CES571S - L3 - MD5 Collision

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Full PDF

1 Becoming a Certificate Authority

Generating.

```
root@LunaEx:~# git clone https://github.com/Luna1996/demoCA.git
Cloning into 'demoCA'...
remote: Enumerating objects: 5, done.
remote: Counting objects: 100% (5/5), done.
remote: Compressing objects: 100% (3/3), done.
remote: Total 5 (delta 0), reused 5 (delta 0), pack-reused 0
Unpacking objects: 100% (5/5), done.
root@LunaEx:~# ls
E81CSE503.pem  demoCA
root@LunaEx:~# openssl req -new -x509 -keyout ca.key -out ca.crt -config ./demoCA/openssl.cnf
Generating a 2048 bit RSA private key
..........................+++
.....................................+++
writing new private key to 'ca.key'
Enter PEM pass phrase:
Verifying - Enter PEM pass phrase:
-----
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) [AU]:CN
State or Province Name (full name) [Some-State]:Beijing
Locality Name (eg, city) []:Beijing
Organization Name (eg, company) [Internet Widgits Pty Ltd]:WYF
Organizational Unit Name (eg, section) []:WYF
Common Name (e.g. server FQDN or YOUR name) []:WangYifu
Email Address []:yifu.w@wustl.edu
root@LunaEx:~#
```

ca.key

```
-----BEGIN ENCRYPTED PRIVATE KEY-----
MIIFHDBOBgkqhkiG9w0BBQ0wQTApBgkqhkiG9w0BBQwwHAQIyxWbUJO3scMCAggA
MAwGCCqGSIb3DQIJBQAwFAYIKoZIhvcNAwcECDB4xXyIzwRRBIIEyG05ectZNvbb
HXRNBs96koDI3Tv0g8UimYYa2c8neOI0JL+Ses/1JYHLYwgVv1TIxtY8Zjr+qGLx
dbsXPv8gsCTr88Qrek2wr1Z1+1C3H9avfKLI0Izo8MDMA+YZQpnnPn/rkCbvwL01
MWnGfZVpHqZZICzDi1Ggx+iJwaDNf5xf8qHnzIc0Li18hMwamRJjcTF90wNnum9o
WUbwS7E1x/d6vciR2aQxaeOJMGmjkbnTnG5IPUuob4NIr3EVNnU0Ss3wMG+EssnH
fbWXMc1MXW++1cTKx0uio2qN4gSi/kS85qLVpHPI1r0JSIQtKDwhYR6ZNpZvFG7Z
360KV8X37uAOxy/rVU2eHezdvMKSiV8mfIm8aJuXBYQ31OHz1WVF6L1NODr4e7o7
U7sd8p9uM1h18vfUKqcr+1+oeT5NK+MKv5wWUoNKCYWKMe+NeH1u6IP/aY/Dskjs
LNCYt8qaPZGZG/IUISRt2vmNeWfNO4jsNPMSMCKkBeNFtrTmbAp6tqAADG5VHQuo
Tskka9TKb92W1Wof3U4cRShLZ8TLBbgarY5gWMtCsNQzVH6rKKS4Aks1UKib73ge
kZ4uQFMOUgiW9Hi8w8bFe10uwt0e5SOF4xe1Sg1G0x5OPNtp8WzH9PUTJYmca2v6
a+EqsASUmnGTv4RDQwDBiyCKW2ENvvkb5qTy1bQSqng6q4uRC0X7T4WhgstKYf9I
gpLbQGAHh9k4HQAhHPpOJdFs3W15AkpeMvH3srpM0FmndyjUc4GrQbaDyOjCWc1G
zK9BNK7TezkhRiZZB0A6NjC5kH5SexyCFnMg/MI0PjUQryRKzN1gOfTeLdlDsVJf
YOafjdDNbcs1tsTP2XK/MI8dpaF2VHMU9bx2jqcIcfrAja54r99G5BpdFFQr06z0
S4mXqGkAw/E5gh+2XTkU6dupIQ6S1zrzzDg6TKkOUT1OZwm5VZi+ctjw0WMzFNBI
g405+HcyXwOPxw+MPWpOptWa1mmaIDx8X/Rx7/bSDRcS43OfA3vH1sQKNLUsych2
iwkbEWJ3EK92cNV4kjb/1RBLCpHXbx5FyRPXHu3xIYmAckG4NT7zSYCyHOaVRg5b
TbYsU17UCOP/wGvXh4ewftOFwZxQ2A6YjY40jbGcK2zefeTFYY8ymZiGsn4P5O3Q
VeeNBk+PYmuZi1hft9Pp91Hk/DaZvWKtpky61kzeGNG1AiIryE8uuZNBaDJMyEvX
g/SobKvd0MdNpmEAOA2Rf19OP0cQFIfbT174LYmT9jEXQMtthTrV3+PuZUWAMIuY
0HaZicMPEkguB7SJziX+pCX2znTdKV8p2DotHJ9rn4O7g5mvU8HOprt1UL/imYmH
8Sx4vvha4E7M7Sin7ZJJkKnUGbcs7Me4VYfqfU5bKt06MFcij+pKfJDFrw6aBUbR
1bTiW5QeXwSqdO9ESORBkW1091rWy4KhxkdnbfmEWvu85wAXWZp/cAvKhu8kxVN2
1QCkL5wEuHb5bnk2xsmQd47R0LUmHSxj/6/utDBeAaYQmkaxopb4YTtg4VT8UPdr
ayvXtr3Kw6fCmSNVfFUt7NSxCfaEMNkGkRbZP4DK+6HukPm05Qt7BodcPGYf8Ys2
iOAOHMzdMC4XmKmUjHFWig==
-----END ENCRYPTED PRIVATE KEY-----
```

ca.crt

```
-----BEGIN CERTIFICATE-----
MIID2jCCAsKgAwIBAgIJAPNtiDc1hLheMA0GCSqGSIb3DQEBCwUAMIGBMQswCQYD
VQQGEwJDTjEQMA4GA1UECAwHQmVpamluZzEQMA4GA1UEBwwHQmVpamluZzEMMAoG
A1UECgwDV11GMQwwCgYDVQQLDANXWUYxETAPBgNVBAMMCFdhbmdZaWZ1MR8wHQYJ
KoZIhvcNAQkBFhB5aWZ1LndAd3VzdGwuZWR1MB4XDTE4MTIwMTA0MjQ1MFoXDTE4
MTIzMTA0MjQ1MFowgYExCzAJBgNVBAYTAkNOMRAwDgYDVQQIDAdCZW1qaW5nMRAw
DgYDVQQHDAdCZW1qaW5nMQwwCgYDVQQKDANXWUYxDDAKBgNVBAsMA1dZRjERMA8G
A1UEAwwIV2FuZ11pZnUxHzAdBgkqhkiG9w0BCQEWEH1pZnUud0B3dXN0bC51ZHUw
ggEiMA0GCSqGSIb3DQEBAQUAA4IBDwAwggEKAoIBAQDJNyLsrwv7mjODR16zy+EP
b20R1Qy8kYXQz64GcT1ZhA001baq9S39I7cGgCwCkL0BN1qEPYaBPreYAansVGEW
511//Nk5DnhDhR/teGRR42VOKMsJIwAIz9OK4UxuwdhYe1O88k8BsBIRq1m0grpv
FV/Zg/but2evCOwHtNs3ta3WwO+oyrSFGjFVjSAQJDz/khIcDbYTIGvfW5o9UQJX
8oKzKRCWdPzr19Sh5CdJXOdVsZ1ayOzCfNDzmzJRiC6SUpP8MJm4ZM/YXZUHvMiK
+O/EbL+n8IM6Z2KGmhxqy28kVXVfxnD+hXdWNPRbCC3yFB9MWWhYGozSpWk1vhRv
AgMBAAGjUzBRMB0GA1UdDgQWBBQpZOPSuvma20xph03VZC1pKu/+NjAfBgNVHSME
GDAWgBQpZOPSuvma20xph03VZC1pKu/+NjAPBgNVHRMBAf8EBTADAQH/MA0GCSqG
SIb3DQEBCwUAA4IBAQCpegLgJITIKSKABTNxSfgDkETSroimuazbT6ejTOgy+rc3
5yCqMg2zG9iO+mu2X6cU3ptmncm4ufYHXcMLxyCJ5zhg8vU0QVUsFVeQ+618CJ3p
sOw9kiEgYFd1WnSxbSIf2NR3GaxrMUc5xkMfcE8wjp26tZ1OqYLLgdGK2kTDIb1y
vQr8rndWcp7PgcH9WngaYdOTLTt7vQyVONq6n21jGzZmyUx4ZL571ELjyENX1DLC
z1NZYjsuPGppCVb4a2m1KfVcvIZVOOVttS9rhUMSVIx9r1zEiMMb5CdUcExyzI7p
NPSzuYOz1zNszAnpmgbnO1/cU8zxIVpXOoryJEUZ
-----END CERTIFICATE-----
```

2 Creating a Certificate for SEEDPKILab2018.com

2.1 Generate public/private key pair

```
root@LunaEx:~# openssl rsa -in server.key -text
Enter pass phrase for server.key:
Private-Key: (1024 bit)
modulus:
    00:bd:be:20:74:5d:ce:48:81:bb:dd:d0:25:bd:83:
    aa:50:da:57:56:a0:a5:7f:a6:af:7e:87:71:3d:49:
    ec:4a:9c:f7:e8:be:61:6f:ae:83:40:90:b8:8e:4b:
    53:03:00:70:5a:54:8e:c2:c9:ba:7b:be:c9:67:c2:
    88:ea:04:c9:56:f7:01:db:7b:d5:85:3a:53:e7:33:
    9b:ac:3d:8d:5b:de:81:62:c2:bd:23:ec:5a:8d:ec:
    72:38:94:ab:39:91:bf:88:bf:68:d4:81:80:76:64:
    ad:1e:a2:05:db:10:84:3b:d5:66:0b:ee:57:65:9b:
    0c:8d:8a:11:10:4f:13:f8:bf
publicExponent: 65537 (0x10001)
privateExponent:
    00:a1:81:7c:4e:90:aa:4d:bd:60:13:e6:60:b9:77:
    a1:39:41:20:a6:74:07:6b:28:8e:a8:bc:d0:fe:c2:
    35:87:2d:25:37:cf:15:50:e2:d2:85:da:a9:bd:35:
    10:6b:b5:ab:ec:b7:9c:ec:e0:99:03:4b:da:53:9f:
    9a:ba:d7:68:28:4e:c5:83:dc:65:dc:a5:a5:51:dc:
    1c:22:05:31:6f:2a:e0:f4:26:99:bb:7a:1f:6b:ad:
    9b:18:2c:3f:77:c7:2d:d2:d5:cf:2c:df:c1:4d:b2:
    50:fa:22:ca:b2:10:93:ce:31:6b:cf:58:83:d6:da:
    57:58:c0:da:60:eb:57:18:c1
prime1:
    00:e0:65:37:0e:b1:62:b9:e8:f6:ee:fd:85:de:46:
    41:b2:98:51:f1:27:cb:7b:af:c3:d8:46:43:f7:43:
    cc:01:1a:46:0c:95:85:26:51:c0:82:fa:16:f6:d3:
    9e:f8:c3:ab:d7:60:26:e1:44:23:ea:88:eb:be:3c:
    e4:fa:40:1e:db
prime2:
    00:d8:77:7a:03:95:50:f6:d8:4f:17:5c:1c:99:b5:
    83:d9:3b:6a:e0:b8:07:9d:f5:2e:19:47:cb:50:d2:
    80:5e:49:48:ff:1b:1b:be:18:82:c2:ae:d3:01:44:
    20:df:97:4d:7b:21:c1:a3:cd:e8:98:66:e8:81:2d:
    43:7f:be:b8:ed
exponent1:
    7a:8d:ac:f9:40:56:2c:35:19:10:43:b4:66:46:36:
    c1:64:c1:74:15:08:e4:3f:85:95:cc:22:78:9c:35:
    81:f0:a8:8b:5c:ea:00:98:ab:ac:9d:0c:07:b8:62:
    5d:78:f8:94:43:76:58:97:8f:8a:1b:47:ad:79:b2:
    91:1e:8d:fb
exponent2:
    2c:c7:42:59:3d:69:1b:37:11:dd:5e:33:98:64:61:
    1a:ed:dc:a5:11:cc:99:93:5f:6e:e1:58:20:a6:fa:
    e1:06:3d:f0:6f:b6:24:73:c3:90:ec:43:3f:ee:cc:
    f2:13:c5:76:64:3c:3f:5b:57:f3:36:ce:7f:f2:52:
    15:39:e9:dd
coefficient:
    3f:d3:2a:b6:90:55:8a:a2:73:73:de:59:8f:a4:40:
    80:ac:c7:7d:73:a8:8c:da:2e:fc:59:1a:bb:6d:0e:
    a2:c6:3b:b2:da:a1:5b:de:2d:ea:a4:42:cf:90:f6:
    03:3c:d5:a9:f3:f7:f5:57:25:83:dd:1f:ed:c0:d9:
    69:ca:65:63
writing RSA key
-----BEGIN RSA PRIVATE KEY-----
MIICXAIBAAKBgQC9viB0Xc5Igbvd0CW9g6pQ2ldWoKV/pq9+h3E9SexKnPfovmFv
roNAkLiOS1MDAHBaVI7Cybp7vslnwojqBMlW9wHbe9WFOlPnM5usPY1b3oFiwr0j
7FqN7HI4lKs5kb+Iv2jUgYB2ZK0eogXbEIQ71WYL7ldlmwyNihEQTxP4vwIDAQAB
AoGBAKGBfE6Qgk29YBPmYLl3oTlBIKZ0B2soji8oP7CNYctJTfPFVDi0oXaqb01
```

2.2 Generate a Certificate Signing Request (CSR)

```
root@LunaEx:~# openssl req -new -key server.key -out server.csr -config ./demoCA/openssl.cnf
Enter pass phrase for server.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) [AU]:
State or Province Name (full name) [Some-State]:
Locality Name (eg, city) []:
Organization Name (eg, company) [Internet Widgits Pty Ltd]:
Organizational Unit Name (eg, section) []:
Common Name (e.g. server FQDN or YOUR name) []:SEEDPKILab2018.com
Email Address []:

Please enter the following 'extra' attributes
to be sent with your certificate request
A challenge password []:zxsaqw21
An optional company name []:
```

2.3 Generating Ceertificates

```
Organizational Unit Name (eg, section) []:
Common Name (e.g. server FQDN or YOUR name) []:SEEDPKILab2018.com
Email Address []:

Please enter the following 'extra' attributes
to be sent with your certificate request
A challenge password []:zxsaqw21
An optional company name []:
root@LunaEx:~# openssl ca -in server.csr -out server.crt -cert ca.crt -keyfile ca.key -config ./demoCA/openssl.cnf
Using configuration from ./demoCA/openssl.cnf
Enter pass phrase for ca.key:
ca: ./demoCA/newcerts is not a directory
./demoCA/newcerts: No such file or directory
root@LunaEx:~# mkdir ./demoCA/newcerts
root@LunaEx:~# openssl ca -in server.csr -out server.crt -cert ca.crt -keyfile ca.key -config ./demoCA/openssl.cnf
Using configuration from ./demoCA/openssl.cnf
Enter pass phrase for ca.key:
Can't open ./demoCA/index.txt.attr for reading, No such file or directory
140185064968640:error:02001002:system library:fopen:No such file or directory:../crypto/bio/bss_file.c:74:fopen('./demoCA/index.txt.attr','r')
140185064968640:error:2006D080:BIO routines:BIO_new_file:no such file:../crypto/bio/bss_file.c:81:
Check that the request matches the signature
Signature ok
The countryName field is different between
CA certificate (CN) and the request (AU)
root@LunaEx:~# vim ./demoCA/openssl.cnf
root@LunaEx:~# openssl ca -in server.csr -out server.crt -cert ca.crt -keyfile ca.key -config ./demoCA/openssl.cnf
Using configuration from ./demoCA/openssl.cnf
Enter pass phrase for ca.key:
Can't open ./demoCA/index.txt.attr for reading, No such file or directory
140408468148672:error:02001002:system library:fopen:No such file or directory:../crypto/bio/bss_file.c:74:fopen('./demoCA/index.txt.attr','r')
140408468148672:error:2006D080:BIO routines:BIO_new_file:no such file:../crypto/bio/bss_file.c:81:
Check that the request matches the signature
Signature ok
Certificate Details:
        Serial Number: 4096 (0x1000)
        Validity
            Not Before: Dec  1 04:39:17 2018 GMT
            Not After : Dec  1 04:39:17 2019 GMT
        Subject:
            countryName               = AU
            stateOrProvinceName       = Some-State
            organizationName          = Internet Widgits Pty Ltd
            commonName                = SEEDPKILab2018.com
        X509v3 extensions:
            X509v3 Basic Constraints:
                CA:FALSE
            Netscape Comment:
                OpenSSL Generated Certificate
            X509v3 Subject Key Identifier:
                FD:23:9B:35:9F:98:20:34:8E:6E:E3:22:93:AE:58:3E:A1:E1:AC:23
            X509v3 Authority Key Identifier:
                keyid:29:67:43:D2:BA:F9:9A:DB:4C:69:87:4D:D5:64:2D:69:2A:EF:FE:36

Certificate is to be certified until Dec  1 04:39:17 2019 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
root@LunaEx:~#
```

```
# and supplied fields are just that :-)
policy          = policy_anything

# For the CA policy
[ policy_match ]
countryName             = match
stateOrProvinceName     = match
organizationName        = match
organizationalUnitName  = optional
commonName              = supplied
emailAddress            = optional

# For the 'anything' policy
# At this point in time, you must list all acceptable 'object'
# types.
[ policy_anything ]
countryName             = optional
stateOrProvinceName     = optional
localityName            = optional
organizationName        = optional
```

3 Deploying Certificate in an HTTPS Web Server

3.1 Configuring DNS

```
# This file is automatically generated by WSL based on the
# %WINDIR%\System32\drivers\etc\hosts. Modifications to thi
127.0.0.1       localhost
127.0.1.1       LunaEx.localdomain      LunaEx
127.0.0.1       SEEDPKILab2018.com
1

# The following lines are desirable for IPv6 capable hosts
::1     ip6-localhost ip6-loopback
fe00::0 ip6-localnet
ff00::0 ip6-mcastprefix
ff02::1 ip6-allnodes
ff02::2 ip6-allrouters
```

3.2 Configuring the web server

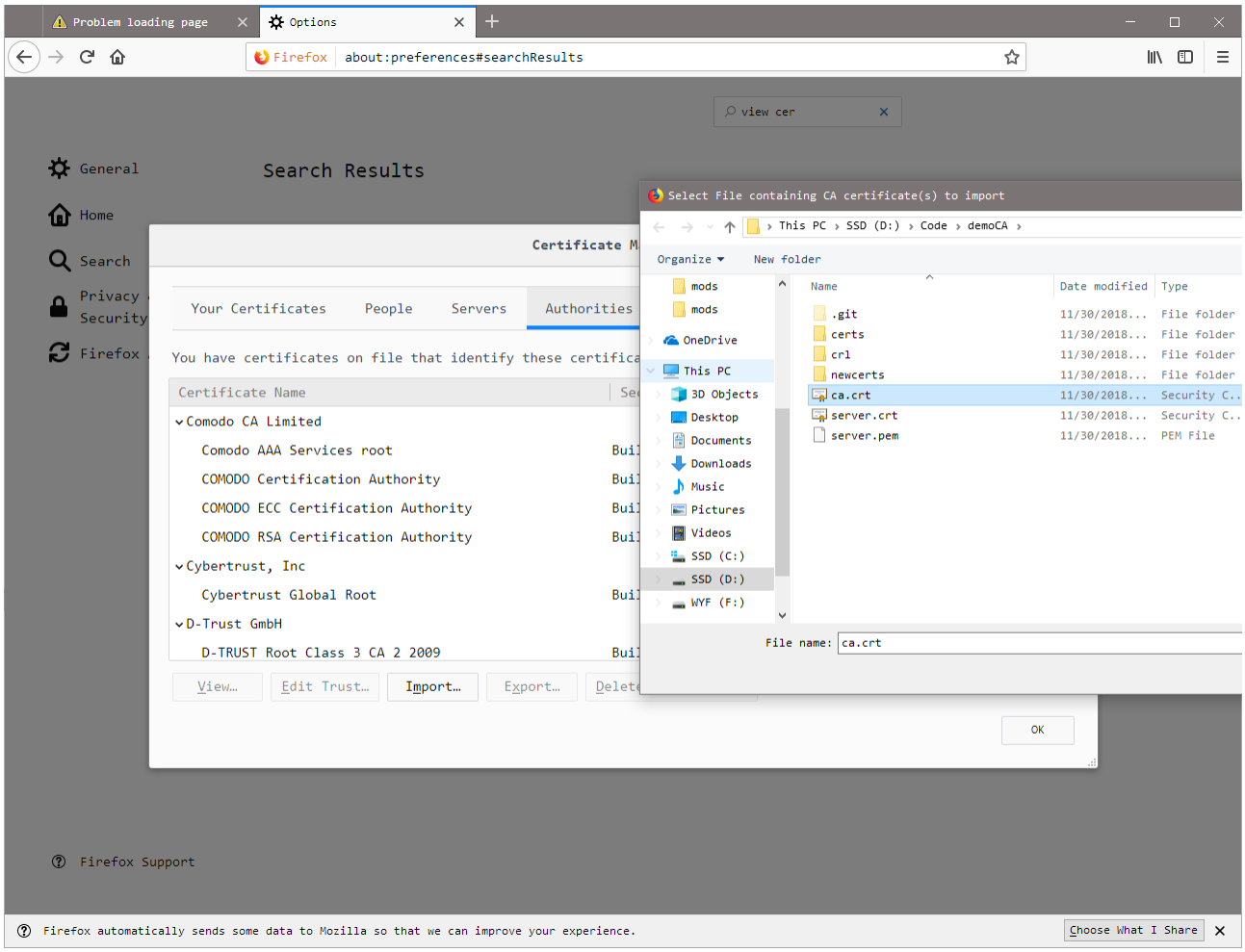
since I don't have an gui ubuntu. I moved my work to my PC.

```
PS D:\Code\demoCA> openssl s_server -cert server.pem -www
Enter pass phrase for server.pem:
Using default temp DH parameters
ACCEPT
```

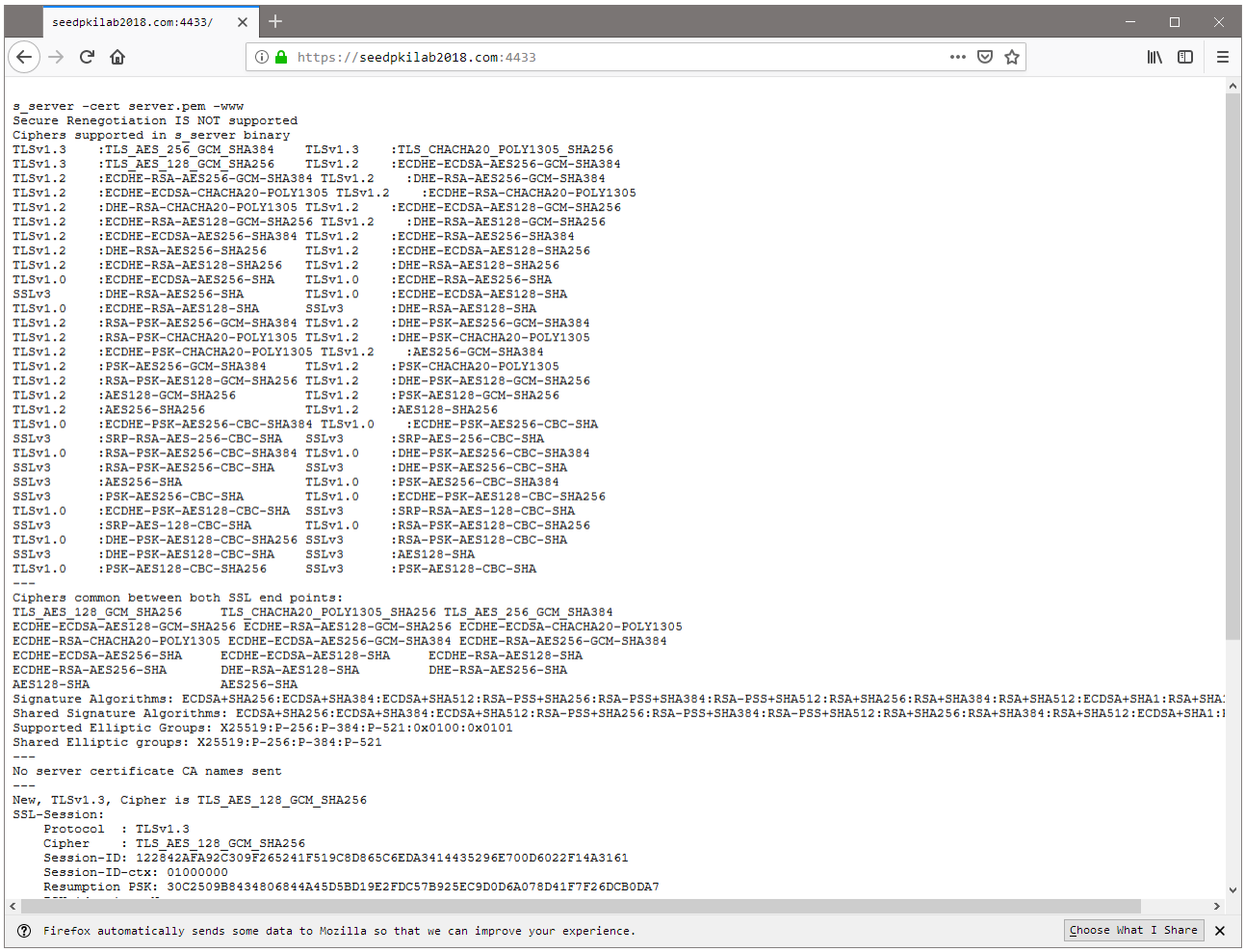
```
@echo off

echo.  >> %windir%/system32/drivers/etc/hosts
echo  127.0.0.1 SEEDPKILab2018.com    >> %windir%/system32/drivers/etc/hosts
```

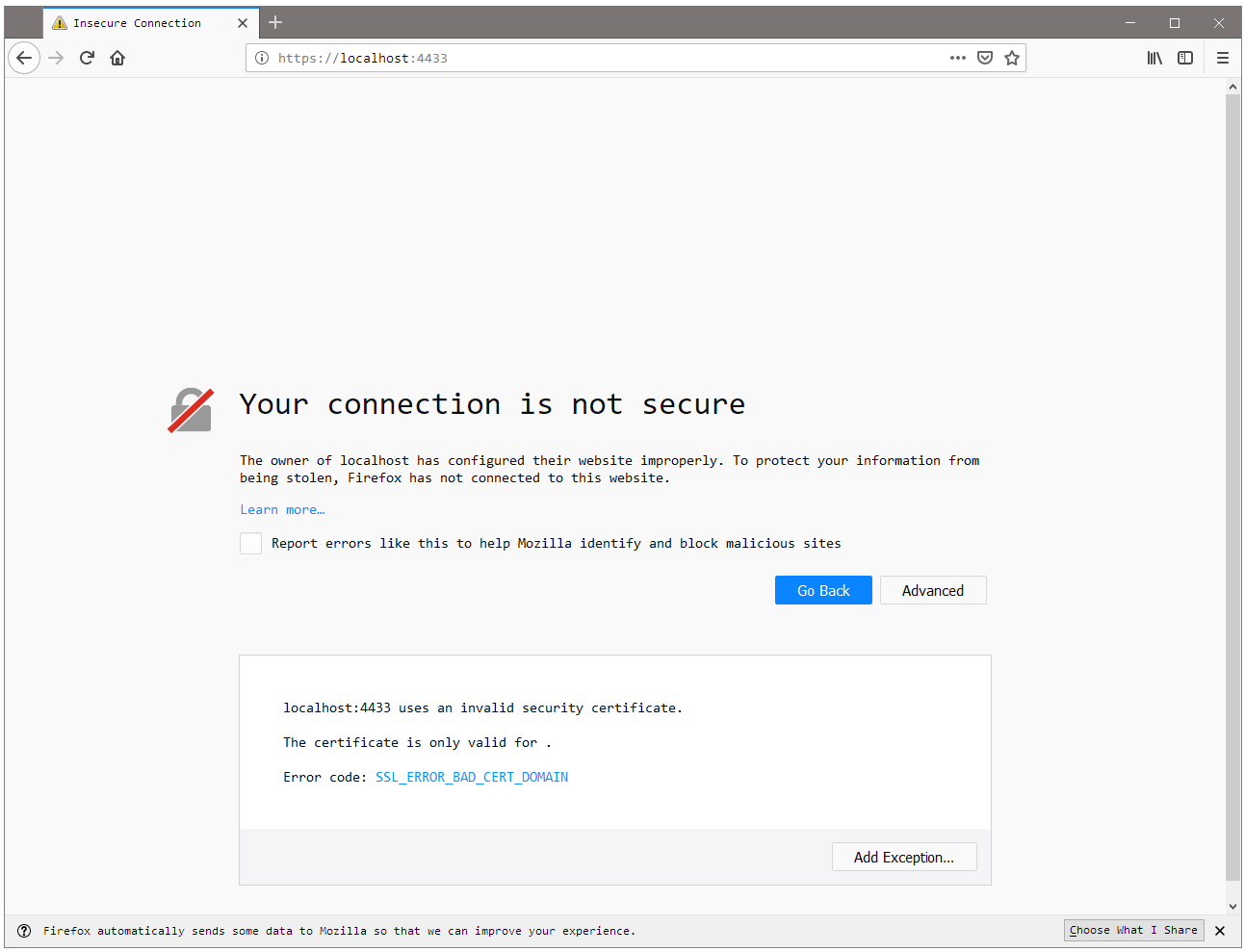
3.3 Getting the browser to accept our CA certificate



3.4 Testing our HTTPS website



but when I try localhost, I can't see the page


Insecure Connection
https://localhost:4433
Your connection is not secure
The owner of localhost has configured their website improperly. To protect your information from being stolen, Firefox has not connected to this website.
Learn more…
Report errors like this to help Mozilla identify and block malicious sites
Go Back
Advanced
localhost:4433 uses an invalid security certificate.
The certificate is only valid for .
Error code: SSL_ERROR_BAD_CERT_DOMAIN
Add Exception...
Firefox automatically sends some data to Mozilla so that we can improve your experience.
Choose What I Share