:32:02:e9:55:2a:ca:6a:7c:51:24:
        0f:4f:29:92:f4:7d:05:f9:e7:c3:5c:8f:e2:28:fd:69:08:ac:
        a4:fa:06:eb:b4:09:f3:c6:e9:ca:ad:b5:56:d7:f0:02:6d:25:
        e4:6d:52:d3:98:20:a9:29:5e:16:70:ab:51:a9:2b:10:d4:7e:
        ee:08:e8:c8:da:b4:86:28:d3:c4:42:cd:2b:20:85:95:f1:15:
        b3:b5:fa:d4:22:6c:25:a6:a0:ee:26:07:95:a1:94:58:ee:36:
        08:83
-----BEGIN CERTIFICATE-----
MIIC+jCCAmOgAwIBAgIBATANBgkqhkiG9w0BAQQFADCBkTELMAkGA1UEBhMCQ04x
DzANBgNVBAgTBlNoYW5YaTENMAsGA1UEBxMEWGlBbjEhMB8GA1UEChMYWGlBbiBK
aWFvdG9uZyBVbml2ZXJzaXR5MQ0wCwYDVQQLEwRYSlRVMRMwEQYDVQQDEwpNRCBS
T09UIENBMRswGQYJKoZIhvcNAQkBFgx4anR1QDE2My5jb20wHhcNMjIwNjA3MTYw
MjI3WhcNMjMwNjA3MTYwMjI3WjCBijELMAkGA1UEBhMCQ04xDzANBgNVBAgTBlNo
YW5YaTENMAsGA1UEBxMEWGlBbjEOMAwGA1UEChMFU2hpSmkxCzAJBgNVBAsTAlNK
MRswGQYDVQQDExJ3d3cueWpxbG92ZW1oeS5jb20xITAfBgkqhkiG9w0BCQEWEnlq
cWxvdmVtaHlAMTYzLmNvbTCBnzANBgkqhkiG9w0BAQEFAAOBjQAwgYkCgYEAzT1i
e7/ZPMVWDS/6W79sM99JYnkWD9qOr3g9nJrsunHDBkgTK6x2PDsninAXJ6GsA/Gb
KIsjmDXql4a37+NSLcCL5fy5aqCwWIVCkqgFJb5SeC4kyFmXK7OXKy+NQQHydNak
bpKXco+d46kSXKatI7eLjtmdsYW0QFFvlU7buW8CAwEAAaNnMGUwHwYDVR0jBBgw
FoAUsdqZ7dfhXZBryRRWcv3OW/8lZQEwNAYDVR0lBC0wKwYIKwYBBQUHAwEGCCsG
AQUFBwMCBgorBgEEAYI3CgMDBglghkgBhvhCBAEwDAYDVR0TAQH/BAIwADANBgkq
hkiG9w0BAQQFAAOBgQDB0fKmMUX3Ay4jamRcQvBe5n7GgyHmxVkhhDIC6VUqymp8
USQPTymS9H0F+efDXI/iKP1pCKyk+gbrtAnzxunKrbVW1/ACbSXkbVLTmCCpKV4W
cKtRqSsQ1H7uCOjI2rSGKNPEQs0rIIWV8RWztfrUImwlpqDuJgeVoZRY7jYIgw==
-----END CERTIFICATE-----

```

4 创建用户证书

使用`./new-user-cert.sh  yjq@www.yjqlovemhy.com`创建用户密钥和用户自签名证书。

```
[root@localhost ssl.ca-0.1]#  ./new-user-cert.sh  yjq@www.yjqlovemhy.com
Fill in certificate data
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.
-----
Common Name (eg, John Doe) []:YiJunQuan
Email Address []:18813517223@163.com

You may now run ./sign-user-cert.sh to get it signed

```

5 签署用户证书

使用`./sign-user-cert.sh  yjq@www.yjqlovemhy.com`，给用户yjq颁发证书。

```
[root@localhost ssl.ca-0.1]# ./sign-user-cert.sh  yjq@www.yjqlovemhy.com
CA signing: yjq@www.yjqlovemhy.com.csr -> yjq@www.yjqlovemhy.com.crt:
Using configuration from ca.config
Enter pass phrase for ./ca.key:
Check that the request matches the signature
Signature ok
The Subject's Distinguished Name is as follows
commonName            :PRINTABLE:'YiJunQuan'
emailAddress          :IA5STRING:'18813517223@163.com'
Certificate is to be certified until Jun  7 16:11:32 2023 GMT (365 days)
Sign the certificate? [y/n]:y


1 out of 1 certificate requests certified, commit? [y/n]y
Write out database with 1 new entries
Data Base Updated
CA verifying: yjq@www.yjqlovemhy.com.crt <-> CA cert
yjq@www.yjqlovemhy.com.crt: OK

```

给用户颁布的证书`yjq@www.yjqlovemhy.com.crt`如下：

```
[root@localhost ssl.ca-0.1]# cat yjq@www.yjqlovemhy.com.crt
Certificate:
    Data:
        Version: 3 (0x2)
        Serial Number: 2 (0x2)
        Signature Algorithm: md5WithRSAEncryption
        Issuer: C=CN, ST=ShanXi, L=XiAn, O=XiAn Jiaotong University, OU=XJTU, CN=MD ROOT CA/emailAddress=xjtu@163.com
        Validity
            Not Before: Jun  7 16:11:32 2022 GMT
            Not After : Jun  7 16:11:32 2023 GMT
        Subject: CN=YiJunQuan/emailAddress=18813517223@163.com
        Subject Public Key Info:
            Public Key Algorithm: rsaEncryption
            RSA Public Key: (1024 bit)
                Modulus (1024 bit):
                    00:c3:cd:2c:ae:b3:a8:ac:3b:7e:dc:3a:48:00:3a:
                    16:e0:99:0b:f4:93:44:1a:35:c1:97:89:2a:55:34:
                    d9:d4:2b:8b:a3:c5:64:24:05:cf:55:b2:2a:62:b4:
                    5d:1a:f7:f6:fa:ca:00:9f:9b:30:12:6f:7a:f0:4c:
                    72:99:86:71:84:77:42:61:a7:e0:2f:d4:2b:5b:c0:
                    13:23:68:77:51:06:9a:2d:7e:13:de:39:89:d7:e0:
                    bc:97:35:10:90:c0:99:90:c5:e9:df:83:49:41:49:
                    c0:81:2c:6d:d7:99:00:17:15:8c:fa:21:66:d2:f9:
                    3d:cd:81:6f:3d:2e:7f:47:a9
                Exponent: 65537 (0x10001)
        X509v3 extensions:
            X509v3 Subject Alternative Name:
                email:18813517223@163.com
            X509v3 Basic Constraints: critical
                CA:FALSE
            X509v3 Authority Key Identifier:
                keyid:B1:DA:99:ED:D7:E1:5D:90:6B:C9:14:56:72:FD:CE:5B:FF:25:65:01

            X509v3 Extended Key Usage:
                TLS Web Client Authentication, E-mail Protection
    Signature Algorithm: md5WithRSAEncryption
        08:1f:cf:fe:ed:07:b3:40:94:41:6e:e6:45:50:0c:df:ea:43:
        f4:f0:de:8f:9d:5d:36:b8:75:4b:7c:d6:26:4d:f9:21:20:58:
        52:4e:f9:5e:3f:4f:8c:da:4c:c4:8c:cf:39:fb:9f:c6:3d:4a:
        a1:f9:fe:fd:b7:59:bc:ea:df:8a:f7:73:be:23:0e:a6:6d:b1:
        2e:7c:77:3a:b2:e4:8b:85:b1:00:97:61:f1:a4:26:78:91:dd:
        a9:13:fd:ad:bb:eb:53:67:2d:45:a3:74:de:6b:9e:fa:84:a2:
        a2:0d:b8:29:4a:ac:24:10:d8:40:ec:f2:4d:1a:0d:4d:35:20:
        a7:ec
-----BEGIN CERTIFICATE-----
MIICsDCCAhmgAwIBAgIBAjANBgkqhkiG9w0BAQQFADCBkTELMAkGA1UEBhMCQ04x
DzANBgNVBAgTBlNoYW5YaTENMAsGA1UEBxMEWGlBbjEhMB8GA1UEChMYWGlBbiBK
aWFvdG9uZyBVbml2ZXJzaXR5MQ0wCwYDVQQLEwRYSlRVMRMwEQYDVQQDEwpNRCBS
T09UIENBMRswGQYJKoZIhvcNAQkBFgx4anR1QDE2My5jb20wHhcNMjIwNjA3MTYx
MTMyWhcNMjMwNjA3MTYxMTMyWjA4MRIwEAYDVQQDEwlZaUp1blF1YW4xIjAgBgkq
hkiG9w0BCQEWEzE4ODEzNTE3MjIzQDE2My5jb20wgZ8wDQYJKoZIhvcNAQEBBQAD
gY0AMIGJAoGBAMPNLK6zqKw7ftw6SAA6FuCZC/STRBo1wZeJKlU02dQri6PFZCQF
z1WyKmK0XRr39vrKAJ+bMBJvevBMcpmGcYR3QmGn4C/UK1vAEyNod1EGmi1+E945
idfgvJc1EJDAmZDF6d+DSUFJwIEsbdeZABcVjPohZtL5Pc2Bbz0uf0epAgMBAAGj
```

```
cDBuMB4GA1UdEQQXMBWBEzE4ODEzNTE3MjIzQDE2My5jb20wDAYDVR0TAQH/BAIw
ADAfBgNVHSMEGDAWgBSx2pnt1+FdkGvJFFZy/c5b/yVlATAdBgNVHSUEFjAUBggr
BgEFBQcDAgYIKwYBBQUHAwQwDQYJKoZIhvcNAQEEBQADgYEACB/P/u0Hs0CUQW7m
RVAM3+pD9PDej51dNrh1S3zWJk35ISBYUk75Xj9PjNpMxIzPOfufxj1Kofn+/bdZ
vOrfivdzviMOpm2xLnx3OrLki4WxAJdh8aQmeJHdqRP9rbvrU2ctRaN03mue+oSi
og24KUqsJBDYQOzyTRoNTTUgp+w=
-----END CERTIFICATE-----
```

6　将用户证书打包到一个pkcs12文件中。

使用`./p12.sh yjq@www.yjqlovemhy.com`将用户证书打包到一个pkcs12文件中

```
[root@localhost ssl.ca-0.1]# ./p12.sh yjq@www.yjqlovemhy.com
Enter Export Password:
Verifying - Enter Export Password:

The certificate for yjq@www.yjqlovemhy.com has been collected into a pkcs12 file.
You can download to your browser and import it.

```

`yjq@www.yjqlovemhy.com.p12`中的信息如下

```
[root@localhost ssl.ca-0.1]# vim yjq@www.yjqlovemhy.com.p12

0<82>
×^B^A^C0<82>
<9d>^F  *<86>H<86>÷^M^A^G^A <82>
<8e>^D<82>
<8a>0<82>
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