The User Guide of TIHM PKI System

By

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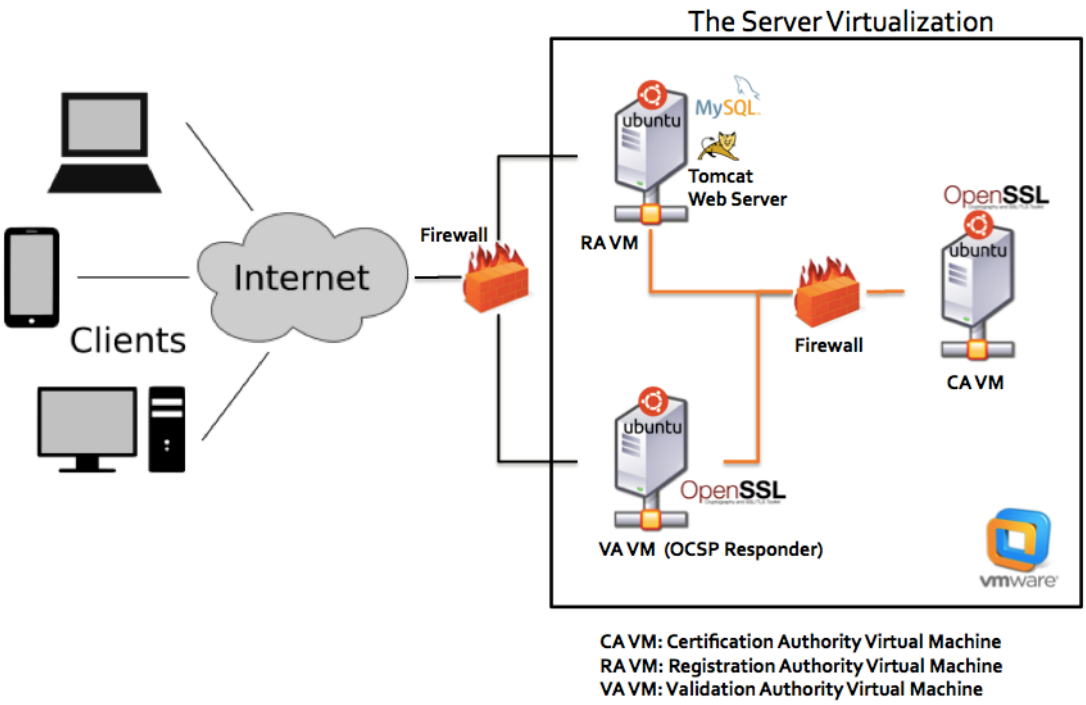
1- TIHM PKI Infrastructure Introduction

The main goal of this PKI system is to generate digital certificates for the entities in the project as these certificates are proposed to enable communicating parties to establish a secure connection (e.g. TLS1.2, etc.). In addition, some features of this system offer a facility for confirming the validity of the current certificate in use when required. In fact, the infrastructure of the PKI system consists of three key services: registration (RA), validation (VA) and certification (CA) as shown below:



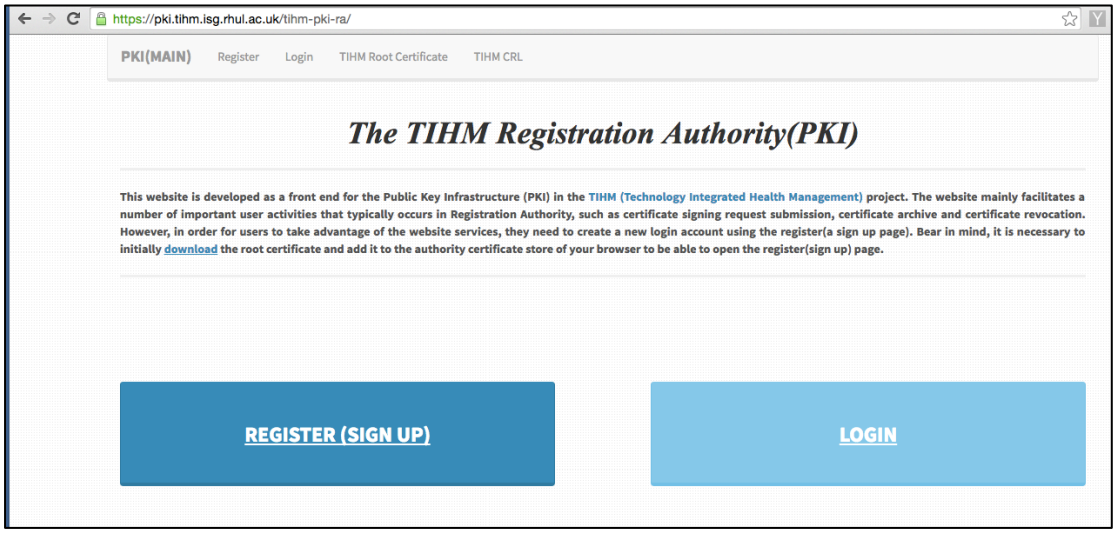
Only registration (RA VM) and validation (AV VM) authority services are accessible for external user. However, the TIHM certification authority (CA VM), which contains the master key for signing certificates, is proposed to be well protected and is anticipated not to be online for use at all-time but only in some certain time slot for security purposes. The Following URLs for registration and validation services show how to reach these services respectively:

1- http://pki.tihm.isg.rhul.ac.uk
2- http://ocsp.tihm.isg.rhul.ac.uk

Bear in mind, the URL of validation service is already included in every certificate being issued by CA. check Authority Information attributes in the certificate.

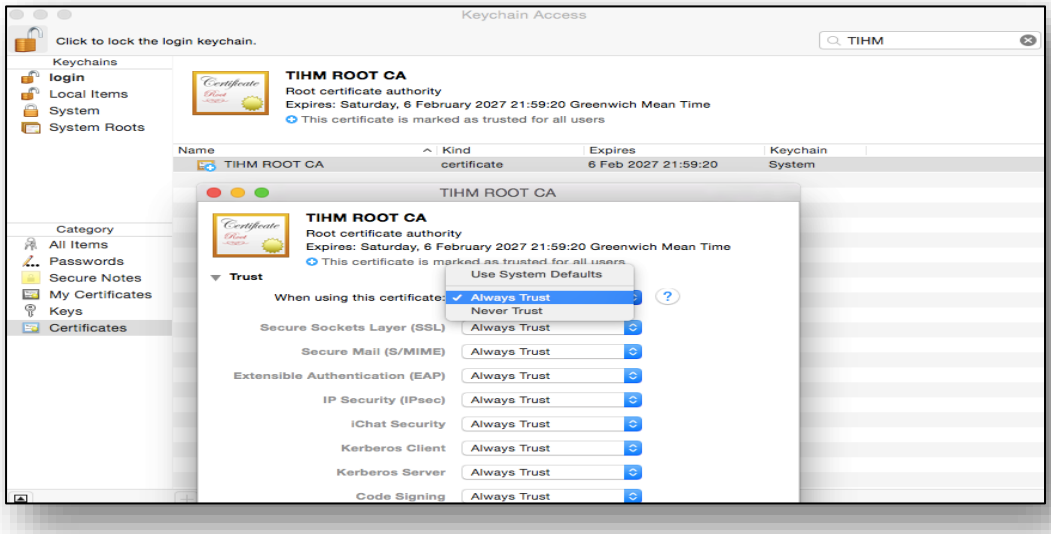
2- Registration & Login

To create an account, you need first to download the TIHM root certificate and then add to the authority certificate store of the browser in use.

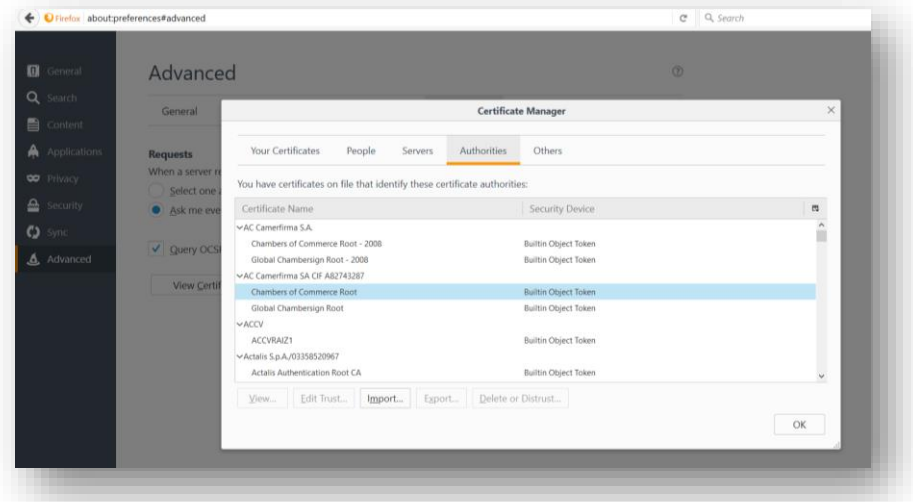


➢ The examples of feeding the root certificate into different browsers

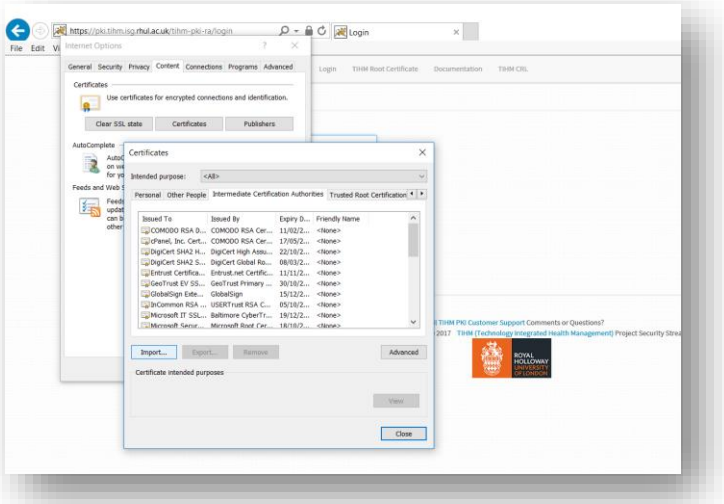
- Adding a certificate in Mac for Chrome, Firefox and Safari:



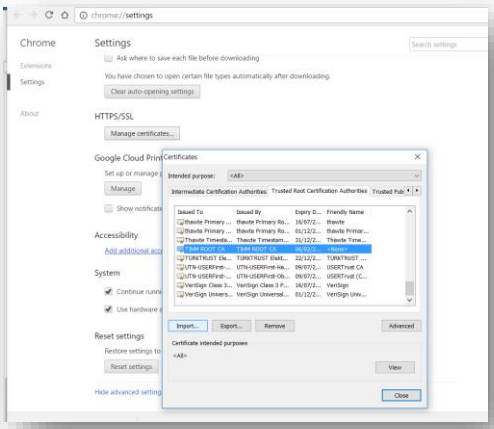
- Adding a certificate in Windows :
  - For Firefox browser:-



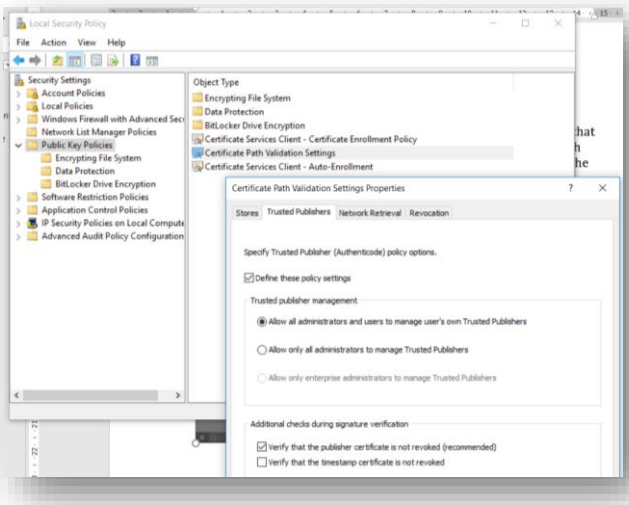
  - For Internet Explorer and Edge browsers:-



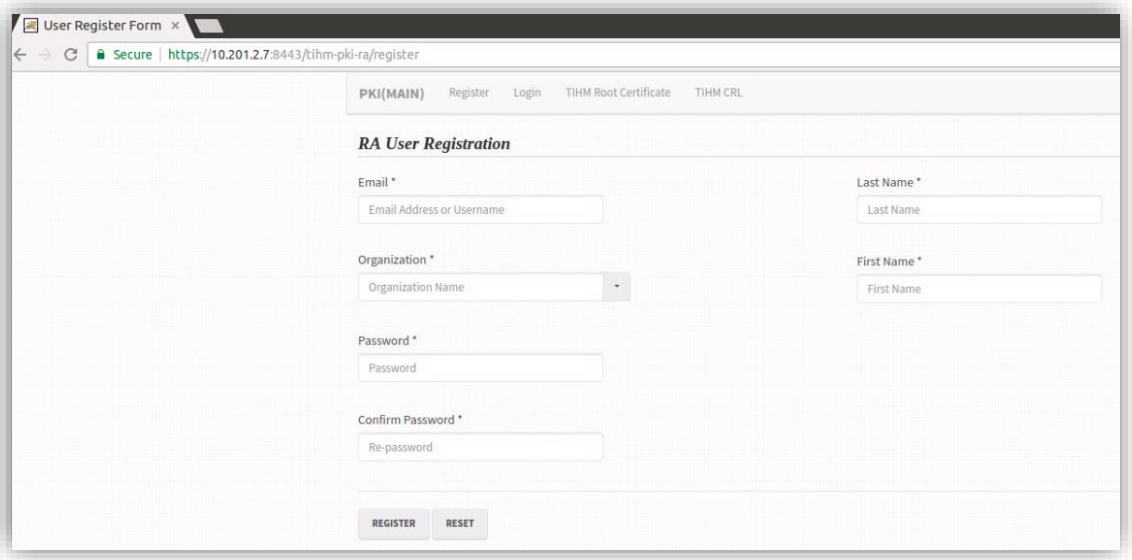
  - For Chrome browsers:-



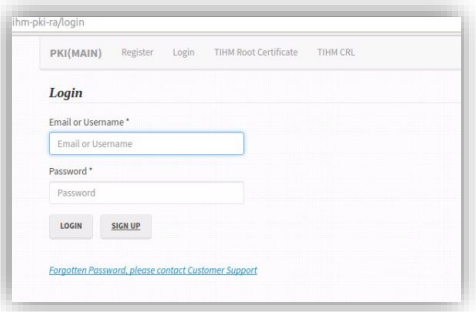
Important Note for revocation: it is important to enable the revocation check in every browser and each browser has a different way of configure that feature. For example, Firefox has an option of OCSP checking which you need to activate. Windows Internet explorer has a number of checks in the advance settings, which you have to enable them in addition some options in local security policy. See the next screenshot:



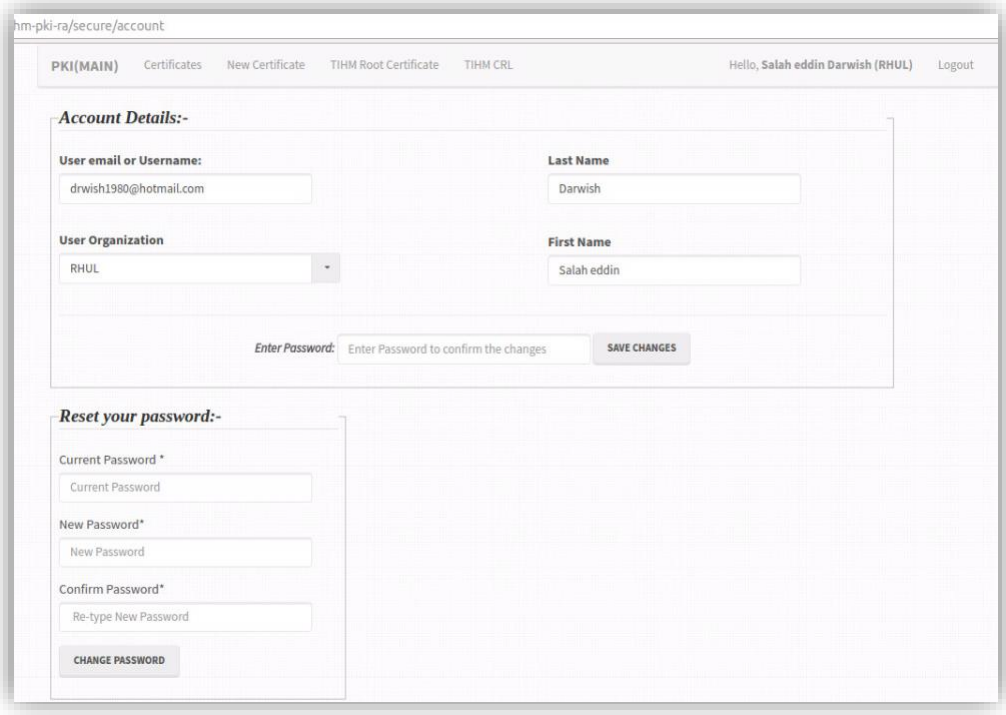
Filling the registration form in order for a user to login to the system, therefore you should provide username, password and your details.



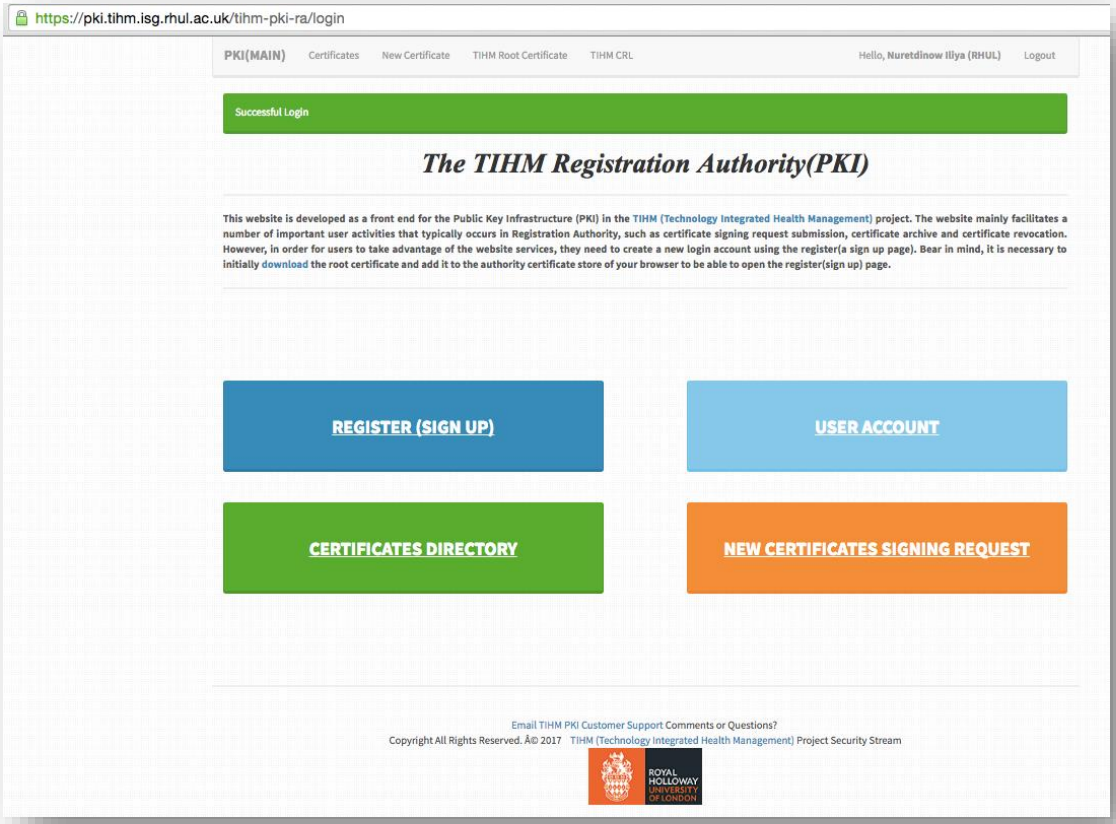
You can access the system by using Login page



The next page is to allow users to manage their login accounts, such as making changes to user details or change the password.

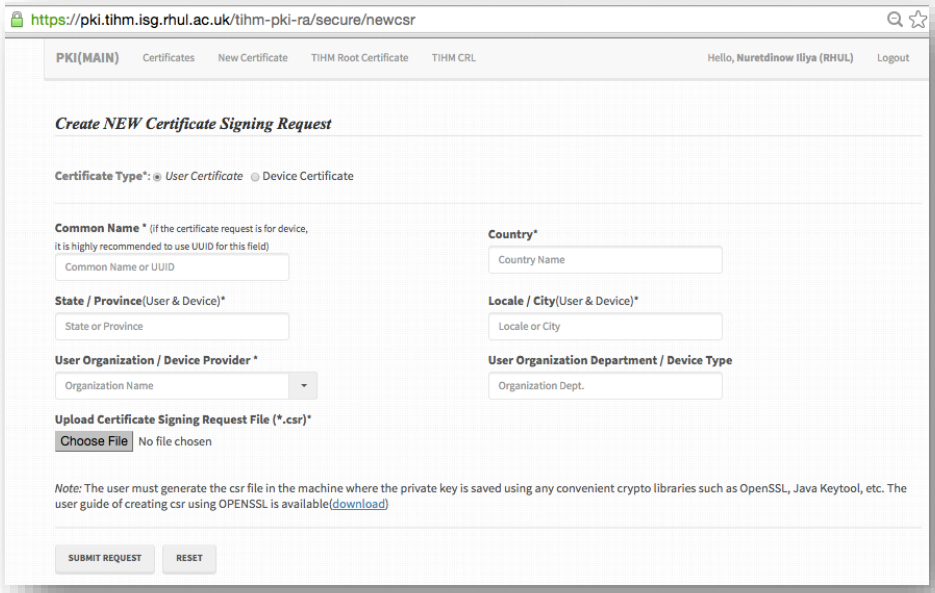


The following screen is available after logging in; the main page will includes four buttons referring to different system activities:



3- Submitting a Certificate Singing Request

The next page allows user to feed the new certificate-signing request to the system. Firstly, before you fill the form in the page, you need to generate csr file any convenient security tools. Bear in mind, the organization name appears in the request must match the user organization inserted during the user registration.



Example: How to generate the CSR file using OPENSSL in Linux: The following steps are to demonstrate how to create Certificate Signing Request (*.csr) file using a Linux terminal, so you can upload to RA to generate a request.
Generating the CSR requires a number of shell commands, the location and file name of your newly created key, and a path and file name for your CSR. In addition, some information (e.g. country, state, etc.) is required to populate the CSR.

1) Generate a pair of keys (public and private keys) and save file in path with key file extension, it is important to provide the size of keys in this example 2048bit:

   openssl genrsa -des3 -out /path/to/www_server_com.key **2048**
2) Then, create a configuration file (*.txt file) which includes all the information and properties required for generate a correct certificate request for CA. in

```
cat > csr_details.txt <<-EOF

[req]
default_bits = 2048
prompt = no
default_md = sha256
req_extensions = req_ext
distinguished_name = dn

[ dn ]
C=GB          # The Country Name is mandatory and takes a two-letter country code such as GB.
```

ST=Surrey # The **State or Province Name** field requires a full name – do not use an abbreviation, such as London.
L=Egham # The **Locality Name** field is for your city or town or device address.
O= RHUL # The **Organization Name** field, insert your organization or device provider
OU=ISG # The **Organizational Unit** Name is an optional field for your department or section or device type
CN = www.your-new-domain.com # The Common Name field is used as a user or device identifier. For a user identifier, enter your name while for a device identifier, it is recommended to use UUDI to have a unique identifier.
emailAddress=your-administrative-address@your- domain.com # An optional filed

[req_ext]
subjectAltName = @alt_names

[alt_names]
DNS.1 = your-new-domain.com # alternative Name for CN
DNS.2 = www.your-new-domain.com # alternative Name for CN
EOF

After performing the previous command, please check if the configuration file has been created by looking into the current directory.

3) Finally, create Certificate Signing Request (*.csr) file by using the following OpenSSL command:

openssl req -new -key -out /path/to/www.your-new-domain.com.csr **-key** /path/to/www_server_com.key **-config** <(**cat** csr_details.txt)

Note that a certificate-signing request always should a file name ending with a *csr* file extension. During executing of the previous command, enter your passphrase will be prompted for the key.

Note: If you prefer to use other tools to generate your own csr file, the following links provide you with some relevant resources of the other tools such as java keytool, windows MMC , etc.:

- **Java Keytool:**

  https://www.digicert.com/csr-creation-java.htm

- **Windows:**

  http://www.entrust.net/knowledge-base/technote.cfm?tn=8924

  https://documentation.meraki.com/zGeneral_Administration/Other_Topics/Creating_an_Offline_Certificate_Request_in_Windows_Server

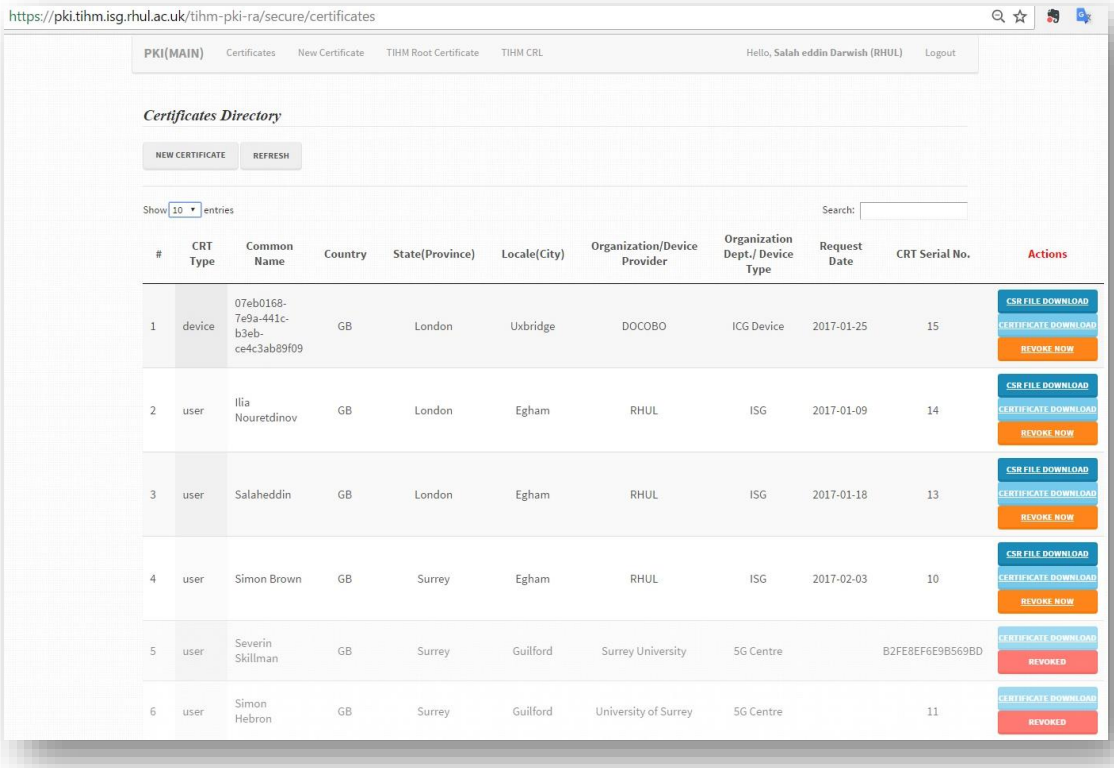
- **Mac:**

  https://www.digicert.com/csr-creation-ssl-installation-mac-osx-el-capitan.htm

  https://www.sslsupportdesk.com/certificate-signing-request-csr-instructions-for-apple-mac-os-x-10-11/

4- Checking a certificate and revocation

Browse certificate directory:



#	CRT Type	Common Name	Country	State(Province)	Locale(City)	Organization/Device Provider	Organization Dept./ Device Type	Request Date	CRT Serial No.	Actions
1	device	07eb0168-7e9a-441c-b3eb-ce4c3ab89f09	GB	London	Uxbridge	DOCOBO	ICG Device	2017-01-25	15	CSR FILE DOWNLOAD, CERTIFICATE DOWNLOAD, REVOKE NOW
2	user	Ilia Nouretdinov	GB	London	Egham	RHUL	ISG	2017-01-09	14	CSR FILE DOWNLOAD, CERTIFICATE DOWNLOAD, REVOKE NOW
3	user	Salaheddin	GB	London	Egham	RHUL	ISG	2017-01-18	13	CSR FILE DOWNLOAD, CERTIFICATE DOWNLOAD, REVOKE NOW
4	user	Simon Brown	GB	Surrey	Egham	RHUL	ISG	2017-02-03	10	CSR FILE DOWNLOAD, CERTIFICATE DOWNLOAD, REVOKE NOW
5	user	Severin Skillman	GB	Surrey	Guilford	Surrey University	5G Centre		B2FE8EF6E9B569BD	CERTIFICATE DOWNLOAD, REVOKED
6	user	Simon Hebron	GB	Surrey	Guilford	University of Surrey	5G Centre		11	CERTIFICATE DOWNLOAD, REVOKED

After submitting a CSR request, refresh the screen in some time to see when it becomes ready for CERTIFCATE DOWNLOAD. The certificate is expected to take at most 20 minutes. For revocation of a certificate, use REVOKE NOW button. The status will be then changed to REVOKED once the revocation request is confirmed by the CA.

5- OCSP responder (Certificate validation)

There is no GUI for this service (http://ocsp.tihm.isg.rhul.ac.uk) and the service is expected to be incorporated in the TLS protocol between two parties to validate certificates being exchanged before establishing a secure channel. Every entity must configure their ends to call back this service.

Example of OPENSSL command line to call this service

- **openssl ocsp -issuer** ~/va/TIHM-CA.crt **-nonce -CAfile** ~/va/TIHM-CA.crt **-url http://ocsp.tihm.isg.rhul.ac.uk -serial** "0x04" **-resp_text**

6- CRL (Certificate Revocation List)

Apart from the OCSP responder, the PKI system is designed to provide CRL to the users as an alternative when OCSP is not available and this list is accessible by http://pki.tihm.isg.rhul.ac.uk/tihm-pki-ra/crl.