UNDERSTAND, INSTALL AND DEPLOY AN EJBCA

Three deployment scenarios for the EJBCA Certification Authority

Abstract

This training document describes how to set-up EJBCA with JBOSS 7 in three scenarios: a) issuing self-signed certificates; b) issuing SSL certificates through a simple CA with certificate revocation services (OCSP and CRL); and c) setting up a more complex CA with: two subordinated CAs, user self-registration and an advanced authorization schema.

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Contents

Scope & audience

This document is designed for people with basic knowledge of Public Key Infrastructure and X509v3 Certificate environments, and is structured to provide a practical idea on how to operate an EJBCA Certification Authority in a progressive way:

- **Fast review on PKI** refreshes concepts about what Public Key Infrastructure is
- **EJBCA 10m Bird's-eye view** gives a general idea about the EJBCA software
- **Installing EJBCA and issuing self-signed certificates** describes how to install a test EJBCA installation and issue self-signed certificates
- **Basic Certification Authority** explains how to operate a basic Certification Authority to issue client and server SSL certificates
- **Advanced Certification Authority** describes how to develop a more advanced certification authority using more features of the EJBCA software

JBOSS Application Server 7.1.1, EJBCA Community Edition 6.0.3, and the H2 database engine are used. We prefer using this configuration as the target for this document is training and not how to deploy EJBCA in production or high availability environments (this would require a specialised knowledge outside the EJBCA software scope). Moreover, it eases making full backups and restoring them if something becomes wrong.

This document is not indented to be an EJBCA guide. You can find a complete EJBCA guide and HOWTOs available in the http://www.ejbca.org site.

Fast review on PKI

Information security is crucial for any organization that deals with sensitive data. Any data transaction should fulfil the following security needs:

- authentication of the identity of the entity with which the information exchange is being conducted;
- confidentiality and confidence in the integrity of the information exchanged;
- establishment of non-repudiation agreements; and
- digitally notarising and securely time stamping.

PKI (initials for Public Key Infrastructure) is a long term solution based on cryptography that delivers these services efficiently and in a cohesive manner. Cryptography is aimed at securing communication in the presence of third parties by using keys to encrypt and decrypt data. Encryption converts text in unintelligible through a mathematical formula; while decryption reverts the process.

There are two types of cryptography: secret key or symmetric and public key or asymmetric. Symmetric key cryptography uses the same key to encrypt and decrypt data. It was the only form of cryptography used until the mid 1970s. Although efficient, it had two problems: it could not support certain security services and the secret keys had to be distributed securely to the communicating parties.

Public key cryptography uses key pairs: the private key, which must be kept secret, and usually under the owner control; and the public key, which can be distributed to anyone that wants to exchange data with the person holding the private key. Although the keys in a pair are mathematically related, the private key cannot be determined by knowing the public key.

Asymmetric cryptography offers two advantages when compared to the symmetric one: facilitating key delivery and reducing the number of keys that must be used within a system. In public key cryptography each person needs just a key pair, whereas in secret key cryptography each person requires a different key for each person with whom he communicates.

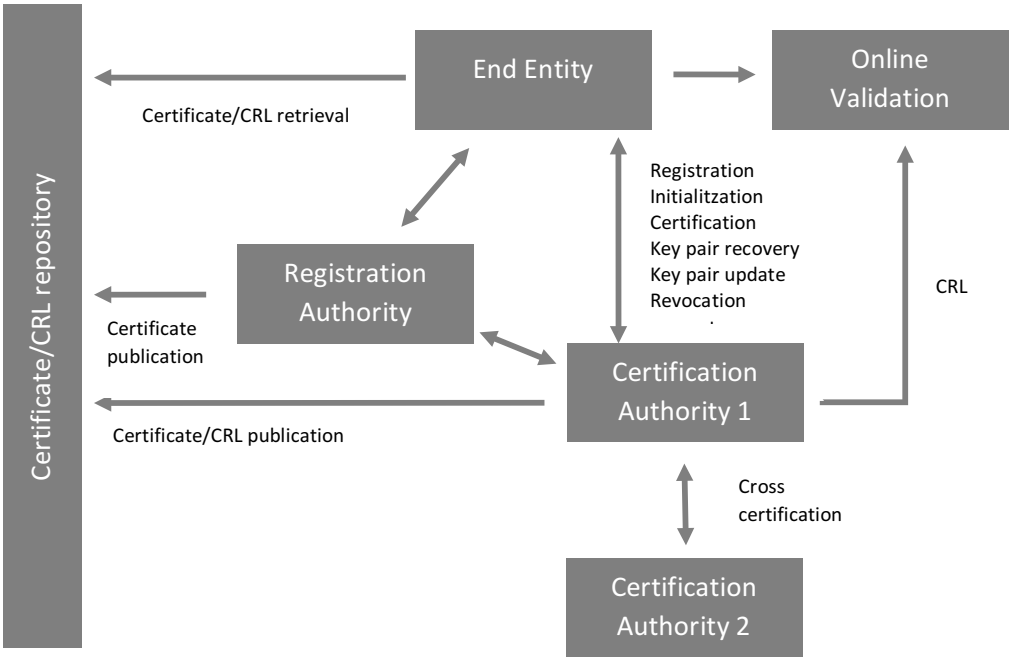
How is trust granted in a Public Key Infrastructure? By using a data element called *digital certificate* or *public key certificate* which binds a public key to identifying information about its owner. Digital certificates allow people to digitally sign a document; thus, verification is made available immediately if the relying party determines that the risk inherent in not doing so is significant enough. The trust is built into the infrastructure by design.

PKI is an authentication technology that integrates public key cryptography for digital signing and key management, and symmetric key cryptography for encrypting. Through scalable key and certificate life cycle management PKI also provides data confidentiality and data integrity. The X.509 standard defines its framework.

The PKIX architecture model

Under this section, a definition of each PKIX component is described, together with how it relates to each other component.

PKIX components



End Entity

Although usually end-users, End Entities can also refer to devices (e.g. servers or routers) or to any other end entity defined in the subject name of a public key certificate. End Entities can also consume or support PKI-related services (e.g. a RA is considered an End Entity from the point of view of a CA).

To participate in a PKI, servers and end-users (that is, End Entities bound to certificates) must first enlist in it.

CA (Certification Authority)

Public keys are distributed in the form of certificates and the CA is the only component infrastructure that can issue them.

CAs also issue Certificate Revocation Lists (CRLs). A CRL is a black list of certificates: it enumerates revoked certificates along with the reason(s) for revocation.

Although a CA may also support administrative functions, these tasks are often delegated to one or more Registration Authorities.

There are two types of CAs: root CAs and intermediate or subordinate CAs. While root CAs are trust anchors, which means that their trust is assumed not derived, intermediate CAs must be

verifiable and verified by following their certification path (chain of certificates between a certificate and its trust anchor CA) in order to be sure of their trustworthiness.

RA (Registration Authority)

The RA is an optional component that can assume CA administrative functions, such as:

- End entity registration process (including verification of the End Entity identity)
- Validating the subject attributes of the certificate requester
- Verifying that the subject holds the private key that is being registered
- Generation of shared secrets to support the initialization and certification process
- Public/private key pair-generation
- Intermediary between the CA or CAs and the End Entity
- Parameter validation of public keys presented for registration

One of RAs main advantage is to reduce overall costs for large and geographically dispersed organizations that require their users to register physically. The offloading of administrative functions from the CA also allows operating it offline, which reduces the risk of suffering remote attacks.

Repositories

Any method used for storing certificates and CRLs so that they can be retrieved by End Entities . Usually LDAP Directory Servers are used.

PKIX management functions

A Public Key Infrastructure needs to support the management functions detailed bellow.

Registration

Before End Entities can interact with a PKI, they must first enlist into the infrastructure. This is done through registration, initialization and certification, which can be managed either as separate functions or combined.

By registering, the End Entity makes itself known to a CA, which verifies its identity.

Initialization

Initializing the associated trust anchor with the End Entity follows registration. In this step, the public and private key pair related to the End Entity is also created. Key pairs can be generated by the End Entity client system, or by an RA, CA or some other component such as a hardware security module.

Certification

The enlistment process ends with the CA issuance of the End Entity public key certificate. If the key pair is generated external to the CA, the public key component must be transmitted to the CA in a secure manner. Once generated, the certificate is returned to the End Entity and/or published to a certificate repository.

Key pair recovery

Key pairs can be used to support digital signature creation and verification, encryption and decryption, or both. It is solely to recover their encryption/decryption use that key pair recovery has been conceived.

For example, key pair recovery allows End Entities to restore their encryption/decryption key pair from an authorized key backup facility in case of forgotten passwords, corrupted disk drives, etc.

Key pair update

Update of a key pair may be needed in two occasions: when the lifetime of a certificate expires or when a certificate is revoked. By updating a key pair, a new key pair is generated and a new public key certificate is issued.

Revocation request

Sometimes a certificate has to be revoked before it expires (e.g. name change or change in affiliation). After an End Entity or RA request certificate revocation to the CA that issued that certificate, either the CRL Issuer or the CA itself must make certificate revocation information available. X.509 defines a method for publishing this information via Certificate Revocation Lists (CRLs.)

It is important for End Entities to check the revocation status of all certificates in a given certification path to ensure that data is protected.

Cross-certification

Cross certification enables entities in one PKI to trust entities in another PKI. In a hierarchical trust model with a root CA and subordinate CAs, the root CA can cross-certificate the subordinate CAs but not the other way round.

Additional management functions

Some management functions may be required just in certain environments. These include:

- CA key update announcement;
- certificate announcement: method to announce the existence of a certificate when no other method is available;
- revocation announcement;
- CRL announcement;
- certificate confirmation: used by an End Entity to accept or reject the issued certificate;
- key archive: used to request private decryption key backup.

PKIX management protocols

Management protocols support online protocol exchanges between various PKI components. Certificate Management Protocols (CMP) are the most comprehensive and flexible PKI management protocols, as they can accommodate various technical, operational and business models.

PKIX certificate discovery and validation protocols

The need to offload portions or all of the certificate discovery and/or validation process from the client system has driven to the creation of developing protocols that assume these tasks.

OCSP is the predecessor for these protocols. It returns real-time responses to client queries, and provides a method for returning certificate status on demand. OCSP functionality is however limited, that's why other protocols have been created.

SCVP allows offloading the certification path and/or validation process from the client's system.

EJBCA 10m Bird's-eye view

EJBCA is a complex piece of software. In this chapter we see the characteristics of EJBCA in a summarized way:

- **Major functionality** describes the main characteristics supported by the Open Source and the Enterprise Edition.
- **Operation Web Portals** details the functionalities shown in the main menu for the private administration portal and the public portal.
- **Systems Operation** explains the available options for system operations.
- **Integration with other components** lists the possible connections with other systems.
- **Supported Software Stack** describes the supported base software into which EJBCA has to be run.

Major functionality

EJBCA comes with two flavours: an Open Source version and an Enterprise Edition. Find bellow their major functionalities.

The Open Source version includes:

- Multiple CAs and levels of CAs: the possibility to build a complete infrastructure (or several) within one instance of EJBCA
- Support of most PKI protocols and algorithms considered safe today
- Support for Hardware Security Modules (HSMs)
- Individual enrollment or batch production of certificates
- Administrator registration and self-registration work-flows out of the box
- Browser enrollment through Firefox, IE, etc. with support for SmartCards
- Key recovery to store private keys for later recovery, for selected users and certificates
- OCSP and CRL services
- Support of special protocols like CMP, XKMS and SCEP
- Source code under LGPL license

The Enterprise Edition adds:

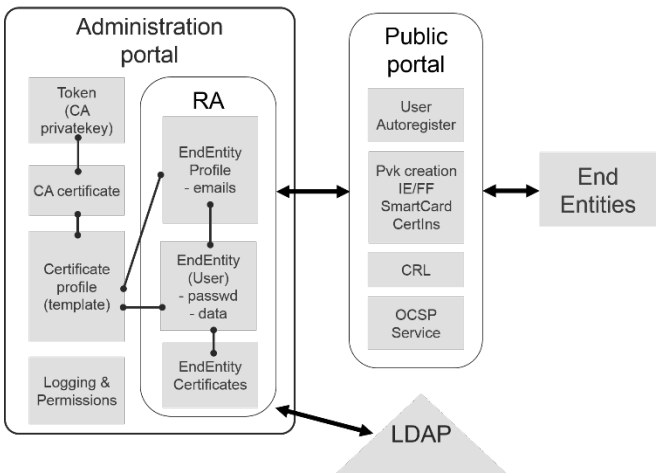
- Database integrity
- Secured audit logging
- Support for highly specialized deployments
- Professional support and know-how

Operation web portals

EJBCA is a software intended to build a full-compliant PKI infrastructure. In order to do so, it offers the following components:

- A **Crypto Token** is a container of private key pairs. It can be stored in software (in the CA host) or in a Hardware Security Module like Thales nShield. More than one key can be stored in a Crypto Token because, aside from the CA signing key, it is useful to store another test key (to perform test signatures in order to check if the HSM module is alive).

- A **Certification Authority** contains a Crypto Token to perform signatures, the CA certificate, and the configuration of EJBCA embedded validation services (it specifies where the CRLs are published or where the OCSP service is located). It can handle multiple root Certification Authorities and their subordinated CAs.
- A **Certificate policy** specifies a certificate template containing all the fields of a certificate (CRL and OCSP issuing points, key sizes, algorithms, extensions, key usage, etc..) except for the subject of the certificate, and the CAs allowed to issue such certificate.
- **End Entities** are similar to end-users (be them individuals or servers) and have attributes such as user names, passwords, email addresses, etc. A CA will issue a certificate for an End Entity by attaching its identity or attributes to the issued certificate. End Entities can be supplied from an external source.
- **An End Entity profile** is an End Entity template that links the concept of CA and Certificate Policy with a user. It specifies the fields of each End Entity (such as address, email address, organization, name, phone number, and if the user password is auto generated) and how these fields are placed into the resulting Subject DN of the created certificate (the field can be fixed or modifiable). This profile can also include the need of informing an End Entity via email of a change in a certificate status.
- **A Registration Authority** manages End Entities and their profiles.
- **Publishers**: EJBCA can publish the issued certificates to a directory server like an LDAP or Active Directory in order to be visible for the organization.
- **Services**: EJBCA has scheduled internal services to send remainder emails to users if their certificate is about to expire, to renew CA keys, to renew CRLs automatically or to publish certificates.
- Various **Administration Roles** and complex security parameterisations can be managed.
- Various **Approvers** can be instructed to perform certain operations, thus enforcing the separation of duties.
- A **public portal** offers direct access to: revocation services (OCSP and CRL) and retrieval of CA certificates. It is also the main place where end users generate and retrieve certificates. This portal is equivalent to the RA portal in a PKI infrastructure.



Private administration portal

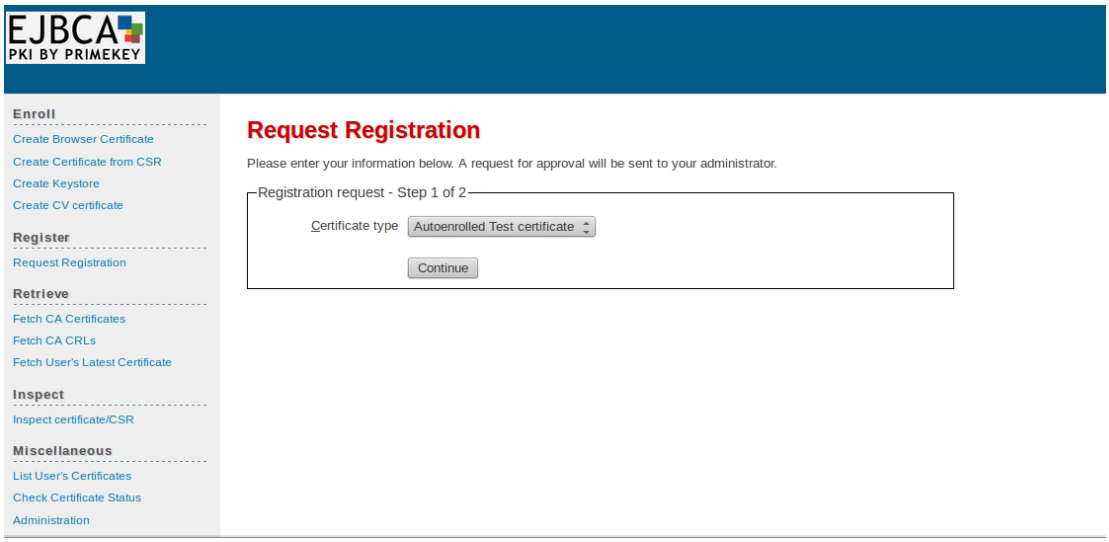
The private CA portal, usually only accessible via Administrative SSL client certificate in **`https://server:8443/ejbca/adminweb`**, contains the following options in its main menu:

- **[CA] CA activation** activates and deactivates CAs. This is useful to check if the private keys are active. It is also helpful when you are renewing the infrastructure.
- **[CA] CA Structure & CRLS** shows the hierarchical structure of the certification authorities managed by this instance of EJBCA (similar to the public portal).
- **[CA] Certificate Profiles** manages the templates for the CA issued certificates.
- **[CA] Certification Authorities** creates, revokes and deletes root and subordinate CAs.
- **[CA] Crypto Tokens** manages the private keys of the certification authorities.
- **[CA] Publishers** configures where the CA and the CA issued certificates are published.
- **[RA] Add End Entity** adds an end-user for which to issue certificates.
- **[RA] End Entity Profiles** manages End Entities and their data in order for EJBCA to issue certificates for them.
- **[RA] Search End Entities** searches for End Entities using various filters.
- **[RA] User Data Sources** configures plug-ins to use End Entities from an external source.
- **[Supervision] Approve Actions** configures actions that require more than one person to be done.
- **[Supervision] View Log** views log records.
- **[System] Administration Roles** assigns various permission types in the Administration console depending on some fields of the SSL logged certificate.
- **[System] CMP configuration** configures the CMP protocol. This protocol is used in large CA deployments.
- **[System] Internal Key Bindings** instructs EJBCA to use of private keys (Crypto Token) for purposes other than issuing certificates.
- **[System] My Preferences** configures user preferences.

- **[System] Services** configures scheduled background actions automatically performed by EJBCA.

Public administration portal

The public CA portal, usually accessible via **`http://server:8080/ejbca`** or **`https://server:8442/ejbca`** contains the following options in its main menu:



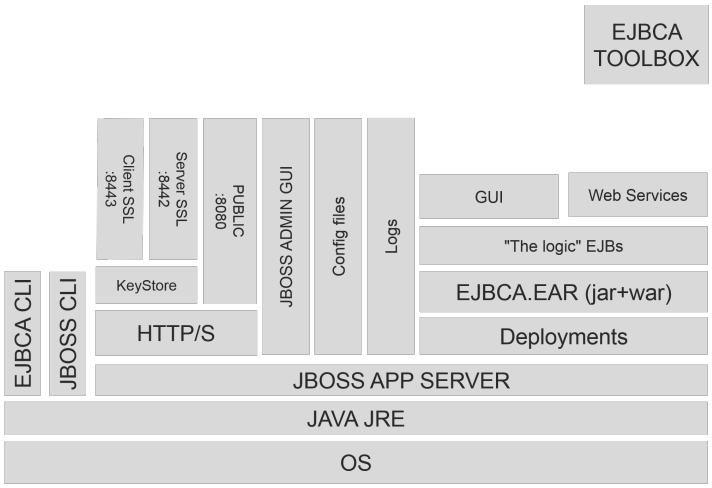
- **[Enroll] Create Browser Certificate** generates a certificate by entering an End Entity's user and password. The key pair can be generated via the browser ("User Generated" according to EJBCA) or in the server and downloaded as a PKCS#12 file ("P12" according to EJBCA). If IE is used, private keys can be created in smart cards using the "User Generated" option.
- **[Enroll] Create Certificate from CSR** generates a certificate by entering an End Entity's user and password and a Certificate Signing Request. This is generally used to generate certificates for SSL servers.
- **[Enroll] Create KeyStore** generates a Java KeyStore by entering an End Entity's user and password. The key pair is generated in the server.
- **[Enroll] Create CV Certificate** creates a Card Verifiable Certificate which is certificate designed to be processed by devices with limited computing power such as smart cards.
- **[Register] Request Registration** requests an RA to create a user for which to issue certificates.
- **[Retrieve] Fetch CA CRLs** downloads the CA CRLs.
- **[Retrieve] Fetch User's Latest Certificate** retrieves the last certificate issued for a user.
- **[Inspect] Certificate/CSR** examines the contents of a certificate or a Certificate Signing Request.
- **[Miscellaneous] List User's Certificates** retrieves any certificate (valid or not) issued for a certain user or End Entity. This can be useful when verifying long-term signatures.
- **[Miscellaneous] Check certificate status** checks if a certificate has been revoked.

System operation

EJBCA supports the following elements for system operation:

- Command line utility **`bin/ejbca.sh`**
- Embedded Web Services via Client Toolbox, an utility to call the Web Services from the command line
- Saves logs to a file although it can also be redirected to a log server to check errors
- Contains an integrated health check system

To better understand how EJBCA is built internally see this block diagram about its internal structure when deployed in a JBOSS Application Server:



- JBOSS CLI: command line utility to send locally commands to JBOSS, e.g. shutting down the server
- EJBCA CLI: command line utility to send locally commands to EJBCA, e.g. listing registered End Entities
- EJBCA TOOLBOX: utility to call EJBCA web services
- Public 8080: http server
- KeyStore: where the certificate and the private keys are located In JBOSS, usually in **`jboss/standalone/configuration/keystore`**
- Client SSL 8443: https server that requires a client certificate
- Server SSL 8443: https server that doesn't require a client certificate
- JBOSS ADMIN GUI: administration GUI for JBOSS, Very minimal. It can be accessed via http://server:8080/
- Log files: JBOSS log files are located in **`jboss/standalone/logs`**
- Config files: JOBSS configuration files are located in **`jboss/standalone/configuration/standalone.xml`**
- Deployments: the deployed applications in JBOSS are located in **`jboss/standalone/deployments`**

Integration with other components

EJBCA has connectors to various components.

- It uses services to:
    - Publish to an external LDAP or Active Directory server

    - Import users from other sources
    - Send e-mails
    - Print
    - Support Hardware Security Modules
    - Create certificates in smart cards using the user's browser

- It offers services for:
    - OCSP (Online revocation check)
    - CRL (Downloadable revoked certificates blacklist)
    - CMP (PKI protocol for large deployments)
    - SCEP (Certificate Enrolment Protocol for devices)
    - XKMS (Protocol for key distribution)
    - RA Web Services
    - Administration Web Services

EJBCA has a plug-in architecture and the source code is available, so there are many options to connect to other systems.

Supported software stack

EJBCA supports the following stack:

- Java
    - Oracle Java 6/7

- Java Application JEE Server
    - JBoss 7.1.1.Final
    - JBoss EAP
    - JBoss 5.1.0.GA
    - JBoss EAP 5.1

- Databases
    - DB2
    - Oracle
    - MySQL
    - HyperSQL (local file)

- As EJBCA is built on JEE, it is transaction-safe and can be deployed in High Availability

Installing EJBCA and issuing self-signed certificates

Self-issued certificates are certificates that are signed by themselves. Within a PKI usually only CA Root certificates use this mechanism although it can also be used to issue SSL server certificates or other types of certificates out of the scope of a Certification Authority itself.

EJBCA is not designed for issuing standalone-self issued certificates, but this can be done easily. This section talks about how to use EJBCA to create self-signed certificates with private keys stored in software.

If you want to use an EJBCA to issue self-signed certificates and you have a production EJBCA PKI, it is recommended to use separated instances of EJBCA.

In this chapter we'll see how to:

- Install the EJBCA software
- Create the certificate profile SELF_ISSUED_SSL_SERVER: a template for issuing self-signed SSL Server certificates
- Create the CN=mysslserver.com self-signed certificate and download it with its private key as a PKCS#12 file

Installation

In order to install the EJBCA software we need to install Java and the Ant build tool in our server. In Debian hosts (like Ubuntu), this can be done with the following instructions:

```
sudo apt-get install openjdk-7-jdk
```

```
sudo apt-get install ant
```

Depending on the corporative system administration guidelines, this software can be located in different locations. In this case we use the **/opt** folder that is a common standard when manually installing software on UNIX machines. We need to download the JBoss Application Server 7.1.1 Final and the EJBCA Community Edition 6.0:

```
mkdir /opt
```

```
mkdir /opt/h2
```

```
unzip jboss-as-7.1.1.Final.zip
```

```
unzip ejbca_ce_6_0_3.zip
```

We need to set some configuration files:

Copy or rename **/opt/ejbca/conf/ejbca.properties.sample** to **/opt/ejbca/conf/ejbca.properties** and set **appserver.home=/opt/jboss-as-7.1.1.Final**
If your server hostname is not localhost copy or rename **/opt/ejbca/conf/web.properties.sample** to **/opt/ejbca/conf/web.properties** and set **httpsserver.hostname=<hostname>**
Copy or rename **/opt/ejbca/conf/database.properties.sample** to **/opt/ejbca/conf/database.properties** and set **database.url=jdbc:h2:/opt/h2/ejbca;DB_CLOSE_DELAY=-1;MVCC=true**

Go to **/opt/jboss-as-7.1.1.Final/bin**, and run

./standalone.sh

Open a new terminal tab and go to **/opt/ejbca_ce_6_0_3**, then run

ant deploy

Sometimes, the first deployment is not successful, so it is necessary to repeat the **ant deploy** operation. When successful, run

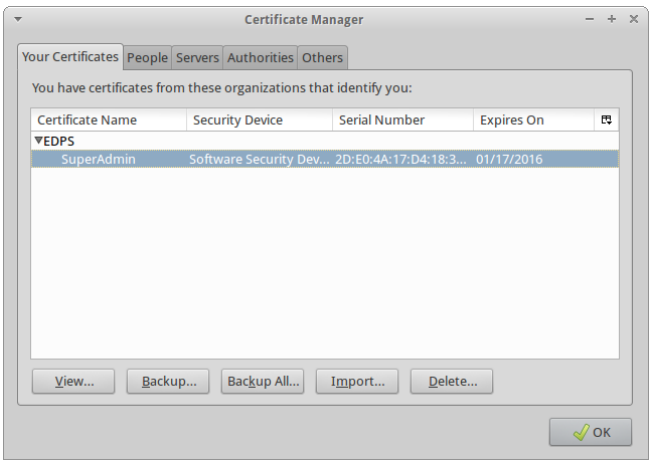
ant install

This will create a temporal administrative CA, accept all default values. When finished, press Control-C to stop the JBOSS Server, and start it again running **./standalone.sh**

Open the Firefox browser, go to Edit > Preferences > Advanced > View certificates>Import

Select the **/opt/ejbca_ce_6_0_3/p12/superadmin.p12** file. Its password is **ejbca**

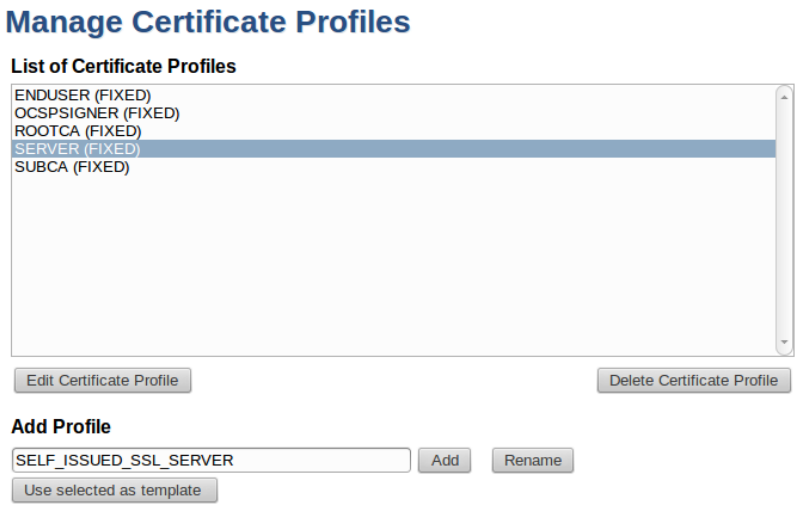
This will import the SuperAdministrator certificate into the Firefox browser.



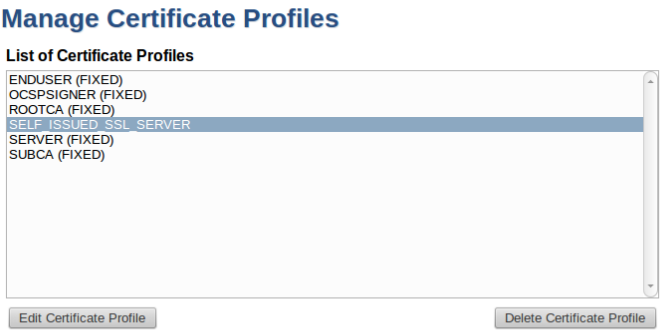
Now, you can enter the Administration portal through https://localhost:8443/ejbca/adminweb to

Creation of a certificate template

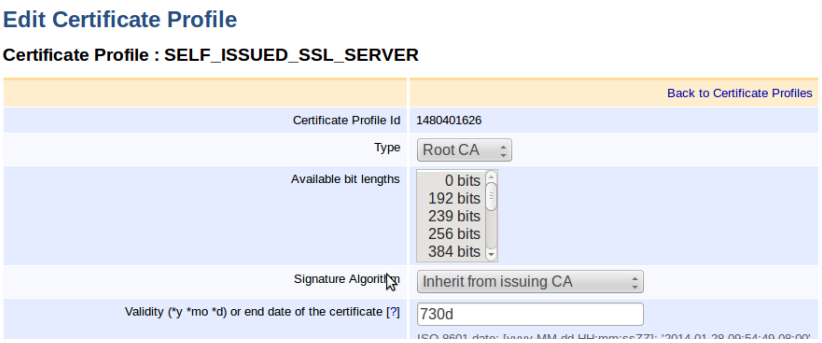
On the Administration portal, select **Certificate Profiles** from the menu. The next screen will appear:



Enter **SELF_ISSUED_SSL_SERVER** in the **Add Profile** textbox. Then, select the **SERVER (FIXED)** existing profile and press the **Use selected as template** button. This will create a certificate profile based on this template. This is really useful because we don't need to know the exact certificate key usages required to issue SSL server certificates. We cannot use the **SERVER (FIXED)** directly because it is not intended to issue self-signed certificates, so we must edit the created profile to adjust it. We can do it by selecting the **SELF_ISSUED_SSL_SERVER** and clicking the **Edit Certificate Profile** button.



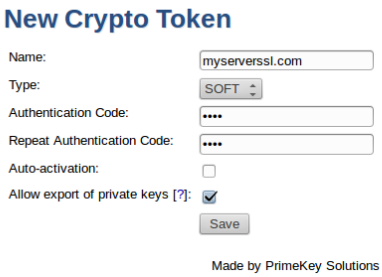
Change the **Type** to **Root CA**, and leave the other parameters as appear. Then click the **Save** button.



Creation and exportation of a certificate

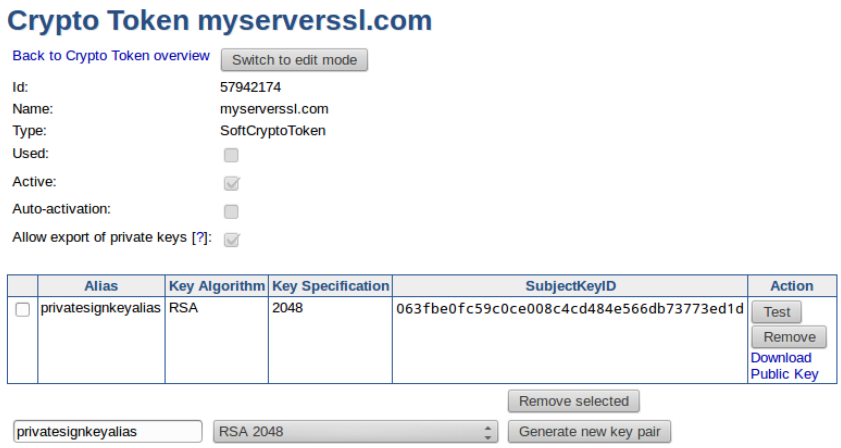
Go to the **Crypto Tokens** main menu option. The following screen will appear:

Then click **Create new…**



Set the **Name** to **myserverssl.com**, the **Type** to **SOFT**, repeat the authentication code (this is the password protecting the private key), and check **Allow export of private keys** (it is not checked by default). Then, click the **Save** button.

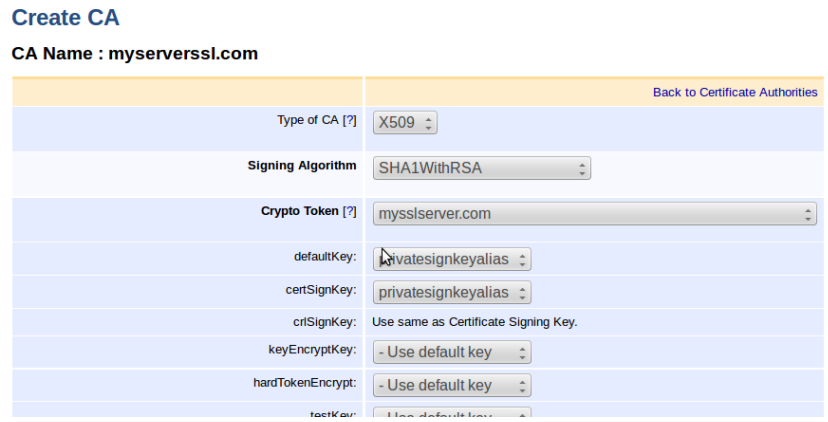
The container for private keys has been created. You should create now the private key itself. Select **RSA 2048** in the combo box and click **Generate new key pair**.



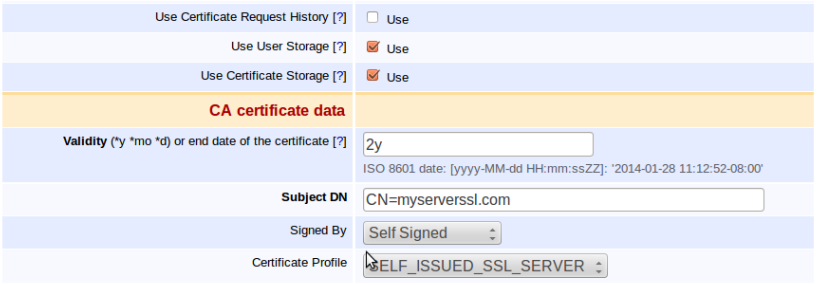
As you can see, you have a key pair created in a Crypto Token named **myserverssl.com**.

Now you should create the certificate. Go to the **Certification Authorities** menu and create a new Certification Authority called **myserverssl.com:**

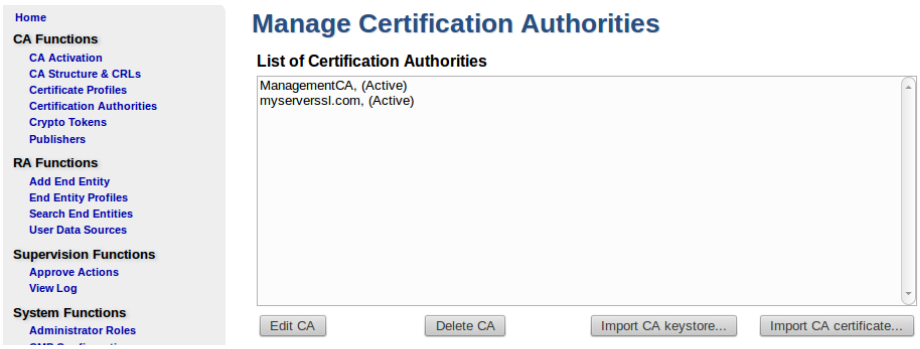
Select it and click the **Create…** button. Select the mysslserver.com **Crypto Token**.



Set the **Validity** to 2y, the **Subject DN** to the CN=mysslserver.com, **Signed By** to Self Signed and the **Certificate Profile** to SELF_ISSUED_SSL_SERVER.



Press the Create button to create the Certificate:



Select the certificate and click **Edit CA.** Go to the **Export CA** section, enter the protection password written in the creation of the Crypto Token, and select Export **CA keystore…** to download the PKCS#12 file. This file is password-protected (the same above mentioned password).

Basic Certification Authority

In the previous chapter we created SSL self-signed certificates, but this is not PKI. Now, we will create a complete Certification Authority that issues and revokes certificates, offers CRLs and OCSP services.

In this chapter, we will:

- Create a root Certification Authority with these parameters:
  - Name: CN=EDPSROOT, O=EDPS
  - Validity: 10 years
  - SHA256WithRSA signing algorithm
  - It issues CRLs
  - It has an OCSP server

- Create 2 types of certificates and End Entity profiles
  - SSL Client certificate
    - We create the Certificate Profile EDPS_SSLCLIENT_CERTPROFILE that will specify the certificate template for an SSL Client certificate.
    - We create the End Entity Profile EDPS_SSLCLIENT_EEPROFILE that forces that:
      - The subject of the certificate is CN=<id of user>, O=EDPS.
      - The private key can be generated by the server (this is, the user downloads a PKCS#12), or is supplied by the user.
  - SSL Server certificate
    - We create the Certificate Profile EDPS_SSLSERVER_CERTPROFILE that will specify the certificate template for an SSL Server certificate.
    - We create the End Entity Profile EDPS_SSLSERVER_EEPROFILE that forces that:
      - The subject of the certificate is CN=<id of host>, O=EDPS.
      - The private key can be generated by the server (this is, the user downloads a JKS java keystore), or supplied by the server.

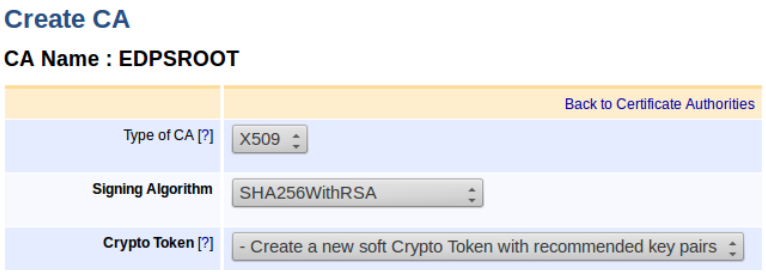
- Create three End Entities and generate a certificate for each one of them:
  - **`CN=john, O=EDPSCA`** SSL Client certificate. Here the user will download the certificate from the CA in a PKCS#12 file.
  - **`CN=peter, O=EDPSCA`** SSL Client certificate. The user will generate the private key in the browser (this is, in the client-side), and the CA will generate the certificate with the supplied public key.
  - **`CN=myserverssl.com, O=EDPS`** SSL Server certificate. The certificate will be generated from a CSR that has been generated in the command line using the openssl tool.

- Revoke the **`CN=john`** certificate and regenerate the CRL

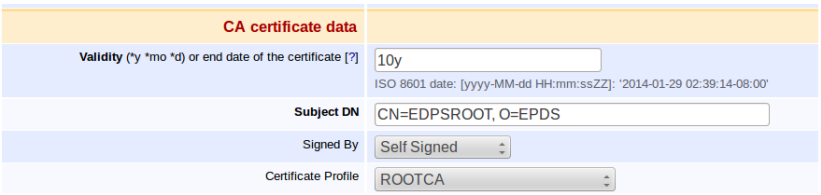
Creation of the EDPSCA ROOT Certification Authority

To create the Root Certification Authority go to **Certification Authorities** and create the **EDPSROOT** Certification Authority by entering the name in the **Add CA** textbox and pressing the **Create…** button.

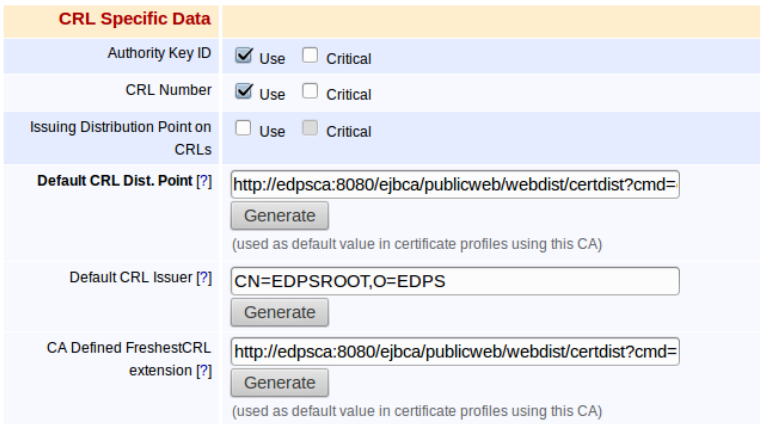
Select **SHA256WithRSA** as the **Signing Algorithm**, and in **Crypto Token** choose the default option **– Create a new soft Crypto Token with recommended key pairs**.



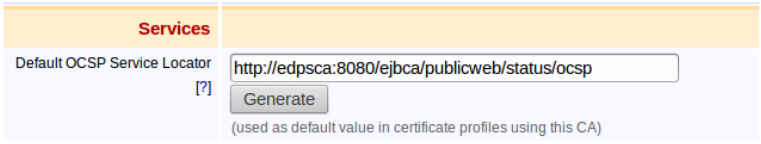
We need to supply the **Subject DN** of this CA: CN=EDPSROOT,O=EDPS , the **Validity** to 10y and the **Certificate Profile** to ROOTCA.



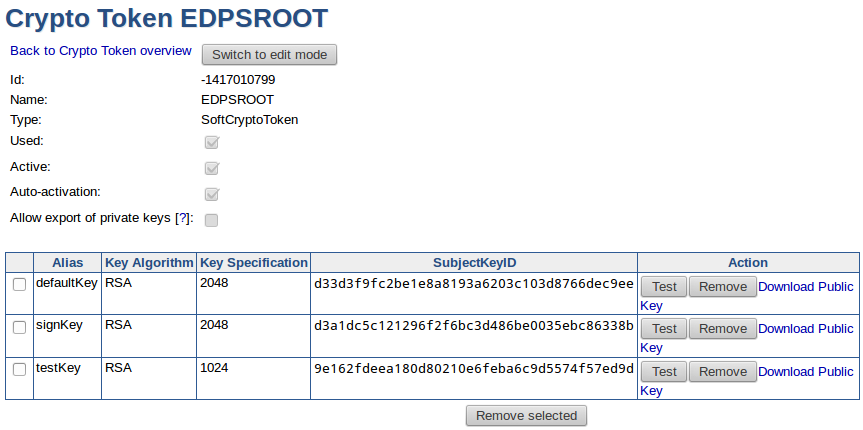
We also need to configure where the CRLs will be published: press each one of the **Generate** buttons in **Default CRL Dist. Point**, **Default CRL Issuer** and **CA Defined FreshestCRL extension**. By default, EJBCA chooses the localhost server, change it for the real server hostname, in this case **edpsca**.



In the **Services** section, press **Generate Button** of the **Default OCSP Service Locator**. Replace the localhost parameter by the name of the host.



The EDPSROOT CA has been created. Go to the **Crypto Tokens** main menu to examine the created keys. There are two keys, the first one is named **signKey** or **defaultKey**, and the other one is **testKey**. In this case, the test key is not useful because it is in software; although it will be useful in HSM environments.



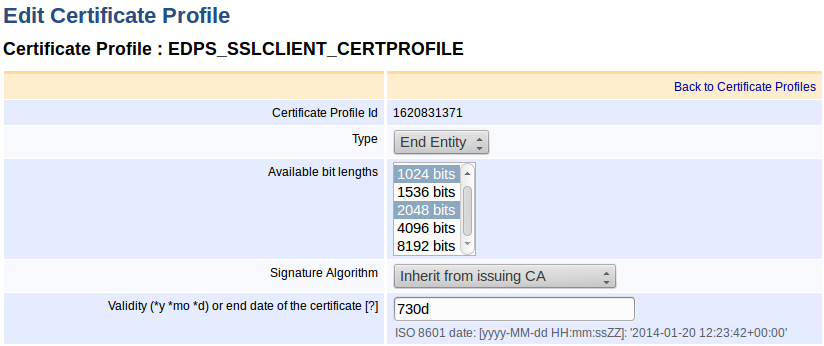
If we go to **CA Structure & CRLs** we can see the created EDPSROOT CA and the last CRL created. Later on, we will use the **Create CRL** button in this screen to renew the CRL.

Creation of the certificate and End Entity profiles

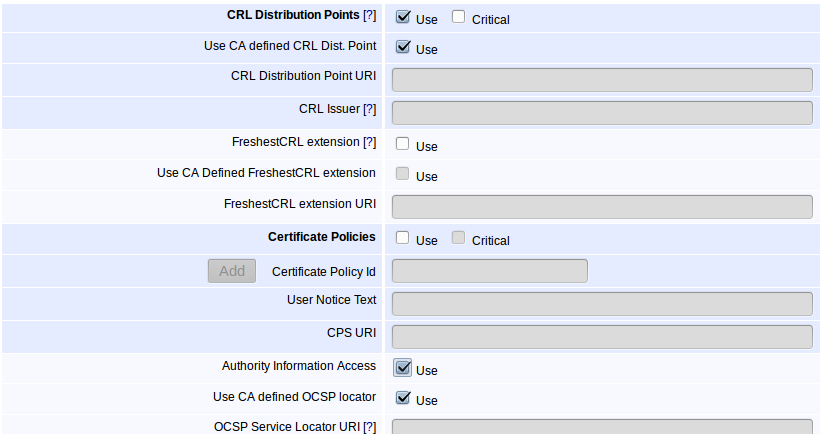
Create the SSL client profile

Go to the **Certificate Profiles** main menu option, and create the **EDPS_SSLCLIENT_CERTPROFILE** using the **ENDUSER (FIXED)** profile with the **Use selected as template** button.

Select **EDPS_SSLCLIENT_CERTPROFILE** and press **Edit Certificate Profile**. Select **1024** and **2048** as **Available bit lengths**.



In the **CRL Distribution Points** section, select the **Use CA defined CRL Dist. Point**. Check **Authority Information Access** and **Use CA defined OCSP locator**.



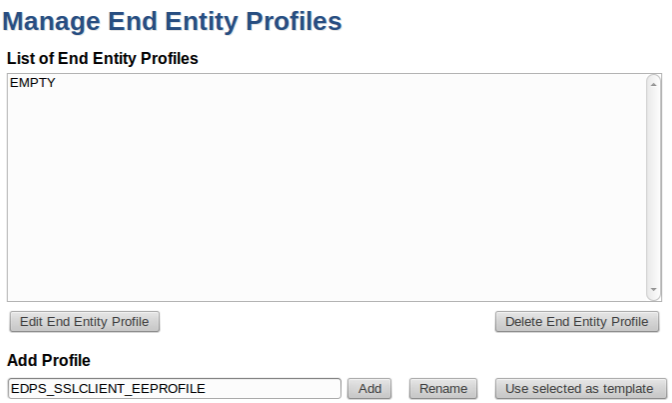
Finally, select that this certificate profile is only issuable from the **EDPSROOT** Certification Authority in **Available** CAs.

SSL Server certificate profile

Create the **EDPS_SSLSERVER_CERTPROFILE** Profile following the same steps but using **SERVER (FIXED)** as template instead of **CLIENT (FIXED)**.

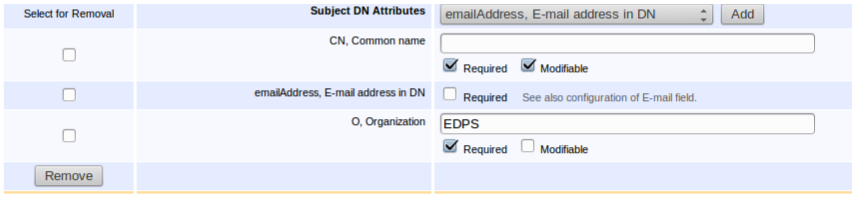
SSL Client entity profile

Go to **End Entity Profiles** and enter **EDPS_SSLCLIENT_EEPROFILE** in the **Add Profile** textbox.

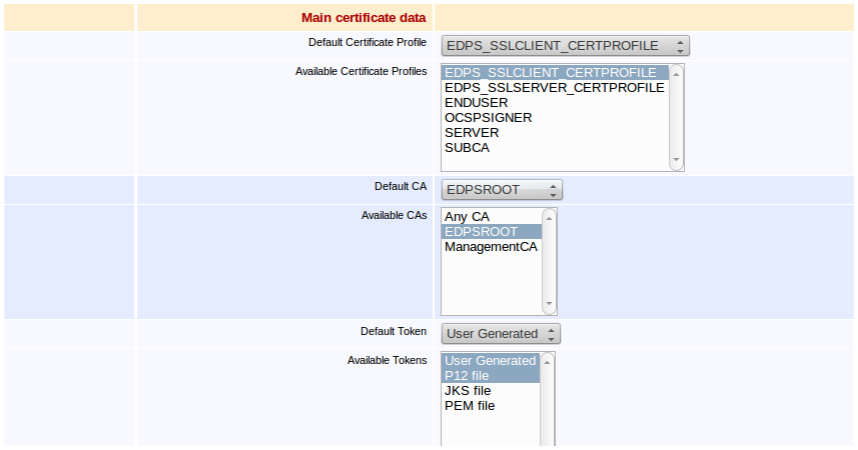


Click the **Add button**.

We need that all SSL client certificates are issued with the O=EDPS field in the Subject DN. To do so, add a field by selecting **Organization** in **Subject DN Attributes**, and pressing **Add**. Then, write **EDPS** in the **O, Organization** textbox, check **Required**, and uncheck **Modifiable**. Add the email field, also.



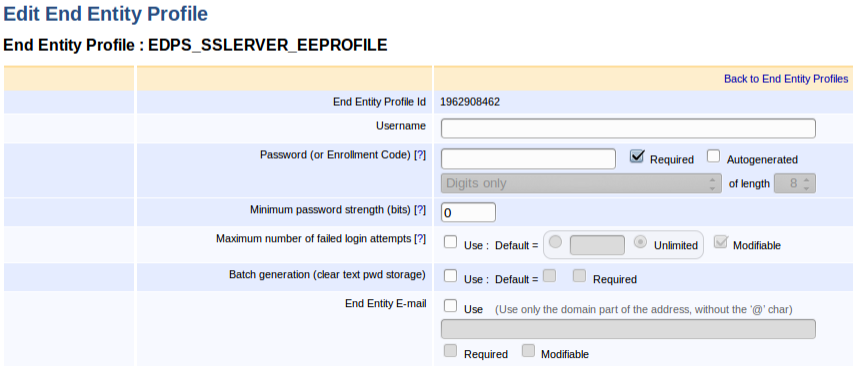
Finally, select that the default and available profile in **Main certificate data** is the **EDPS_SSLCLIENT_CERTPROFILE**, that the default and available CA is **EDPSROOT** and that the **Available Token**s are **User Generated** and **P12 file**.



Finally, press the **Save** button.

SSL Server entity profile

Create the **EDPS_SSLSERVER_EEPROFILE** profile with the same parameters as we created **EDPS_SSLCLIENT_EEPROFILE**, but unchecking **End Entity E-mail Use** and using **EDPS_SSLSERVER_CERTPROFILE** as the default and available certificate profile.



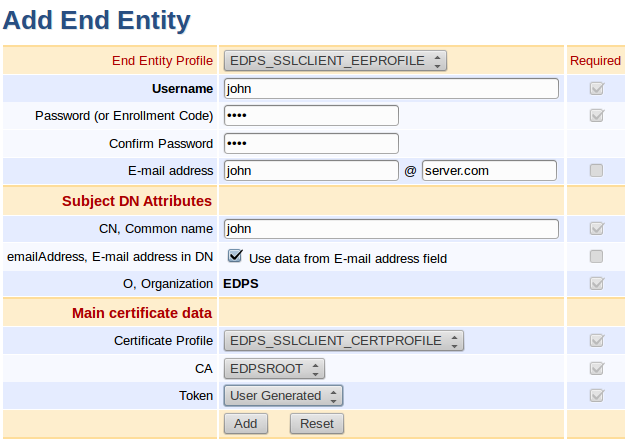
Issuing the certificates

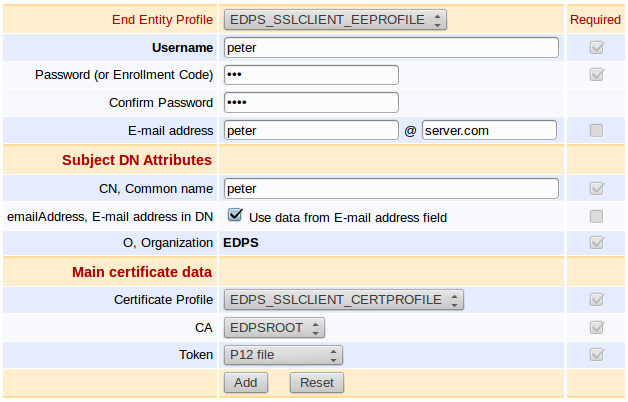
Creating end-users

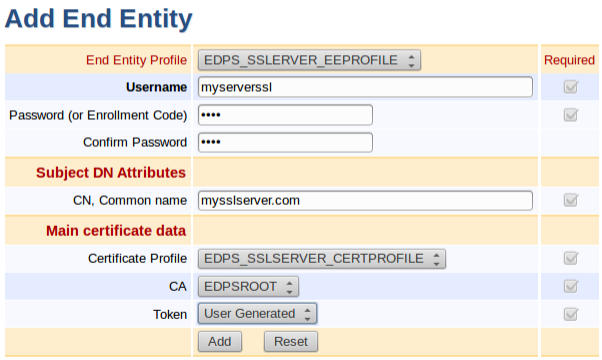
We need to create users, there's no possibility in EJBCA to create End Entity certificates without the "user" concept (in normal deployments, a special configuration allows it).

We will create three users:

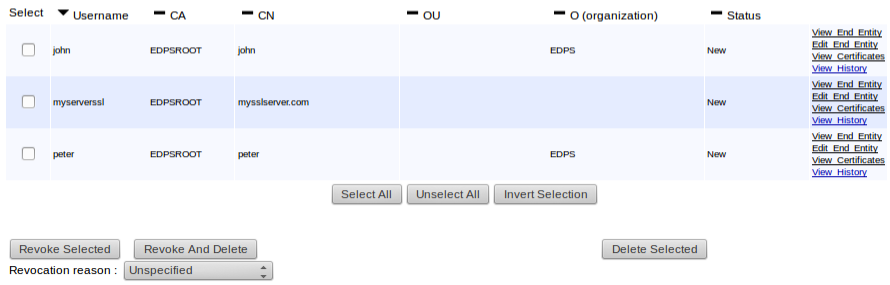
- user **john** with **EDPS_SSLCLIENT_EEPROFILE** in **User Generated Token**
- user **peter** with **EDPS_SSLCLIENT_EEPROFILE** in **P12 file Token**
- user **myserverssl** with **EDPS_SSLSERVER_EEPROFILE** and **User Generated Token**







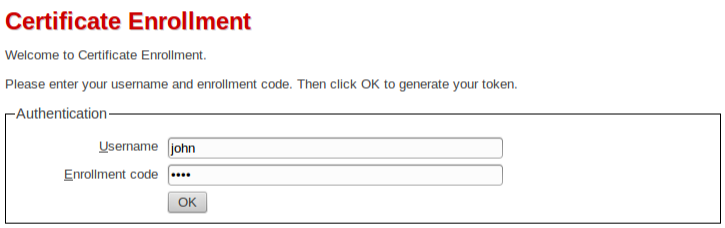
We can see the created users in the **Search End Entitie**s menu (in the **Filter** use **New** in **Search end entities with status**).



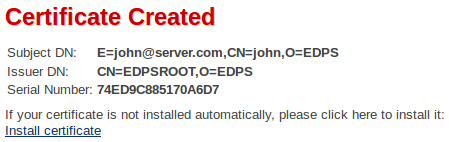
Generating a client SSL certificate for john

Go the public web portal and click the **Public Web** option in the menu.

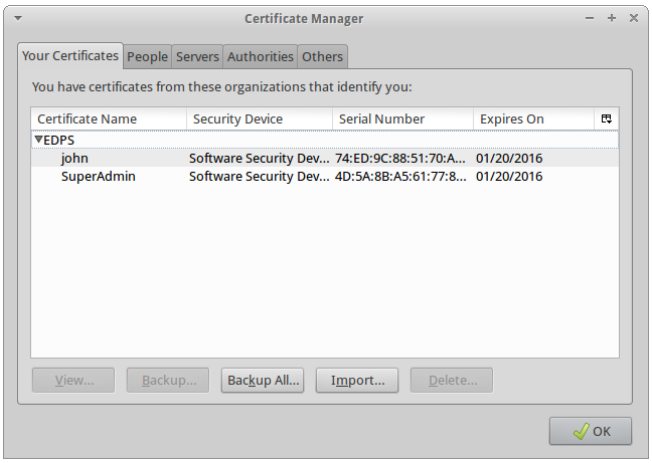
Then, in the public portal click the **Create Browser Certificate** menu, enter **john** and its password, and click the **OK** button.



A key pair will be generated in the browser, and EJBCA will issue and install a certificate for this key pair. All these operations are done automatically with JavaScript (or VBScript in windows systems) in the browser. After the process, EJBCA shows you that the certificate has been created and installed in the browser.

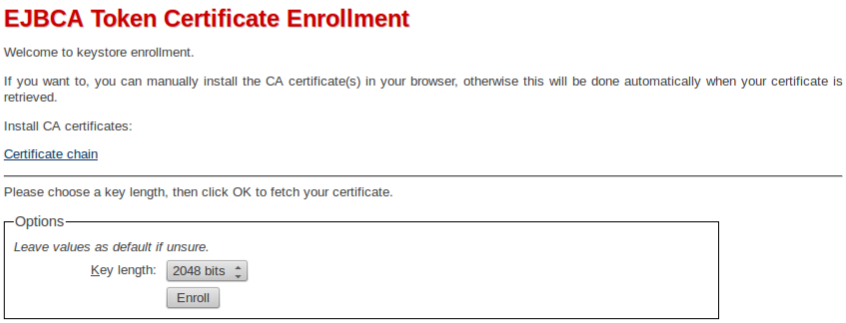


Open the Firefox browser, go to Edit > Preferences > Advanced > View certificates, and the created certificate will be shown.



Generating a client SSL certificate for peter

In the public portal click the **Create Browser Certificate** menu, enter **peter** and its password, and click the **OK** button.



You will be able to choose the **Key length** of the certificate in a menu. Then, press the **Enroll** button. EJBCA will create a PKCS#12 file downloadable with the browser.

Generating the SSL server certificate

SSL server certificates are usually created via CSR. CSR is a file format that contains the public key and the subject of the certificate. It is generated in the client side. The CSR is given to EJBCA and EJBCA issues a certificate with the supplied public key. Usually CAs also pick the subject from the CSR file, but EJBCA doesn't, that's why the issuer of the created certificate must be well pre-defined in EJBCA.

In this example, we use the **openssl** tool that is available in almost all UNIX systems. First, create the key pair with the **genrsa** parameter. Afterwards, use the **req** parameter to generate a CSR.

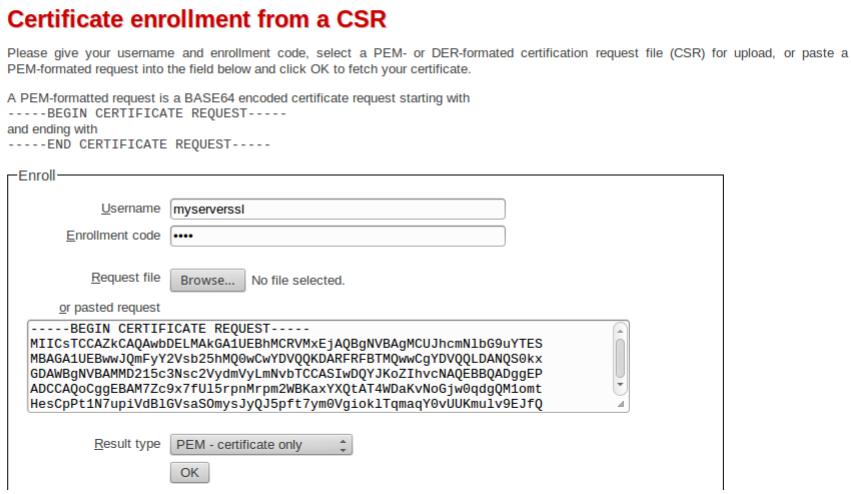
```
user@edpsca:~/mysslserver$ openssl genrsa -out mysslserver.key 2048
Generating RSA private key, 2048 bit long modulus
....+++
.............................................+++
e is 65537 (0x10001)
user@edpsca:~/mysslserver$ openssl req -new -key mysslserver.key -out server.csr
You are about to be 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]:ES
State or Province Name (full name) [Some-State]:Barcelona
Locality Name (eg, city) []:Barcelona
Organization Name (eg, company) [Internet Widgits Pty Ltd]:EDPS
Organizational Unit Name (eg, section) []:PKI
Common Name (e.g. server FQDN or YOUR name) []:mysslserver.com
Email Address []:

Please enter the following 'extra' attributes
to be sent with your certificate request
A challenge password []:
An optional company name []:
user@edpsca:~/mysslserver$
```

If we dump the **server.csr** file, we can see that it is encoded in a base-64 format. Copy this text to the clipboard.

```
user@edpsca:~/mysslserver$ cat server.csr
-----BEGIN CERTIFICATE REQUEST-----
MIICsTCCAZkCAQAwbDELMAkGA1UEBhMCRVMxEjAQBgNVBAgMCUJhcmNlbG9uYTES
MBAGA1UEBwwJQmFyY2Vsb25hMQ0wCwYDVQQKDARFRFBTMQwwCgYDVQQLDANQS0kx
GDAWBgNVBAMMD215c3Nsc2VydmVyLmNvbTCCASIwDQYJKoZIhvcNAQEBBQADggEP
ADCCAQoCggEBAM7Zc9x7fUl5rpnMrpm2WBKaxYXQtAT4WDaKvNoGjw0qdgQM1omt
HesCpPt1N7upiVdBlGVsaSOmysJyQJ5pft7ym0VgioklTqmaqY0vUUKmulv9EJfQ
iEObie1a5+9rCl2rq355zKy2Sc+YAgHH/Gp9ITK0TlG1oBBSBoV7OoOJPKxSF4rV
crlD79zcPdykITSRaBL1icd2166RoIk/qETY6XIPC8q5x+Cl+S69Y5CV8H5tltfV
JDZ1Vhs5T6j2OjXEhl7rlsL+3FzoqURp4oN+Y+QftnwBMDifvhyhCUAnLVpu8BJN
oZkuIcKe2zUKQ+/cPLommUcvOrrhWOcFNH8CAwEAAaAAMA0GCSqGSIb3DQEBBQUA
A4IBAQBCjRW5Ef0OqBytqdV6tFBvOXXHYKicQ1qWtgZ5Gym88iidektnxCavExZh
ag37YIhm2Wzeqn+ODkuRUNudMBFAAVyB5CQpxWFx8JH6RyU1NLkIpO86XtTKQ24A
Pj8G+8QXhyupt8weETsdvszUmN4yctZfkmKCYOBd+iwTKwZXUe4vw+rf1DOf8/id
b7aqDR6gHOptANFb7cZ/aiuhO/RMc9C39WMxdhDUHqekH2m3GtlMOJA9M78DDBnU
htwRh2DviPCw2VTYuYnAs0j4QAHWDU+Ngnzrn7eZA8E6IkvXRExUOoM9tViCZTdY
qFFXVDaUaDkpmIjS/DYMa/MgorkN
-----END CERTIFICATE REQUEST-----
user@edpsca:~/mysslserver$
```

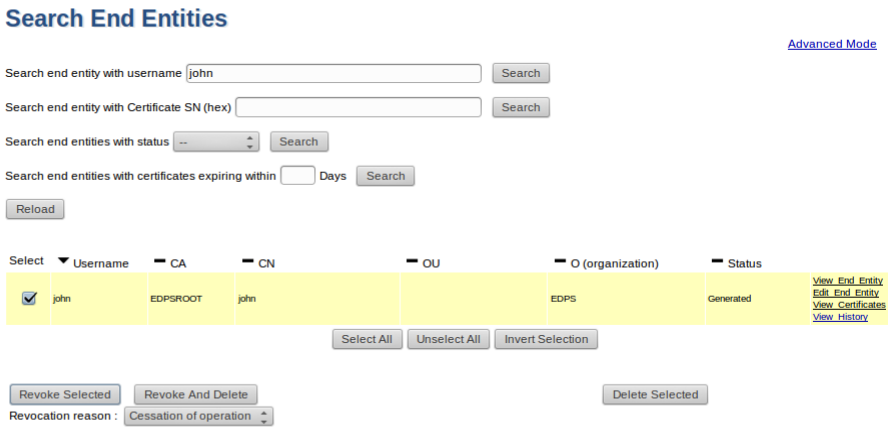
Go to the public portal, and select **Create Certificate from CSR**, enter the **myserverssl** user and password. Then, paste the server.csr text into the text area, select **PEM – certificate only**, and click the **OK** button.



The **myserver.pem** file is downloaded. This PEM file is an X509v3 file encoded in base64.

Revoking john's certificate and generating a new CRL

To revoke a certificate, search the End Entity that contains the certificate you want to revoke in the **Search End Entities** menu. In this case we use **john**, so we check the **Select** checkbox, choose the **Revocation reason** (in this case **Cessation of operation**), and click the **Revoke Selected** button.



After that, the **Status** of the certificate changes to **Revoked**.

If you click the **View Certificate** link, more information about the revocation is shown.

To renew the CRL, go to the **CA Structure & CRLs** main menu option and click the **Create CRL** button in the **EDPSROOT** CA.

Advanced Certification Authority

A Certification Authority may have more specialised features than the CA created in the previous chapter. For example:

- Two subordinated CAs exist: one for issuing administrator certificates and the other one for issuing end user certificates.
- Certain CA administrators ARE NOT super administrators of the whole EJBCA.
- Certificates are published in a corporative directory.
- Users can enroll themselves instead of being previously created. In this case, emails are sent to users.
- Dual-control is required to issue certificates.
- Certificates have a policy to identify its own usage.
- CA data can be retrieved from another server.

In this chapter these functionalities will be implemented:

- Two subordinated CAs will be created:
    - EDPSADMIN will be created to issue only administration certificates
        - SuperAdministrator certificates
        - CA administrator certificates
    - EDPSNQC will be created to issue non-qualified certificates
        - SSL client certificates with policy 1.3.130.2.1: self-enrolled users with subject CN=<user>, OU=NQC, O=EDPS.
        - SSL client certificates with policy 1.3.130.2.2: they need the approval of two RA administrators. Their subject will be CN=<user>, FirstName=<initials>,SurName=<surname>,UID=<personalID>, OU=NQC, O=EDPS.
- Two 1.3.130.2.1 certificates will be created and permissions will be given to approve 1.3.120.2.2 certificates.
- Certificates will be published to an LDAP server.

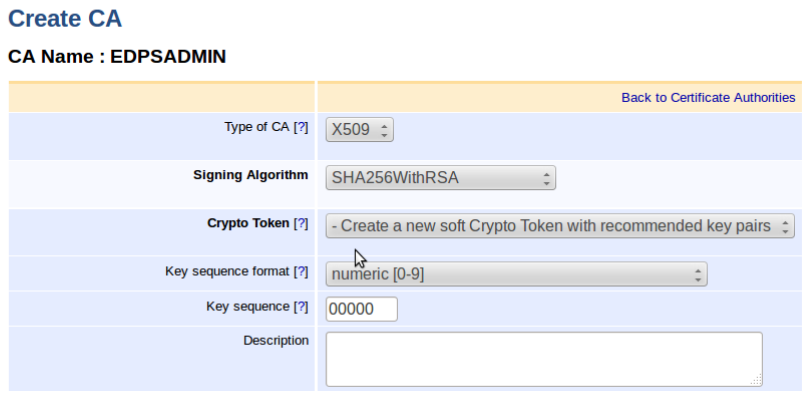
And with the following implementation:

- Two 1.3.130.2.1 certificates will be created: one for CN=ejbcauser1 and the other one for CN=ejbcauser2, both self-enrolled in the public portal with password sent by email.
- Both certificates will be configured as valid RA Administrators.
- A 1.3.130.2.2 user with CN=ejbcauser3 will be issued with the dual approbation of CN=ejbcauser1 and CN=ejbcauser2.
- All certificates will be published into an LDAP server.
- Finally we will access the EJBCA Web Services from a remote machine.

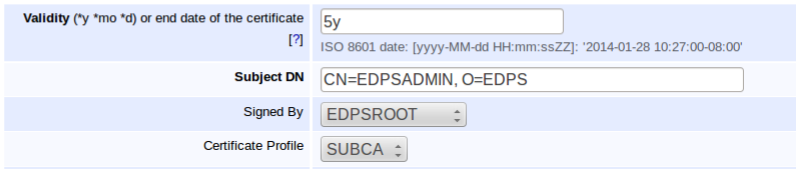
Please, note that this configuration is only for training purposes and cannot be used in the real world due to lack of security.

Create the administration and NQC subordinated CAs

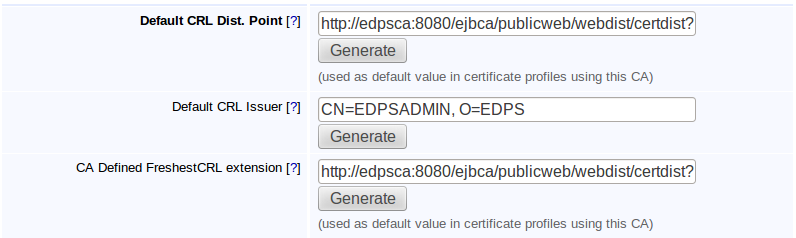
Go to **Certification Authorities**, and create the **EDPSADMIN** certification authority. Then select SHA256WithRSA as the **Signing Algorithm**.



Set the **Validity** to 5 years and the **Subject DN** to CN=EDPSADMIN, O=EDPS. Choose EDPSROOT in **Signed By** and **SUBCA** in **Certificate Profile**.



We need to configure where the CRLs will be published. Press the **Generate** button in **Default CRL Dist.Point**, **Default CRL Issuer** and **CA Defined FreshestCRL extension**. By default, they will be placed in the localhost server, change it by the server hostname, in this case **edpsca**.



In the **Services** section, press **Generate Button** in **Default OCSP Service Locator**. Change also the localhost parameter by the name of the host.

Click **Create** to create the EDPSADMIN subordinated CA.

Repeat the same steps to create the EDPSNQC CA, but giving it the subject DN to CN=EDPSNQC, O=EDPS.

The basic Certification Authority structure has been created.

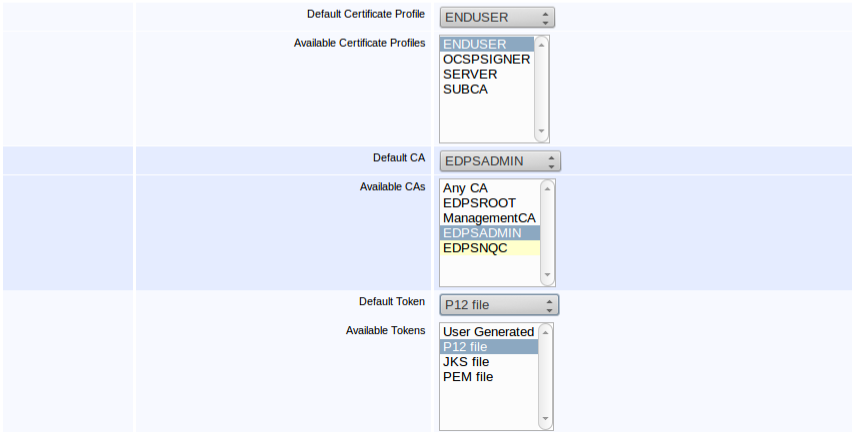
Set-up EJBCA to use SSL certificates from EDPSADMIN SUBCA

The next steps should be done to perform this task:

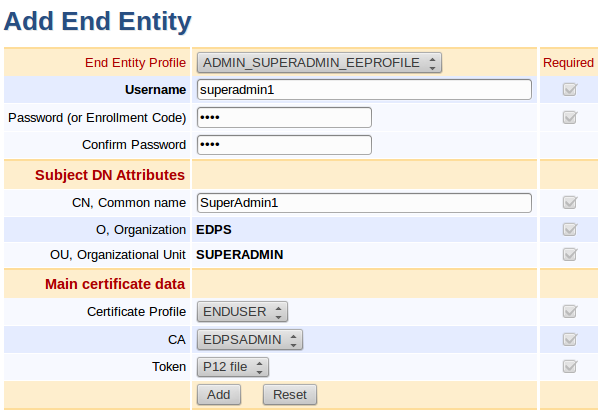
- Creating a new SuperAdministrator SSL Client certificate issued by the EDPSADMIN subordinated CA and installing it into the browser.
- Giving SuperAdministrator permissions to the SuperAdministrator SSL Client certificate.
- Creating the server SSL certificate.
- Configuring JBOSS to use this server SSL certificate and to accept SSL client certificates from the EDPSADMIN CA.

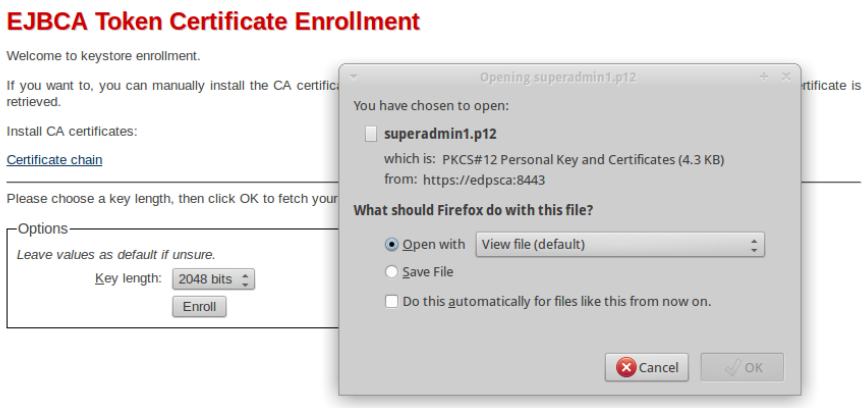
Create a Super Administrator certificate and set permissions

Create an End Entity Profile called **ADMIN_SUPERADMIN_EEPROFILE** with fixed **O=EDPS**, **OU=SuperAdministrator** in the subject. Choose **ENDUSER** in certificate profiles and allow the profile only to be issuable from the **EDPSADMIN** CA and token in **P12 File**.

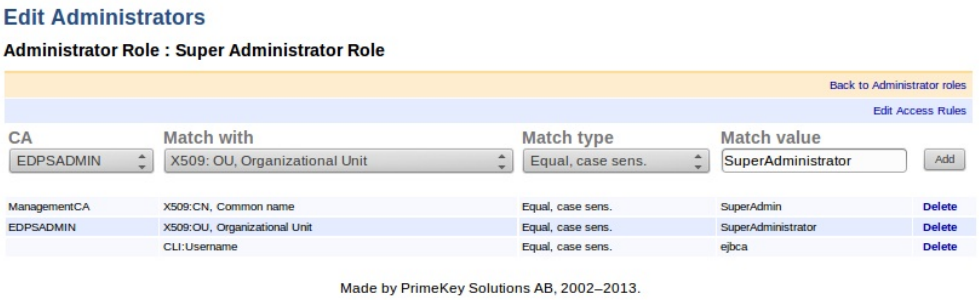


Create user **superadmin1**, using the **ADMIN_SUPERADMIN_EEPROFILE**. Then, create and install the certificate in the browser by creating a PKCS#12 file through the public portal.



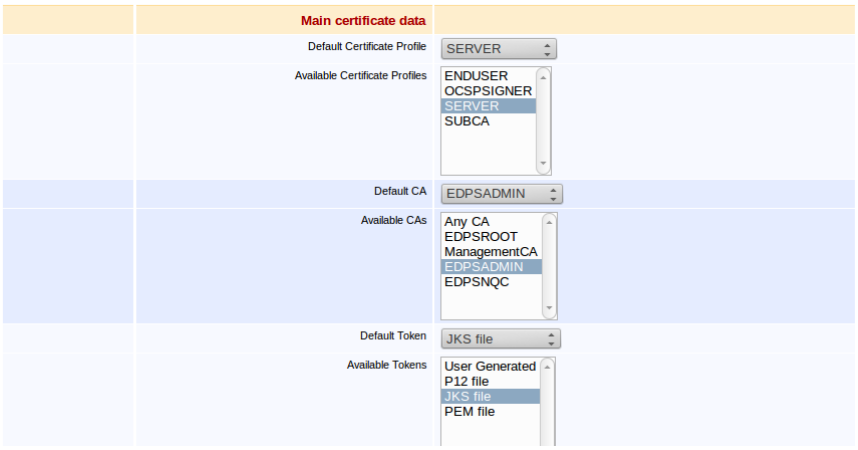


Go to the **Administrator Roles** menu option, and add **OU=SUPERADMIN** with the **EDPSADMIN** CA to the **Super Administrator Role** clicking the **Administrators** label.

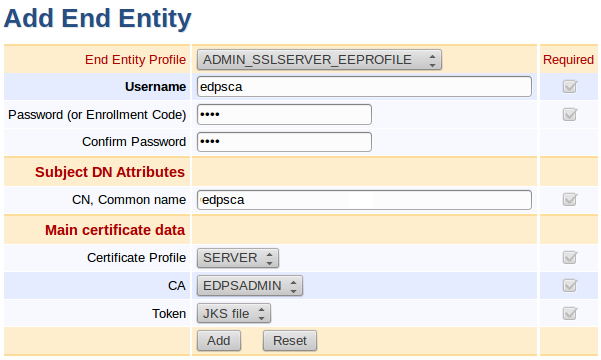


Create a new JBOSS SSL server certificate and replace the existing one

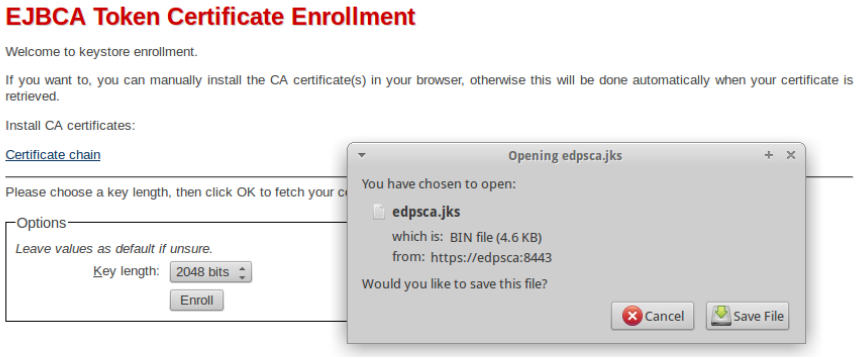
Create an End Entity profile called **ADMIN_SSLSERVER_EEPROFILE**, using the **SERVER** certificate profile, attached to the **EDPSADMIN** CA, and with token as **JKS** file.



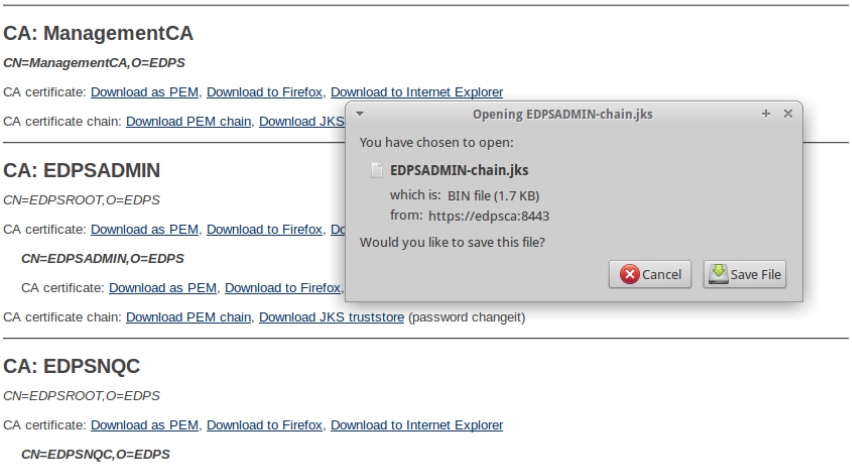
Then, create the End Entity with this profile, entering the hostname (mandatory SSL requirements) in the CN.



Go to the public portal and select **Create KeyStore**. Generate the certificate and download the .jks file. This file, like PKCS#12 files, contains the certificate and the private key. This is called the server keystore.



We also need to instruct JBOSS HTTP/S server on what certificates can be used for SSL authentication (the so called truststore): go to **Fetch CA Certificates** (on the public web) and download the EDPSADMIN CA certificate chain called **Download JKS truststore**.



Stop the JBOSS server by pressing Control-C. Now, we'll create a back-up of the JBOSS folder.

Copy **edpsca.jks** (or the keystore file) to **/opt/jboss-as-7.1.1.Final/standalone/configuration/keystore/keystore.jks**

Copy **EDPSADMIN-chain.jks** (or the truststore file) to **/opt/jboss-as-7.1.1.Final/standalone/configuration/keystore/truststore.jks**

Edit the **/opt/jboss-as-7.1.1.Final/standalone/configuration/standalone.xml** file to match the passwords and the aliases of the keystore and truststore files.

Sometimes there are some problems with keystores. To avoid them, keep this reference commands in mind:

- Change password in a keystore: **keytool -storepasswd -keystore keystore.jks**
- List aliases in a keystore: **keytool -list -keystore keystore.jks**
- Change the alias of a keystore: **keytool -changealias -alias "oldalias" -destalias "newalias" -keystore keystore.jks -storepass xxxx**

Restart the JBOSS server by running again **./standalone.sh**

Check if you can logon with the new SuperAdministrator certificate.

Revoke the old management CA

Go to the **Certification Authorities** menu, select **Management CA** and click the **Edit CA** button.

Then, select a revocation reason like **Cessation of operation** and click the **Revoke** Button.

Go to **Administration Roles** and remove the Management CA as a source of **Super Administration Roles**.

By default, this CA is used to sign OCSP requests querying information from unknown CAs. Change now the configuration of OCSP. It will become active later in the redeployment process.

Copy or rename **ocsp.properties.sample** to **ocsp.properties** in EJBCA's **conf** folder.

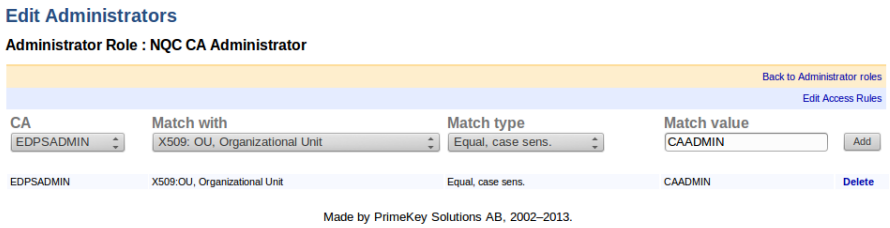
Edit the **ocsp.properties** file and set

ocsp.defaultresponder=CN=EDPSROOT,O=EDPS

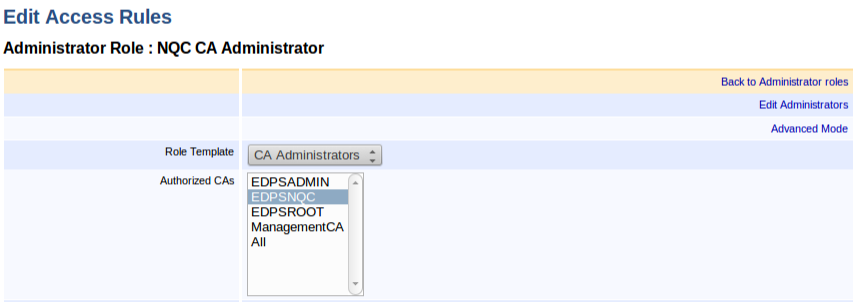
Create EDPSNQC CA administrators

Create the **ADMIN_CAADMIN_EEPROFILE** profile following the same procedure than for **ADMIN_SUPERADMIN_EEPROFILE**, but with the fixed DN to **OU=CAADMIN** and **O=EDPS**.

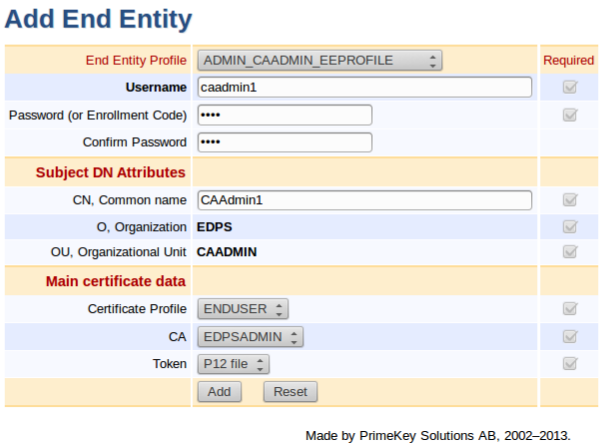
Go to the **Administrator Roles** menu, and set **OU=CAADMIN** as a role of a new **Administrator Role** called **NQC CA Administrator**.



Set the permissions byclicking on **Edit Access Rules**. Select **CA Administrators** in **Role Template**, and select **EDPSNQC** in **Authorized CAs.**



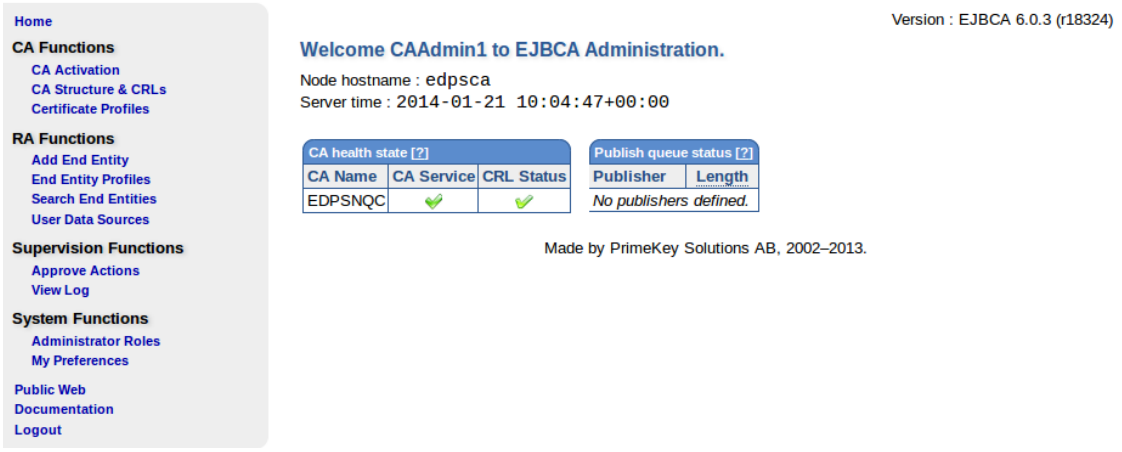
Create the **caadmin1** user.



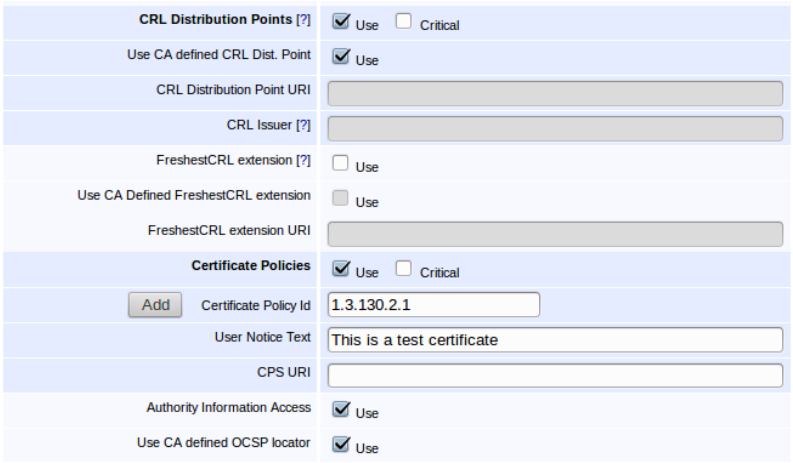
Go to the public portal, generate, download and install the PKCS#12 file with its certificate and private key.

Create NQC certificate templates and profiles

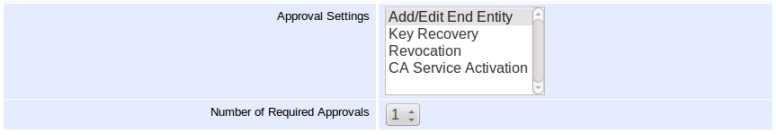
Log in into the Administration portal using the previously created Administrator certificate. As you can see, the functionality is reduced to the administration of the EDPSNQC CA.



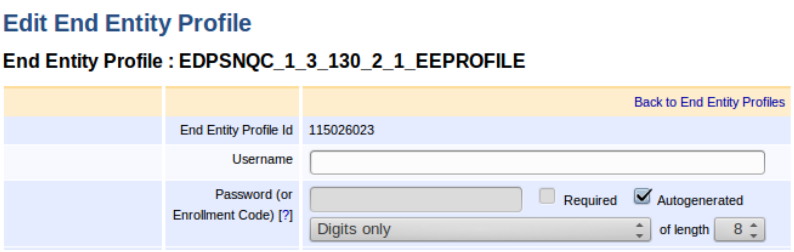
Create the certificate profile **EDPSNQC_1_3_130_2_1_CERTPROFILE**, with activated **CRL Distribution Points** and **OCSP/Authority Information Access**. In this case, we added the **Certificate Profile** extension to 1.3.130.2.1 to identify this type of certificate.



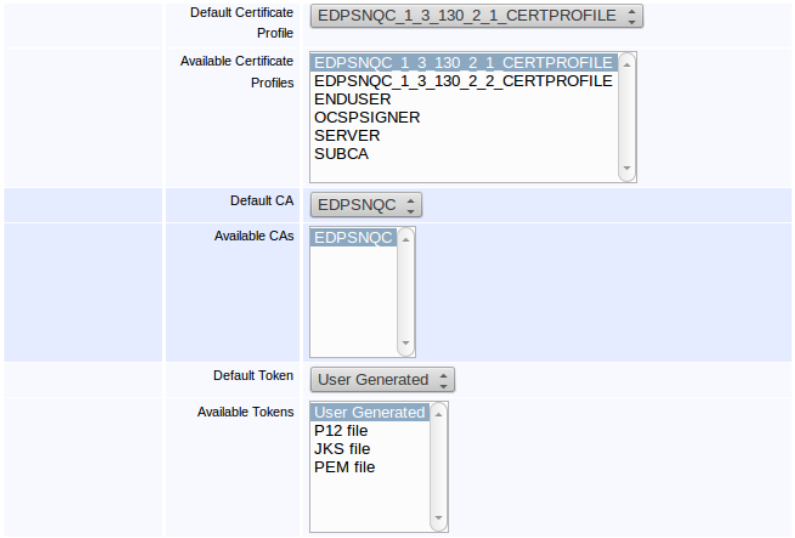
Create the certificate profile **EDPSNQC_1_3_130_2_2_CERTPROFILE**, with the same data, but using **1.3.130.2.2** as **Certificate Policy OID**, and "This is a production certificate" as **User Notice Text**. In this case, we have added that one extra approval is required to create this type of user for 1.3.130.2.2 certificates by setting the **Approval Settings** to **Add/Edit End Entity** and **Number of Required Approvals** to 1.



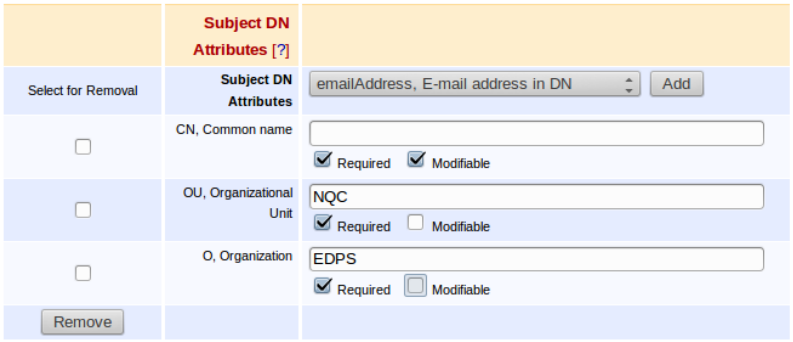
Create the end entity profile **EDPSNQC_1_3_130_2_1_EEPROFILE** by checking the **Autogenerated** password checkbox.



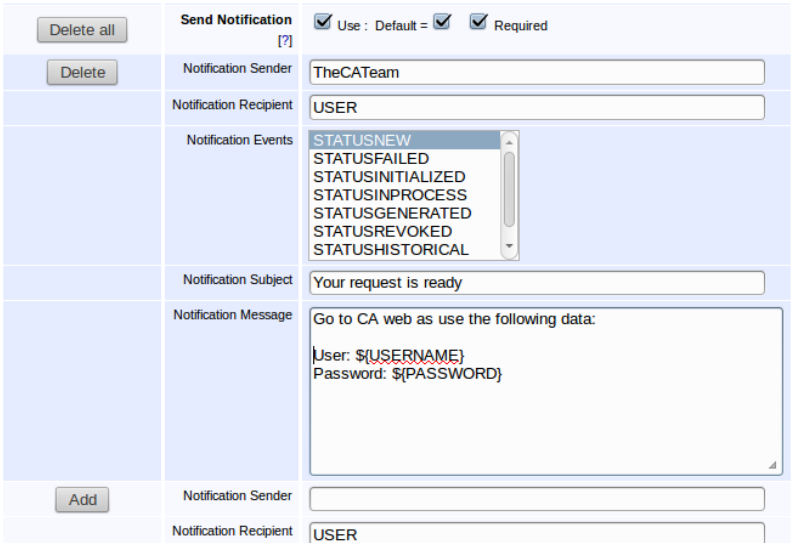
Select **EDPSNQC_1_3_130_2_1_CERTPROFILE** and **User Generated** token.



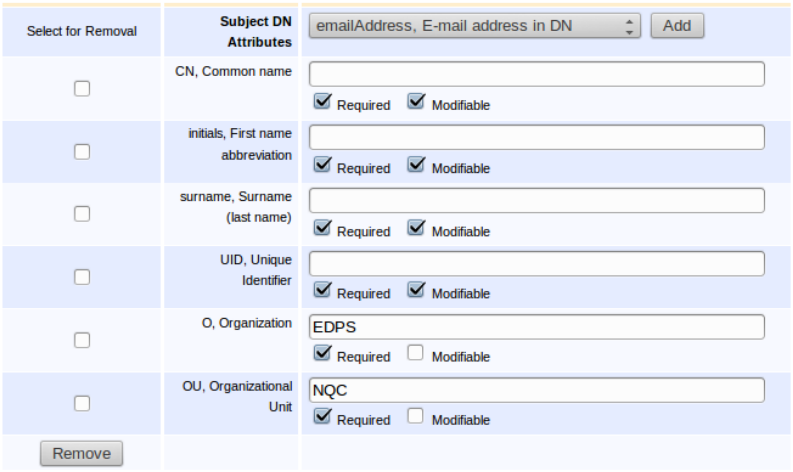
We instruct EJBCA to add OU=NQC, O=EPDS to all issued certificates using this End Entity profile.



As these kind of certificate users are self-enrollable, we need to check if the email address is correct. Thus, we instruct, via the End Entity template, that an email containing the password is sent to the user in order to allow him to log into the public portal and create the certificate. Check **Send Notification** and write the email text, using the ${USERNAME} and ${PASSWORD} substitution variables in the **Notification Message**.



Create the end entity profile EDPSNQC_1_3_130_2_2_EEPROFILE, without sending an email, but with more information attached to the user subject DN like **initials**, **surname** and **UID**.



Configure the website to enable self-registering to the portal and to send emails

To allow users to self-register with the End Entity profile **EDPSNQC_1_3_130_2_1_EEPROFILE** we need to edit **`web.properties`** in the **`ejbca/conf`** file and set:

```
web.selfreg.enabled=true
web.selfreg.defaultcertype=1
web.selfreg.certtypes.1.description=Autoenrolled Test Certificate
web.selfreg.certtypes.1.eeprofile=EDPSNQC_1_3_130_2_1_EEPROFILE
web.selfreg.certtypes.1.certprofile=EDPSNQC_1_3_130_2_1_CERTPROFILE
```

For email configuration configure the **`mail.properties`** file in EJBCA's **`conf`** folder. Here's the configuration for a test Gmail account:

```
mail.user = ejbca.user.1
mail.password =edpsedps
mail.smtp.host=smtp.gmail.com
mail.smtp.port=465
mail.smtp.auth=true
mail.smtp.starttls.enable=true
mail.debug=true
```

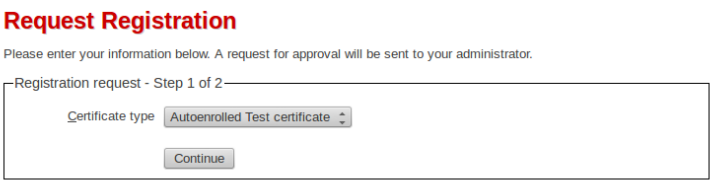
Now we need to redeploy the EAR without installing the services again into the JBOSS. To do so, use the next instructions within the ejbca folder:

```
ant clean
ant deployear
ant jee:deployServices
```

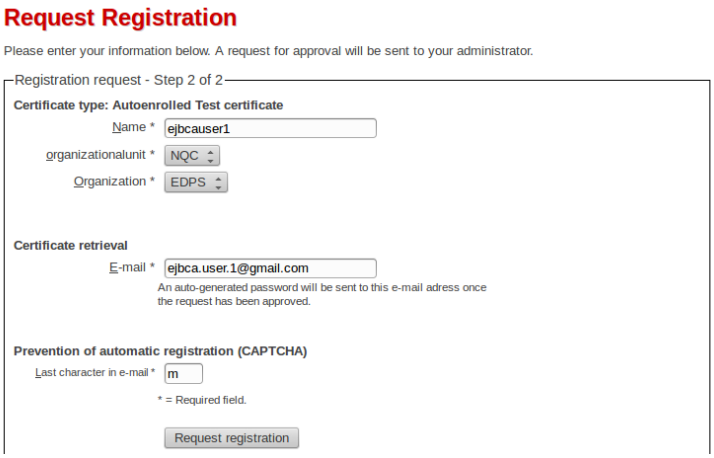
If this doesn't work consider stopping and restarting the JBOSS server.

Creating a self-registered 1.3.130.2.1 user

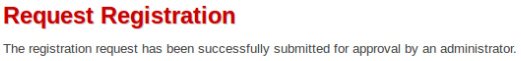
Go to the public portal and select the **Request Registration** menu option. Press **Continue**.



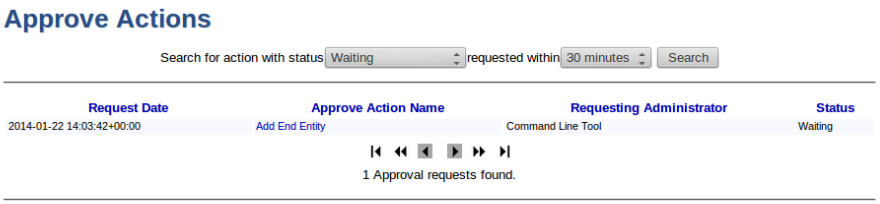
Enter the data to autoenroll the user, in this case **ejbcauser1.** Then, press the **Request Registration** button.



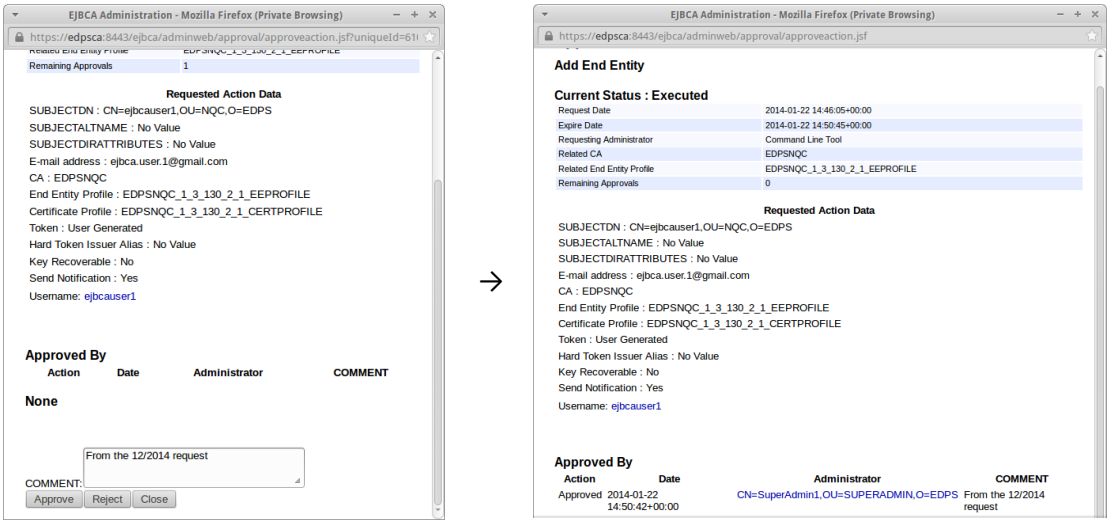
The next message will be shown because the registration must be approved by an administrator:



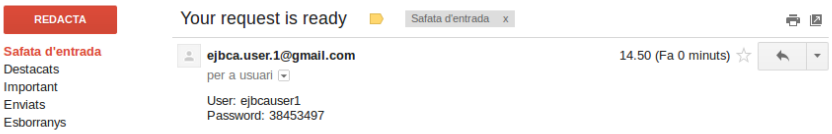
Enter the private administration portal with the CA Administration certificate, and go to the **Approve Actions** menu. The request will be shown. Click on it.



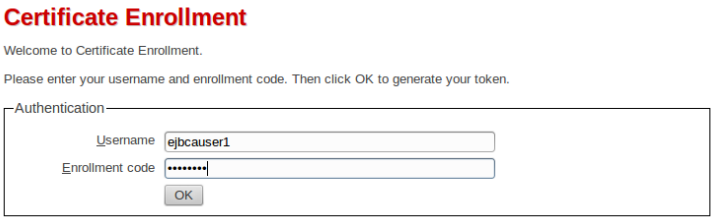
A new window will appear. Enter a **COMMENT** and press the **Approve** button to approve the End Entity user creation action.

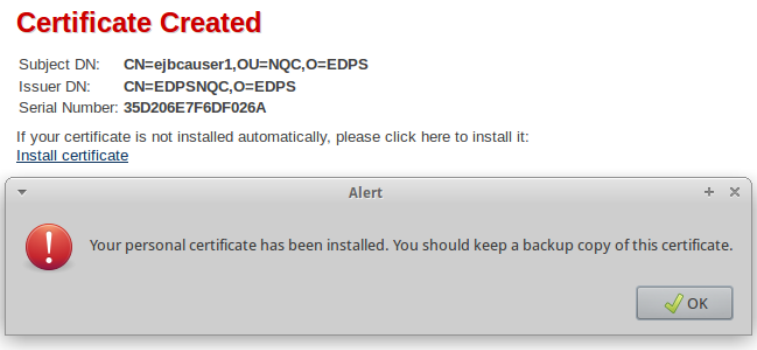


When the user is created, the email trigger specified in the End Entity profile is fired, so an email is sent to the user.



This password can be used to enroll into the public portal and create the certificate.



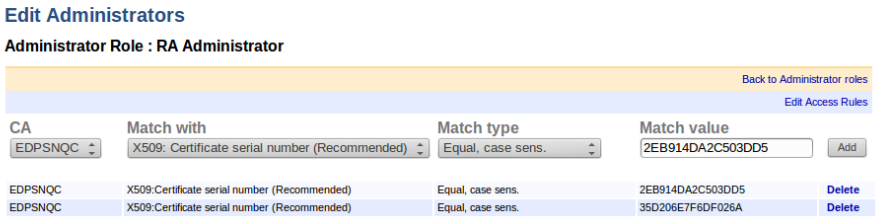


Repeat the operation to create the ejbcauser2 with CN=ejbcauser2 with EDPSNQC_1_3_130_2_1_EEPROFILE.

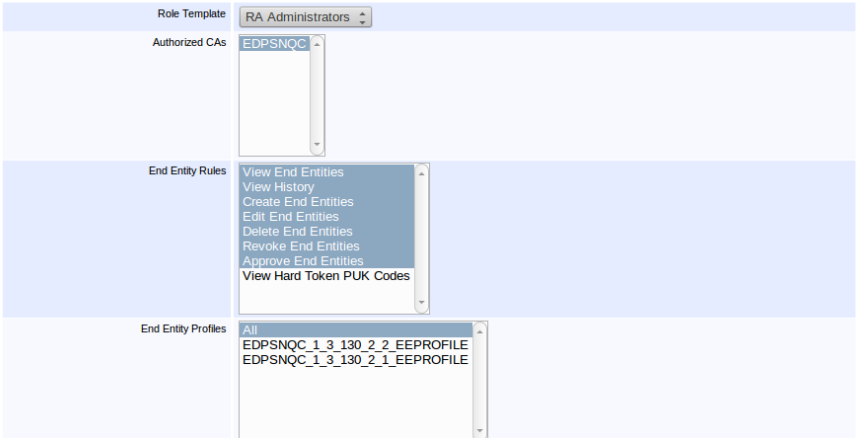
Registering the users as RA administrators

Once the CN=ejbcauser1 and CN=ejbcauser2 certificates are created, they must be authorized as RA Administrators.

Go to **Manage Administrator Roles** and create a new role named **RA Administrator**. Set the serial numbers of the certificates in the role filter setting:



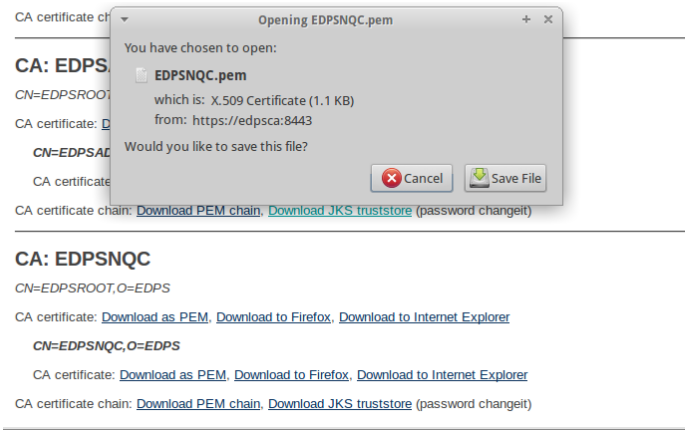
Go to **Edit Access Rules** and set the permissions for these RA Administrators.



Configuring JBOSS to accept the RA administrator certificates as valid SSL client certificates

The JBOSS HTTP/S server is now configured to accept certificates from EDPSADMIN CA, but RA Administrator certificates come from EDPSNQC CA.

Go to the public portal and download the EDPSNQC certificate as a PEM file.



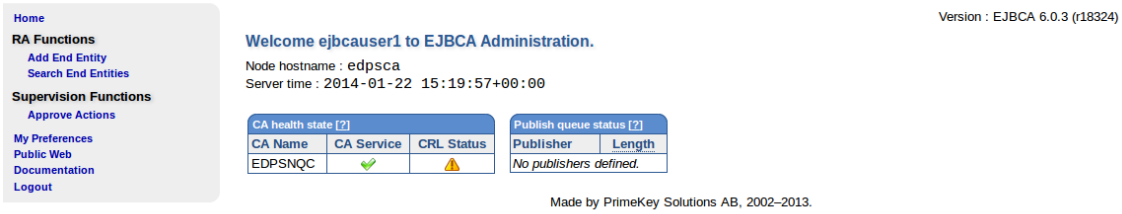
Then, import this certificate into the JBOSS truststore with this command:

```
user@edpsca:/opt/jboss-as-7.1.1.Final/standalone/configuration/keystore$ keytool -importcert -file EDPSNQC
.pem -alias nqc -keystore truststore.jks -storepass changeit
Certificate was added to keystore
```

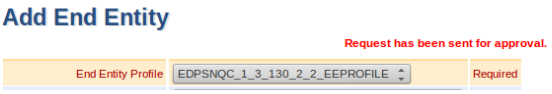
Restart JBOSS in order to apply the changes.

Creating a 1.3.130.2.2 user with dual control (two approvals)

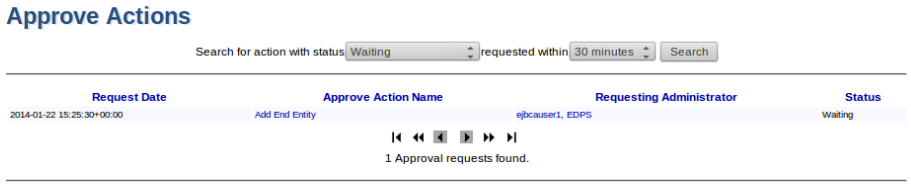
If we enter EJBCA with the CN=ejbcauser1 RA administrator SSL certificate, the following screen will be shown. As you can see, it is a reduced version of the CA administrator portal.



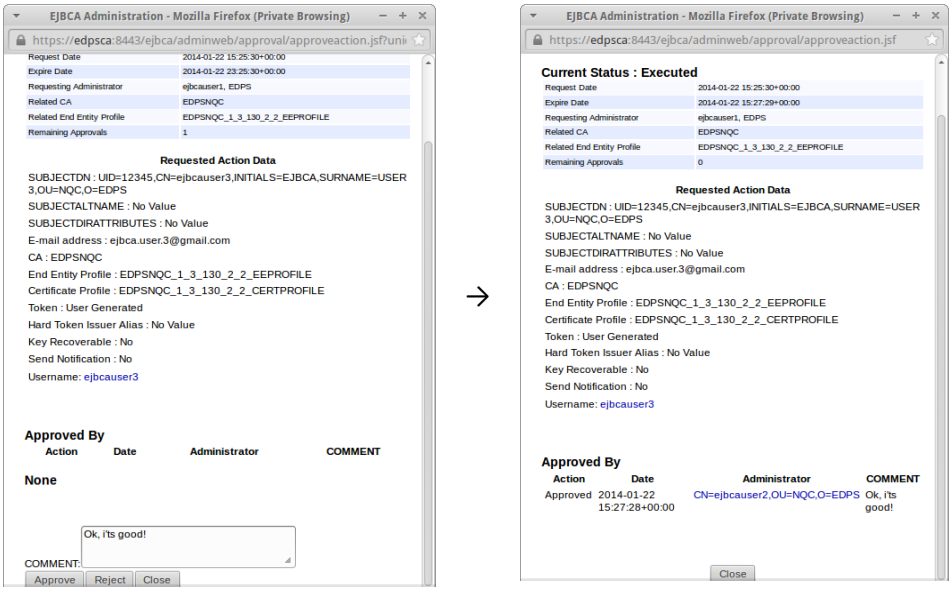
Go to the **Add Entity** menu option, and fill out the data for the user with profile **EDPSNQC_1_3_130_2_2.** The entity will not be added automatically. Instead, a message will be shown saying that the **Request has been sent for approval,** as another approval is needed to add this user.



If the ejbcauser2 logs into EJBCA and goes to the **Approve Actions** menu, the request will be shown.



If you click the request entry, the approve action will be shown. Enter a message in the **COMMENT** text area and click the **Approve** button to create the user.

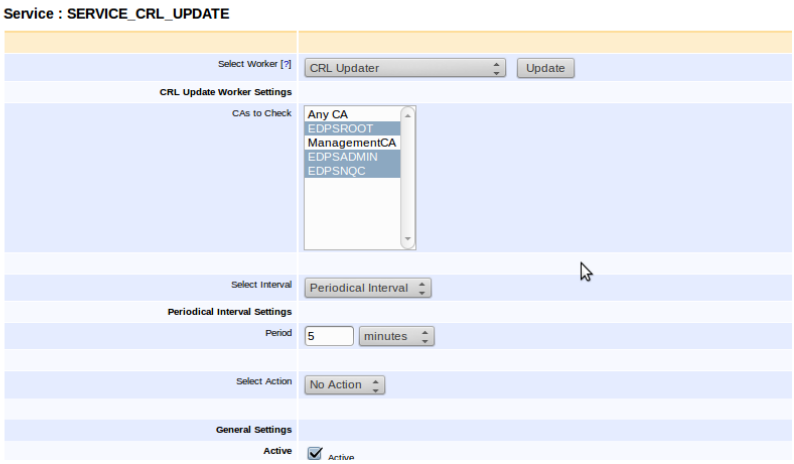


Creating an EJBCA service to automatically update CRLs

By default, EJBCA does not renew the CRLs automatically, although it can be easily configured to do so.

Go to the **Services** menu in the Administration console, and add service **SERVICE_CRL_UPDATE**.

Edit it and set the following parameters. Don't forget to mark the service as **Active**.



Publishing issued certificates in an LDAP directory

To publish the certificates in an LDAP directory the next steps are required:

- Installing an LDAP server, in this case OpenDS will be used
- Creating a publisher connected to the LDAP
- Configuring EJBCA CAs End Entity templates to specify the publisher to be used
- Creating a service to perform automatic publishing
- Republishing all certificates

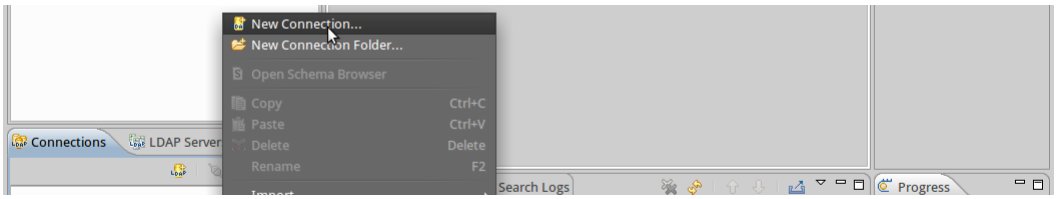
Install and configure OpenDS

Download and install ApacheDS 2.0.0-M15-64bit.bin. Follow the instructions from the README file.

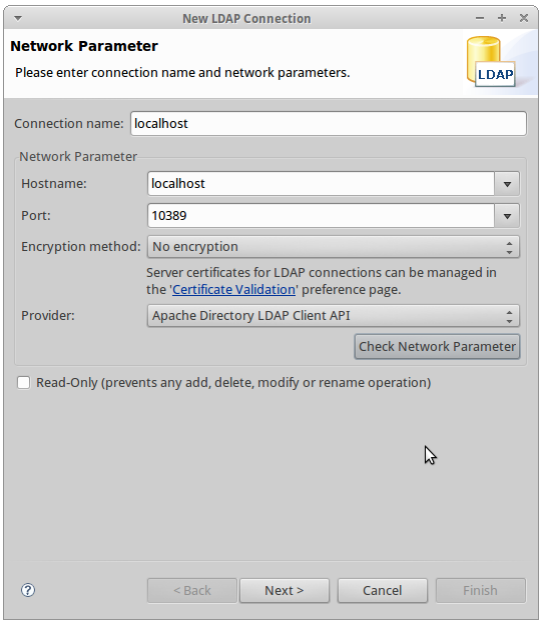
Start the OpenDS service with:

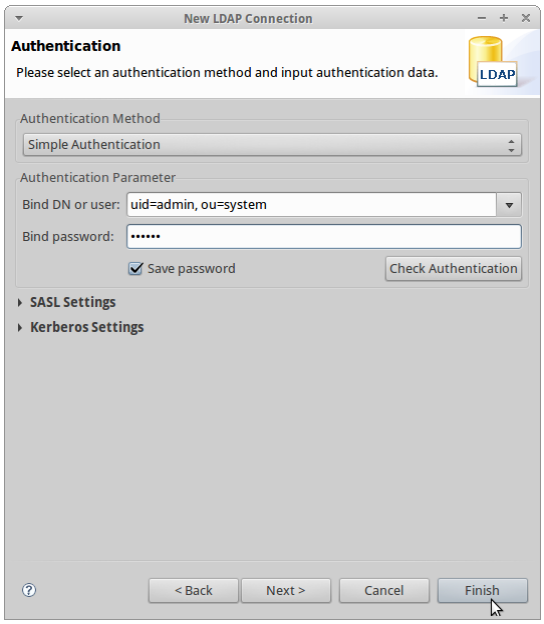
```
sudo /etc/init.d/apacheds-2.0.0-M15-default start
```

To configure ApacheDS, install the Apache Directory Studio, go to the **Connections** tab, left click and select **New connection…**

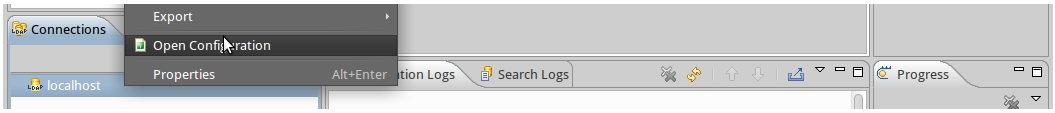


Set the LDAP **Hostname** to localhost, the **port** to 10389, the **Bind DN** to ui=admin, ou=system, and the **Bind password** to “secret”.

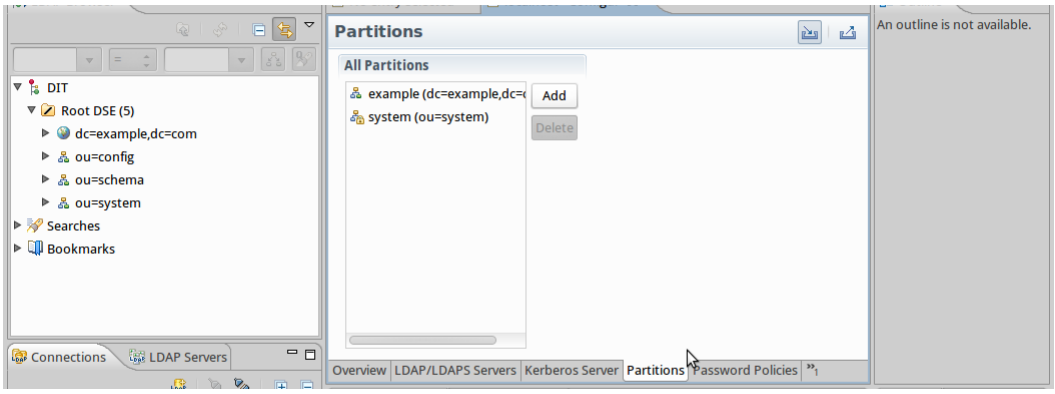




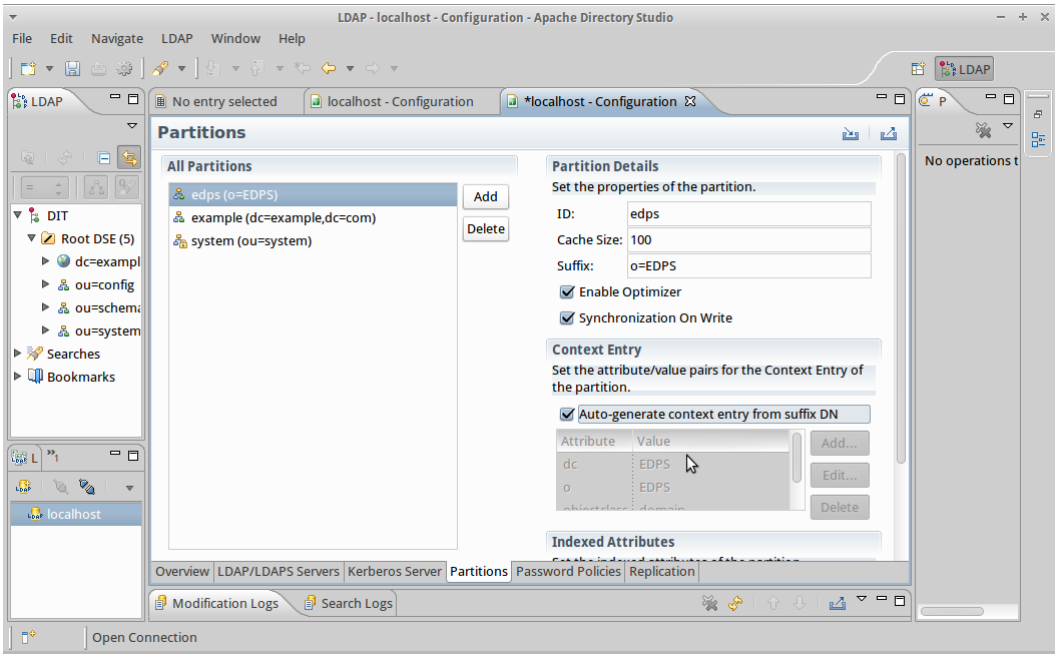
Select **Open Configuration** by right-clicking the **localhost** entry in the **Connections** tab.



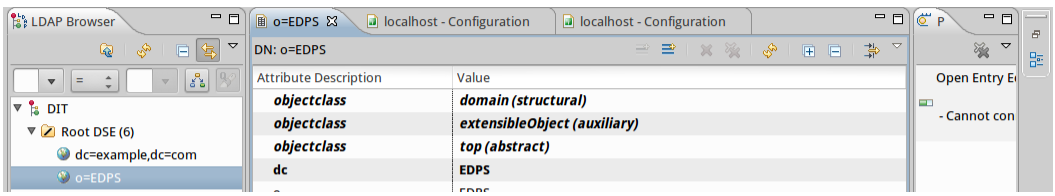
Select the **Root DSE** in the left tree. Select then the **Partitions tab** and click **Add**.



Set the suffix to o=EDPS.

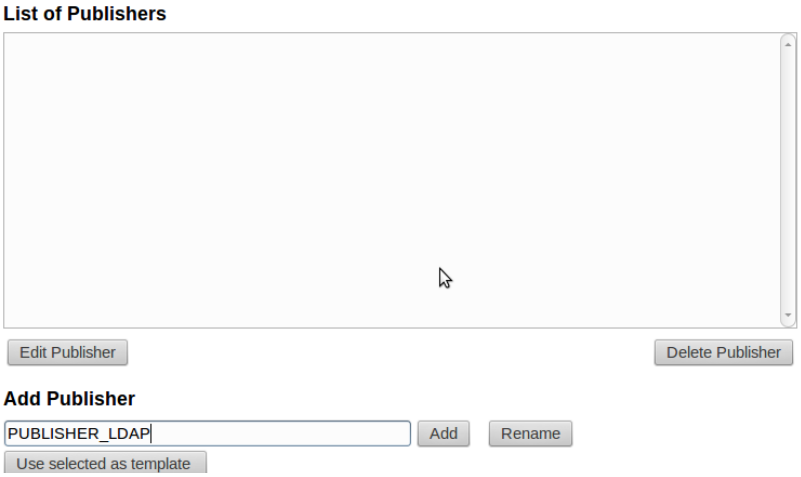


Refresh the Root DSE node with the **Refresh** menu option by right-clicking the node. The new entry should be now available.

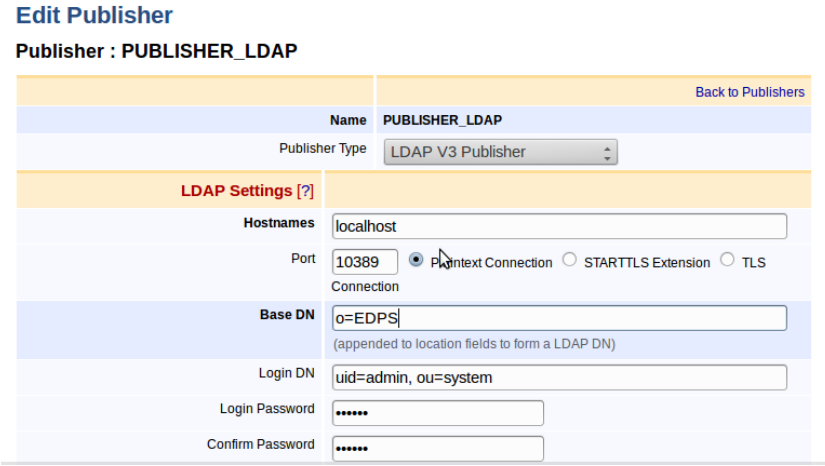


Configure EJBCA to publish certificates in the LDAP

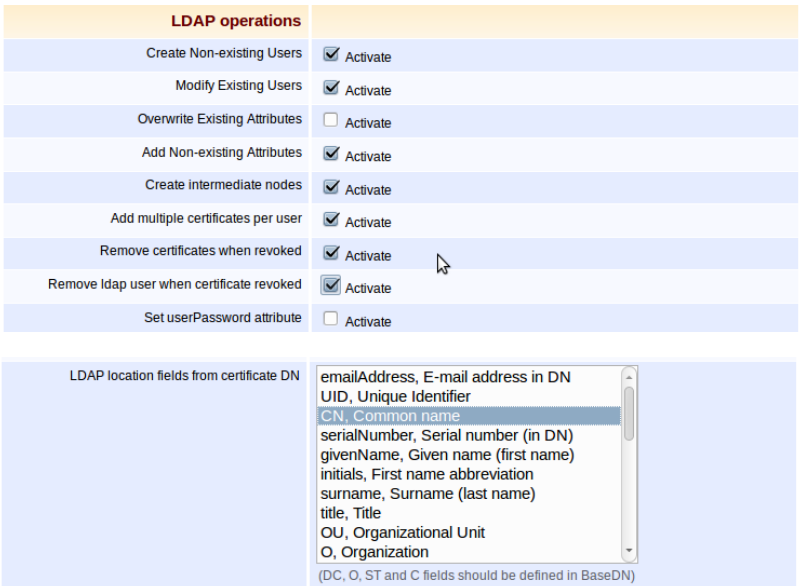
Go to the **Publishers** menu in the administration portal and create a new publisher named **PUBLISHER_LDAP**.



Configure it with the same parameters introduced in the ApacheDS configuration.

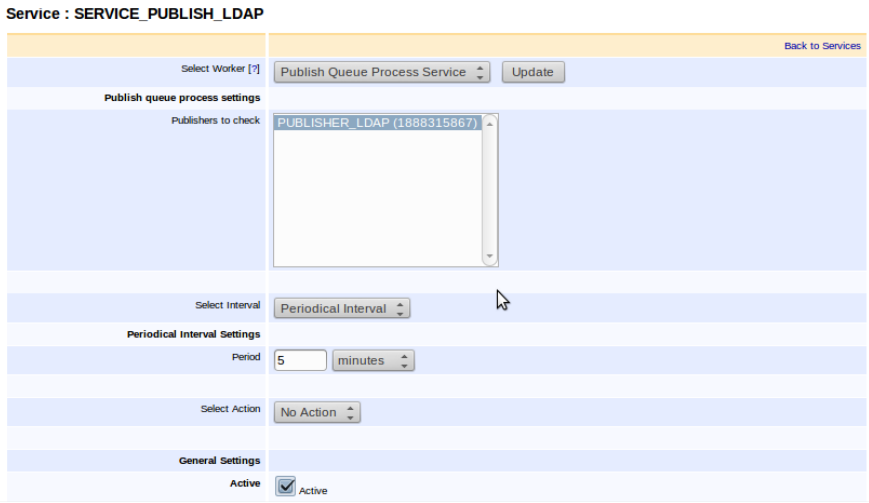


It is important to set the following options in the configuration:



Create a new service called **SERVICE_PUBLISH_LDAP** in the **Services** main menu option.

To configure the service select **Worker Publishing Queue Process Service**, and in **Publishers to check** the LDAP publisher **PUBLISHER_LDAP**.



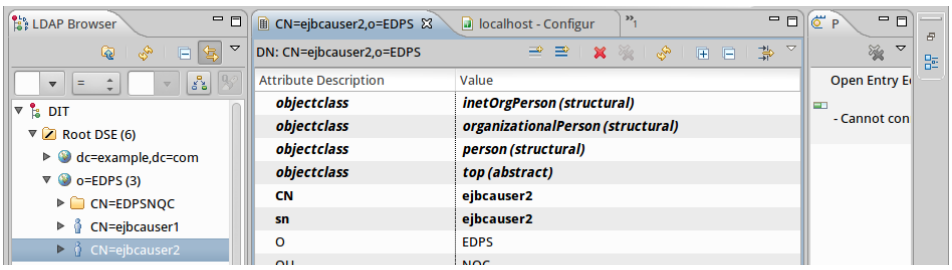
Edit the **EDPSNQC** CA, **EDPSNQC_1_3_130_2_1_EEPROFILE** and **EDPSNQC_1_3_130_2_2_EEPROFILE** to set the publisher to **PUBLISHER_LDAP**.

Republishing all certificates in the LDAP

To republish all certificates in the LDAP, execute this command from the EJBCA folder.

```
bin/ejbca.sh ca republish EDPSNQC -all
```

If you go to Apache Directory Studio and refresh the entries, the users will be shown.



Accessing the CA remotely

To access the CA remotely from the command line, go to the EJBCA folder and execute

```
ant clientToolBox
```

When compiled, move the **dist/clientToolBox** folder to the remote host.

Copy the administrator certificate in the form of a PKCS#12 (e.g. caadmin1.p12) to the remote host, too.

In the remote host, edit the **ejbcawsracli.properties** file and set

```
ejbcawsracli.url = https://edpsca:8443/ejbca/ejbcaws/ejbcaws
```

```
ejbcawsracli.keystore.path = caadmin1.p12
```

Now, you can query and operate remotely executing script **ejbcaClientToolBox.sh**

For instance, with this command you can see how many users in the CA contain the “adria” substring.

```
./ejbcaClientToolBox.sh  EjbcaWsRaCli finduser USERNAME CONTAINS adria
```