Markvision Enterprise

Version 4.2

Administrator's Guide

September 2022

www.lexmark.com

Contents

Change history

August 2022

- Added information on the following:
  - Enrollment over Secure Transport (EST) protocol as defined in RFC 7030
  - Security Dashboard
  - Automatic assignment of keywords during discovery
  - Support for e-mail over SSL/TLS
  - Support for Windows Server 2022
- Updated information on the following:
  - Supported printer models
  - Managing certificates using Microsoft CA through Microsoft Certificate Enrollment Web Services (MSCEWS)
  - Configuring OpenXPKI CA server
  - Managing MVE configurations

March 2022

- Updated information on the supported printer models.
- Added information on creating a client certificate.

May 2021

- Updated information on the following:
  - Supported printer models
  - Managing Microsoft Certificate Authority (CA)
  - Configuring Markvision^{TM} Enterprise (MVE) for automated certificate management
  - Configuring Microsoft Enterprise CA with Network Device Enrollment Service (NDES)
- Added information on the following:
  - Managing certificates using Microsoft CA through Microsoft Certificate Enrollment Web Services (MSCEWS)
  - Creating SSL Certificate for Certificate Enrollment Policy Web Service (CEP) and Certificate Enrollment Web Service (CES) servers
  - Authentication methods for CEP and CES
  - Named device certificate

November 2020

- Updated information on the following:
  - Supported printer models
  - Supported databases
- Added information on the following:
  - Managing and deploying configurations
  - Backing up and restoring the database

  - Managing certificates using OpenXPKI and Microsoft Certificate Authority
- Added support for the following:
  - Managing and deploying configurations to a group of printer models
  - Creating custom database names

February 2020

- Updated information on the following:
  - Supported printer models
  - Supported servers
  - Supported databases
  - Valid MVE upgrade path
- Added information on the following:
  - Instructions for best practices
  - Instructions on managing automated certificates
  - Default advanced security components and their settings
  - Other ways in securing printers
  - Sample scenarios

June 2019

- Updated information on the following:
  - Footnotes added to printer models that require certificates
  - Assigning dbo rights when setting up the database
  - Valid upgrade path when upgrading to version 3.4
  - Files that are needed when backing up and restoring the database
  - LDAP server authentication settings
  - Certificate validity status, dates, and time zone parameters are added to the search rule settings
  - Configuring the permissions and function access controls in the printer security settings
  - Selecting a firmware file from the resource library when updating the printer firmware
  - Selecting the start date, start and pause time, and days of the week when updating the printer firmware
  - Managing configurations
- Added information on the following:
  - Understanding printer security states
  - Configuring advanced security components
  - Creating an advanced security component from a printer
  - Generating a printable version of the configuration settings
  - Uploading a printer fleet certificate authority
  - Removing user information and references
  - Understanding permissions and function access controls
  - Troubleshooting steps when enforcement of configurations with multiple applications fails
  - Troubleshooting steps when an Admin user has forgotten the password

August 2018

- Updated information on the following:
  - Supported printer models
  - Setting up the database
  - Upgrading to MVE 3.3
  - Frequently asked questions
  - Creating an action
  - Creating a schedule
- Added information on the following:
  - Setting up a run-as domain user account
  - Exporting logs
  - Troubleshooting steps when MVE does not recognize secured printers

July 2018

- Updated information on upgrading to MVE 3.2.

April 2018

- Updated information on the following:
  - Supported printer models
  - Setting up the database
  - Backing up and restoring database files
  - The URL for accessing MVE
  - Understanding variable settings
- Added information on the following:
  - Configuring printer certificates
  - Stopping tasks
  - Updating printer firmware

September 2017

- Updated information on the following:
  - System requirements
  - Communication between MVE and Lexmark™ Forms Printer 2580, 2581, 2590, and 2591 models
  - Manual dropping of Microsoft SQL Server databases
  - Backing up and restoring database files
  - Required security settings for function access controls when deploying firmware and solution files to printers
  - Support for licenses when deploying applications
  - Printer alerts and their associated actions
  - Printer state automatic recovery
  - Events and keywords assignment

June 2017

- Initial document release for MVE 3.0.

Overview

Understanding Markvision Enterprise

Markvision Enterprise (MVE) is a web-based printer management utility software designed for IT professionals.

With MVE, you can manage a large fleet of printers in an enterprise environment efficiently by doing the following:

- Find, organize, and track a fleet of printers. You can audit a printer to collect printer data such as status, settings, and supplies.
- Create configurations and assign them to printers.
- Deploy firmware, printer certificates, certificate authority (CA), and applications to the printers.
- Monitor printer events and alerts.

This document provides information on how to configure, use, and troubleshoot the application.

This document is intended for administrators.

Getting started

Best practices

This topic outlines the recommended steps to use MVE in managing your fleet effectively.

1. Install MVE in your environment.
   - a Create a server using the latest Windows Server environment.

     Related content:

     Web server requirements
   - b Create a domain user account that does not have administrator access.

     Related content:

     Setting up a run-as user
   - c Create a Microsoft SQL Server database, set up encryption, and then give the new user account access to the databases.

     Related content:

     - **Database requirements**
     - **Setting up the database**
   - d Install MVE using the domain user account and the SQL server with Windows Authentication.

     Related content:

     Installing MVE
2. Set up MVE, and then discover and organize your fleet.
   - a Sign the server certificate.

     Related content:

     - **Signing the MVE certificate**
     - **Setting up MVE to manage certificates automatically**
   - b Set up the LDAP settings.

     Related content:

     - **Enabling LDAP server authentication**
     - **Installing LDAP certificates**
   - c Connect to an e-mail server.

     Related content:

     Configuring e-mail settings
   - d Discover your fleet.

     Related content:

     Discovering printers
   - e Schedule audits and status updates.

     Related content:

     - **Auditing printers**
     - **Updating printer status**

f Set up basic settings, such as contact names, locations, asset tags, and time zones.

g Organize your fleet. Use keywords, such as locations, to categorize the printers.

Related content:

- **Assigning keywords to printers**
- **Creating a saved search**

3 Secure your fleet.

a Secure printer access using the default advanced security components.

Related content:

- **Securing printers using the default configurations**
- **Understanding permissions and function access controls**
- **Other ways to secure your printers**

b Create a secured configuration that includes certificates.

Related content:

- **Creating a configuration**
- **Importing files to the resource library**

c Enforce the configuration on your current fleet.

Related content:

- **Assigning configurations to printers**
- **Enforcing configurations**

d Schedule enforcements and conformance checks.

Related content:

Creating a schedule

e Add configurations to discovery profiles to secure new printers.

Related content:

Creating a discovery profile

f Sign printer certificates.

Related content:

Signing the MVE certificate

4 Keep your firmware up to date.

Related content:

Updating the printer firmware

5 Install and configure applications.

Related content:

- **Creating a configuration**
- **Importing files to the resource library**

6 Monitor your fleet.

Related content:

Creating a saved search

System requirements

MVE is installed as a web server and can be accessed from a web browser on any computer on the network. MVE also uses a database to store information about the printer fleet. The following lists are the requirements for the web server, database, and user system:

Web server requirements

Processor	At least 2GHz dual-core processor that uses Hyper-Threading Technology (HTT)
RAM	At least 4GB
Hard disk drive	At least 60GB

Note: MVE, Lexmark Document Distributor (LDD), and Device Deployment Utility (DDU) cannot be run on the same server.

Supported servers

- Windows Server 2022 Standard Edition
- Windows Server 2019
- Windows Server 2016 Standard Edition
- Windows Server 2012 Standard Edition
- Windows Server 2012 R2

  Note: MVE supports virtualization for the supported servers in a premise-based environment.

Database requirements

Supported databases

- Firebird® database (built-in)
- Microsoft SQL Server 2019
- Microsoft SQL Server 2017
- Microsoft SQL Server 2016
- Microsoft SQL Server 2014
- Microsoft SQL Server 2012

  Note: The recommended minimum database size is 60GB to allocate 20MB for FRAMEWORK, and 4.5MB for MONITOR and QUARTZ. For more information, see “Setting up the database” on page 18.

User system requirements

Supported web browsers

- Microsoft Edge
- Mozilla Firefox (latest version)
- Google Chrome™ (latest version)
- Apple Safari (latest version)

Screen resolution

At least 1280 x 768 pixels

Supported languages

- Brazilian Portuguese
- English
- French
- German
- Italian
- Simplified Chinese
- Spanish

Supported printer models

- Lexmark 6500
- Lexmark B2236[2]
- Lexmark B2338[2], B2442[2], B2546[2], B2650[2], B2865[1]
- Lexmark B3440[2], B3442[2]
- Lexmark C2132
- Lexmark C2240[2], C2325[2], C2425[2], C2535[2]
- Lexmark C2335[2]
- Lexmark C3224[2]
- Lexmark C3326[2]
- Lexmark C3426[2]
- Lexmark C4150[2], C6160[2], C9235[2]
- Lexmark C4342[2], C4352[2]
- Lexmark C746, C748
- Lexmark C792
- Lexmark C925[1], C950
- Lexmark CS310, CS410, CS510
- Lexmark CS317, CS417, CS517
- Lexmark CS331[2]
- Lexmark CS421[2], CS521[2], CS622[2]
- Lexmark CS431[2]
- Lexmark CS531[2], CS632[2]
- Lexmark CS720[2], CS725[2]
- Lexmark CS727[2], CS728[2]
- Lexmark CS730[2]
- Lexmark CS735[2]
- Lexmark CS820[2], CS827[2]
- Lexmark CS921[2], CS923[2], CS927[2]

- Lexmark CS943[2]
- Lexmark CX310, CX410, CX510
- Lexmark CX317, CX417, CX517
- Lexmark CX331[2]
- Lexmark CX421[2], CX522[2], CX622[2], CX625[2]
- Lexmark CX431[2]
- Lexmark CX532[2]
- Lexmark CX625[2]
- Lexmark CX635[2]
- Lexmark CX725[2]
- Lexmark CX728[2]
- Lexmark CX730[2]
- Lexmark CX735[2]
- Lexmark CX820[2], CX825[2], CX827[2], CX860[2]
- Lexmark CX920[2], CX921[2], CX922[2], CX923[2], CX924[2], CX927[2]
- Lexmark CX930[2], CX931[2]
- Lexmark CX942[2], CX943[2], CX944[2]
- Lexmark Forms Printer 2580[4], 2581[4], 2590[4], 2591[4]
- Lexmark M1140, M1145, M3150
- Lexmark M1242[2], M1246[2], M3250[2], M5255[2], M5265[2], M5270[2]
- Lexmark M3350[2]
- Lexmark M5155, M5163, M5170
- Lexmark M5255[2], M5265[2], M5270[2]
- Lexmark MB2236[2]
- Lexmark MB2338[2], MB2442[2], MB2546[2], MB2650[2], MB2770[2]
- Lexmark MB3442[2]
- Lexmark MC2325[2], MC2425[2], MC2535[2], MC2640[2]
- Lexmark MC3224[2]
- Lexmark MC3326[2]
- Lexmark MC3426[2]
- Lexmark MS310, MS312, MS315, MS410, MS415, MS510, MS610
- Lexmark MS317, MS417, MS517
- Lexmark MS321[2], MS421[2], MS521[2], MS621[2], MS622[2]
- Lexmark MS331[2], MS431[2]
- Lexmark MS531[2], MS631[2], MS632[2]
- Lexmark MS617, MS817, MS818
- Lexmark MS710, MS711, MS810, MS811, MS812
- Lexmark MS725[2], MS821[2], MS822[2], MS823[2], MS824[2], MS825[2], MS826[2]
- Lexmark MS911
- Lexmark MX310, MX410, MX510, MX511, MX610, MX611
- Lexmark MX317, MX417, MX517

- Lexmark MX321[2], MX421[2], MX521[2], MX522[2], MX622[2]
- Lexmark MX331[2], MX431[2]
- Lexmark MX432[2]
- Lexmark MX532[2], MX632[2]
- Lexmark MX617, MX717, MX718
- Lexmark MX6500
- Lexmark MX710, MX711, MX810, MX811, MX812
- Lexmark MX721[2], MX722[2], MX725[2], MX822[2], MX824[2], MX826[2]
- Lexmark MX910, MX911, MX912
- Lexmark MX931[2]
- Lexmark T650[1], T652[1], T654[1], T656[1]
- Lexmark X651[1], X652[1], X654[1], X656[1], X658[1], XS651[1], XS652[1], XS654[1], XS658[1]
- Lexmark X746, X748, X792
- Lexmark X850[1], X852[1], X854[1], X860[1], X862[1], X864[1], XS864[1]
- Lexmark X925, X950, X952, X954
- Lexmark XC2130, XC2132
- Lexmark XC2235[2], XC2240[2], XC4240[2]
- Lexmark XC2335[2]
- Lexmark XC4140[2], XC4150[2], XC6152[2], XC8155[2], XC8160[2]
- Lexmark XC9225[2], XC9235[2], XC9245[2], XC9255[2], XC9265[2]
- Lexmark XC9325[2], XC9335[2]
- Lexmark XC9445[2], XC9455[2], XC9465[2]
- Lexmark XM1135, XM1140, XM1145, XM3150
- Lexmark XM1242[2], XM1246[2], XM3250[2]
- Lexmark XM3142[2]
- Lexmark XM3350[2]
- Lexmark XM5163, XM5170, XM5263, XM5270
- Lexmark XM5365[2], XM5370[2]
- Lexmark XM7155, XM7163, XM7170, XM7263, XM7270
- Lexmark XM7355[2], MX7365[2], MX7370[2]
- Lexmark XM9145, XM9155, XM9165
- Lexmark XM9335[2]
- Lexmark XC2326
- Lexmark XC2326
- Lexmark XC4342[2], XC4352[2]

[1] A printer certificate update is required. In this release, the Java platform security and performance update remove support for some certificate-signing algorithms, such as MD5 and SHA1. This change prevents MVE from working with some printers. For more information, see the **help information documentation**.

[2] SNMPv3 support must be enabled on the printer.

[3] If an advanced security password is set on the printer, then MVE cannot support the printer.

[4] MVE cannot communicate with Lexmark Forms Printer 2580, 2581, 2590, and 2591 models that are in the Not Ready state. The communication works only when MVE has previously communicated with the printer in the Ready state. The printer can be in the Not Ready state when there are errors or warnings, such as empty supplies. To change the state, resolve the error or warning, and then press **Ready**.

Setting up the database

You can use either Firebird or Microsoft SQL Server as the back-end database. The following table can help you decide on what database to use.

	Firebird	Microsoft SQL Server
Server installation	Must be installed on the same server as MVE.	Can be run from any server.
Communication	Locked down to only localhost.	Communicates over a static port or a dynamic named instance. SSL/TLS communication with a secured Microsoft SQL server is supported.
Performance	Shows performance issues with large fleets.	Shows the best performance for large fleets.
Database size	Default database sizes are 6MB for FRAMEWORK, and 1MB for MONITOR and QUARTZ. The FRAMEWORK table grows at 1KB for each printer record that is added.	Default database sizes are 20MB for FRAMEWORK, and 4.5MB for MONITOR and QUARTZ. The FRAMEWORK table grows at 1KB for each printer record that is added.
Configuration	Configured automatically during installation.	Requires preinstallation setup.

If you are using Firebird, then the MVE installer installs and configures Firebird with no other configuration required.

If you are using Microsoft SQL Server, then before installing MVE, do the following:

- Allow the application to run automatically.
- Set the network libraries to use TCP/IP sockets.
- Create the following databases:

  Note: The following are default database names. You can also provide custom database names.

  - FRAMEWORK
  - MONITOR
  - QUARTZ
- If you are using a named instance, then set the Microsoft SQL Server Browser service to start automatically. Otherwise, set a static port on the TCP/IP sockets.

- Create a user account with dbowner rights to all three databases that MVE uses to connect to and set up the database. If the user is a Microsoft SQL Server account, then enable the Microsoft SQL Server and the Windows Authentication modes on the Microsoft SQL Server.

  Note: Uninstalling MVE that is configured to use Microsoft SQL Server does not drop the created tables or databases. After uninstalling, the FRAMEWORK, MONITOR, and QUARTZ databases must be dropped manually.
- Assign the dbo rights to the database user, and then set the dbo schema as the default schema.

Setting up a run-as user

During installation, you can specify MVE to execute either as a local system account or as a domain user account. Executing MVE as a run-as domain user account provides a more secure installation. The domain user account has limited privileges compared to a local system account.

	Run-as domain user account	Run-as local system
Local system permissions	• File all access to the following: – *$MVE_INSTALL*/tomcat/logs – *$MVE_INSTALL*/tomcat/temp – *$MVE_INSTALL*/tomcat/work – *$MVE_INSTALL*/apps/library – *$MVE_INSTALL*/apps/dm-mve/picture – *$MVE_INSTALL*/../mve_truststore* – *$MVE_INSTALL*/jre/lib/security/cacerts – *$MVE_INSTALL*/apps/dm-mve/WEB-INF/ldap – *$MVE_INSTALL*/apps/dm-mve/download Where *$MVE_INSTALL* is the installation directory. • Windows privilege: LOGON_AS_A_SERVICE	Administrator permissions
Database connection authentication	• Windows Authentication with Microsoft SQL Server • SQL Authentication	SQL Authentication
Configuration	A domain user must be configured before installation.	Configured automatically during installation

If you set up MVE as a run-as domain user account, then create the user on the same domain as the MVE server.

Installing MVE

1. Download the executable file into a path that does not contain any spaces.
2. Run the file as an administrator, and then follow the instructions on the computer screen.

Notes:

- Passwords are hashed and stored securely. Make sure that you remember your passwords, or store them in a secure location because passwords cannot be decrypted once stored.
- If you are connecting to the Microsoft SQL Server using Windows Authentication, then no connection verification occurs during installation. Make sure that the user designated to execute the MVE windows

service has a corresponding account in the Microsoft SQL Server instance. The designated user must have dbowner rights to the FRAMEWORK, MONITOR, and QUARTZ databases.

Installing MVE silently

Database settings for silent installation

Setting	Description	Value
--help	Shows the list of valid options.	
--version	Shows the product information.	
--unattendedmodeui <unattendedmodeui>	The user interface for unattended mode.	Default: **none** Allowed: • **none** • **minimal** • **minimalWithDialogs**
--optionfile <optionfile>	The installation option file.	Default:
--debuglevel <debuglevel>	The debug information level of verbosity.	Default: **2** Allowed: • **0** • **1** • **2** • **3** • **4**
--mode <mode>	The installation mode.	Default: **win32** Allowed: • **win32** • **unattended**
--debugtrace <debugtrace>	The debug file name.	Default:
--installer-language <installer-language>	The language selection.	Default: **en** Allowed: • **en** • **es** • **de** • **fr** • **it** • **pt_BR** • **zh_CN**
--encryptionKey <encryptionKey>	The encryption key.	Encryption key: Default:
--prefix <prefix>	The installation directory.	Default: **C:\Program Files**

Setting	Description	Value
--mveLexmark_runas <mveLexmark_runas>	The run-as user options.	Default: **LOCAL_SYSTEM** Allowed: • **LOCAL_SYSTEM** • **SPECIFIC_USER**
--serviceRunAsUsername <serviceRunAsUsername>	The run-as user name.	User name: Default:
--serviceRunAsPassword <serviceRunAsPassword>	The run-as user password.	Password: Default:
--mveLexmark_database <mveLexmark_database>	The database type.	Default: Allowed: • **FIREBIRD** • **SQL_SERVER**
--firebirdUsername <firebirdUsername>	The Firebird database user name.	User name: Default:
--firebirdPassword <firebirdPassword>	The Firebird database password.	Password: Default:
--firebirdFWDbName <firebirdFWDbName>	The Firebird database name for FRAMEWORK.	Database names: Default: **FRAMEWORK**
--firebirdMNDbName <firebirdMNDbName>	The Firebird database name for MONITOR.	Default: **MONITOR**
--firebirdQZDbName <firebirdQZDbName>	The Firebird database name for QUARTZ.	Default: **QUARTZ**
--databaseIPAddress <databaseIPAddress>	The database IP address or host name.	IP address or host name: Default:
--databasePort <databasePort>	The database port number.	Port number: Default:
--instanceName <instanceName>	The instance name.	Instance name: Default:
--instanceIdentifier <instanceIdentifier>	The instance.	Default: **databasePort** Allowed: • **databasePort** • **instanceName**
--databaseUsername <databaseUsername>	The database user name.	User name: Default:
--databasePassword <databasePassword>	The database password.	Password: Default:

Setting	Description	Value
--sqlServerAuthenticationMethod <sqlServerAuthenticationMethod>	The Microsoft SQL server authentication method.	Default: **sqlServerDbAuthentication** Allowed: • **sqlServerDbAuthentication** • **sqlServerWindowsAuthentication**
--fWDbName <fWDbName>	The database name for FRAMEWORK.	Database names: Default: **FRAMEWORK**
--mNDbName <mNDbName>	The database name for MONITOR.	Default: **MONITOR**
--qZDbName <qZDbName>	The database name for QUARTZ.	Default: **QUARTZ**
--mveAdminUsername <mveAdminUsername>	The administrator user name.	User name: Default: **admin**
--mveAdminPassword <mveAdminPassword>	The administrator password.	Password: Default:

Accessing MVE

To access MVE, use the login credentials that you created during installation. You can also set up other login methods, such as LDAP, Kerberos, or other local accounts. For more information, see “Setting up user access” on page 28.

1. Open a web browser, and then type **https://*MVE_SERVER*/mve/**, where ***MVE_SERVER*** is the host name or IP address of the server hosting MVE.
2. If necessary, accept the disclaimer.
3. Enter your credentials.
4. Click **Log In**.

Notes:

- After logging in, make sure that you change the default administrator password that was used during installation. For more information, see “Changing your password” on page 23.
- If MVE is idle for more than 30 minutes, then the user is logged out automatically.

Changing the language

1. Open a web browser, and then type **https://*MVE_SERVER*/mve/**, where ***MVE_SERVER*** is the host name or IP address of the server hosting MVE.
2. If necessary, accept the disclaimer.
3. On the upper-right corner of the page, select a language.

Changing your password

1. Open a web browser, and then type `https://`***`MVE_SERVER`***`/mve/`, where ***`MVE_SERVER`*** is the host name or IP address of the server hosting MVE.
2. If necessary, accept the disclaimer.
3. Enter your credentials.
4. Click **Log In**.
5. On the upper-right corner of the page, click your user name, and then click **Change password**.
6. Change the password.

Maintaining the application

Upgrading to MVE 4.2

Before you begin the upgrade, do the following:

- Back up the database, application, and properties files. For more information, see "Backing up and restoring the database" on page 25.
- If necessary, provide custom database names.

If upgrading from version 1.x, then upgrade to version 2.0 first, then respectively to version 3.3 and 4.0, before upgrading to version 4.2. The policy migration process is performed only when upgrading to MVE 2.0.

Valid upgrade path	**3.3** to **4.0** to **4.2**
Invalid upgrade path	**1.6.x** to **4.2** **2.0** to **4.2**

1. Back up your database and application files. Any upgrade or uninstallation creates a risk of unrecoverable data loss. You can use the backup files to restore the application to its previous state in case the upgrade fails.

   Warning—Potential Damage: When you upgrade MVE, the database is changed. Do not restore a database backup that was created from a previous version.

   Note: For more information, see "Backing up and restoring the database" on page 25.

2. Download the executable file into a temporary location.

3. Run the installer as an administrator, and then follow the instructions on the computer screen.

   Notes:

   - When you upgrade to MVE 2.0, policies that are assigned to printers are migrated into a single configuration for each printer model. For example, if fax, copy, paper, and print policies are assigned to an X792 printer, then those policies are consolidated into an X792 configuration. This process does not apply to policies that are not assigned to printers. MVE generates a log file confirming that the policies are migrated to a configuration successfully. For more information, see "Where can I find the log files?" on page 144.
   - After upgrading, make sure to clear the browser cache before accessing the application again.
   - When MVE is upgraded to version 3.5 or later, the advanced security components are factored out of the configurations that they are in. If one or more advanced security components are the same, then they are combined into one component. The created advanced security component is added to the advanced security components library automatically.

Backing up and restoring the database

Note: There is potential data loss when performing backup and restore procedures. Make sure to perform the steps properly.

Backing up the database and application files

We recommend backing up your database regularly.

1. Stop the Firebird service and the Markvision Enterprise service.
   - a Open the Run dialog box, and then type `services.msc`.
   - b Right-click **Firebird Guardian - DefaultInstance**, and then click **Stop**.
   - c Right-click **Markvision Enterprise**, and then click **Stop**.
2. Browse to the folder where Markvision Enterprise is installed.

   For example, `C:\Program Files\`
3. Back up the application and database files.

   ### Backing up the application files

   Copy the following files to a safe repository:

   - Lexmark\mve_encryption.jceks
   - Lexmark\mve_truststore.p12
   - Lexmark\Markvision Enterprise\apps\dm-mve\WEB-INF\classes\database.properties
   - Lexmark\Markvision Enterprise\apps\dm-mve\WEB-INF\classes\encryption.properties
   - Lexmark\Markvision Enterprise\apps\dm-mve\WEB-INF\classes\platform.properties
   - Lexmark\Markvision Enterprise\apps\library
   - Lexmark\Markvision Enterprise\apps\mve-data-service\WEB-INF\classes\database.properties
   - Lexmark\Markvision Enterprise\apps\mve-data-service\WEB-INF\classes\encryption.properties
   - Lexmark\Markvision Enterprise\jre\lib\security\cacerts
   - Lexmark\Markvision Enterprise\tomcat\conf\server.xml

   Note: Make sure that these files are properly stored. Without the encryption keys in the mve_encryption.jceks file, data stored in an encrypted format in the database and on the file system cannot be recovered.

   ### Backing up the database files

   Do either of the following:

   Note: The following files are using the default database names. These instructions also apply to customized database names.

   - If you are using a Firebird database, then copy the following files to a safe repository. These files must be backed up regularly to avoid data loss.
     - Lexmark\Markvision Enterprise\firebird\security2.fdb

       If you are using custom database names, then update the following:

       - Lexmark\Markvision Enterprise\apps\dm-mve\WEB-INF\classes\database.properties
       - Lexmark\Markvision Enterprise\apps\mve-data-service\WEB-INF\classes\database.properties

        - Lexmark\Markvision Enterprise\apps\mve-data-service/WEB-INF\classes\application.yml
        - Lexmark\Markvision Enterprise\firebird\aliases.conf
    - Lexmark\Markvision Enterprise\firebird\data\QUARTZ.FDB
    - Lexmark\Markvision Enterprise\firebird\data\MONITOR.FDB
    - Lexmark\Markvision Enterprise\firebird\data\FRAMEWORK.FDB
- If you are using Microsoft SQL Server, then create a backup for FRAMEWORK, MONITOR, and QUARTZ. For more information, contact your Microsoft SQL Server administrator.

4 Restart the Firebird service and the Markvision Enterprise service.

a Open the Run dialog box, and then type `services.msc`.

b Right-click **Firebird Guardian - DefaultInstance**, and then click **Restart**.

c Right-click **Markvision Enterprise**, and then click **Restart**.

Restoring the database and application files

Warning—Potential Damage: When you upgrade MVE, the database may be changed. Do not restore a database backup that was created from a previous version.

1 Stop the Markvision Enterprise service.

For more information, see step 1 of "Backing up the database and application files" on page 25.

2 Browse to the folder where Markvision Enterprise is installed.

For example, `C:\Program Files\`

3 Restore the application files.

Replace the following files with the files that you saved during the backup process:

- Lexmark\mve_encryption.jceks
- Lexmark\mve_truststore.p12
- Lexmark\Markvision Enterprise\apps\dm-mve\WEB-INF\classes\database.properties
- Lexmark\Markvision Enterprise\apps\dm-mve\WEB-INF\classes\encryption.properties
- Lexmark\Markvision Enterprise\apps\dm-mve\WEB-INF\classes\platform.properties
- Lexmark\Markvision Enterprise\apps\library
- Lexmark\Markvision Enterprise\apps\mve-data-service\WEB-INF\classes\database.properties
- Lexmark\Markvision Enterprise\apps\mve-data-service\WEB-INF\classes\encryption.properties
- Lexmark\Markvision Enterprise\jre\lib\security\cacerts
- Lexmark\Markvision Enterprise\tomcat\conf\server.xml

Note: You can restore a database backup to a new MVE installation only if the new MVE installation is the same version.

4 Restore the database files.

Do either of the following:

- If you are using a Firebird database, then replace the following files that you saved during the backup process:

  Note: The following files are using the default database names. This instruction also applies to customized database names.

    - Lexmark\Markvision Enterprise\firebird\security2.fdb

      If you are using custom database names, then the following files are also restored:

      - Lexmark\Markvision Enterprise\apps\dm-mve\WEB-INF\classes\database.properties
      - Lexmark\Markvision Enterprise\apps\mve-data-service\WEB-INF\classes\database.properties
      - Lexmark\Markvision Enterprise\apps\mve-data-service/WEB-INF\classes\application.yml
      - Lexmark\Markvision Enterprise\firebird\aliases.conf

    - Lexmark\Markvision Enterprise\firebird\data\QUARTZ.FDB
    - Lexmark\Markvision Enterprise\firebird\data\MONITOR.FDB
    - Lexmark\Markvision Enterprise\firebird\data\FRAMEWORK.FDB

  - If you are using Microsoft SQL Server, then contact your Microsoft SQL Server administrator.

5 Restart the Markvision Enterprise service.

   For more information, see step 4 of “Backing up the database and application files” on page 25.

Updating the installer settings after installation

The Markvision Enterprise Password Utility lets you update the Microsoft SQL Server settings that have been configured during installation without reinstalling MVE. The utility also lets you update the run-as user domain account credentials, such as user name and password. You can also use the utility to create another Admin user if you forget your previous Admin user credentials.

1 Browse to the folder where Markvision Enterprise is installed.

   For example, `C:\Program Files\`

2 Launch the **mvepwdutility-windows.exe** file in the Lexmark\Markvision Enterprise\ directory.

3 Select a language, and then click **OK** > **Next**.

4 Follow the instructions on the computer screen.

Setting up user access

Overview

MVE lets you add internal users directly to the MVE server or use the user accounts registered in an LDAP server. For more information on adding internal users, see “Managing users” on page 29. For more information on using LDAP user accounts, see “Enabling LDAP server authentication” on page 30.

When adding users, roles must be assigned. For more information, see “Understanding user roles” on page 28.

During authentication, the system checks the user credentials of the internal users present in the MVE server. If MVE cannot authenticate the user, then it tries to authenticate the user in the LDAP server. If the user name exists in both the MVE server and the LDAP server, then the password in the MVE server is used.

Understanding user roles

MVE users can be assigned to one or more roles. Depending on the role, users can perform the following tasks:

- **Admin**—Access and perform tasks in all menus. They also have administrative privileges, such as adding users to the system or configuring the system settings. Only users with an Admin role can stop any running task no matter what user type started it.
- **Printers**
  - Manage discovery profiles.
  - Set the printer states.
  - Perform an audit.
  - Manage categories and keywords.
  - Schedule an audit, data export, and printer discovery.
- **Configurations**
  - Manage configurations, including importing and exporting configuration files.
  - Upload files to the resource library.
  - Assign and enforce configurations to printers.
  - Schedule a conformance check and configurations enforcement.
  - Deploy files to printers.
  - Update the printer firmware.
  - Generate printer certificate signing requests.
  - Download printer certificate signing requests.
- **Event Manager**
  - Manage actions and events.
  - Assign events to printers.
  - Test actions.
- **Service Desk**
  - Update the printer status.
  - Reboot printers.

- Run a conformance check.
- Enforce configurations to printers.

Notes:

- All users in MVE can view the printer information page, and manage saved searches and views.
- For more information on assigning user roles, see “Managing users” on page 29.

Managing users

1 Click ⚙ on the upper-right corner of the page.

2 Click **User**, and then do any of the following:

Add a user

a Click **Create**.

b Type the user name, user ID, and password.

c Select the roles.

Note: For more information, see “Understanding user roles” on page 28.

d Click **Create User**.

Edit a user

a Select a user ID.

b Configure the settings.

c Click **Save Changes**.

Delete users

a Select one or more users.

b Click **Delete**, and then confirm deletion.

Note: A user account is locked out after three consecutive failed login attempts. Only an Admin user can reactivate the user account. If the Admin user is locked out, then the system reactivates it automatically after five minutes.

Enabling LDAP server authentication

LDAP is a standards-based, cross-platform, extensible protocol that runs directly on top of TCP/IP. It is used to access specialized databases called directories.

To avoid maintaining multiple user credentials, you can use the company LDAP server to authenticate user IDs and passwords.

As a prerequisite, the LDAP server must contain user groups that correspond to the required user roles. For more information, see “Understanding user roles” on page 28.

1. Click ⚙ on the upper-right corner of the page.
2. Click **LDAP**, and then select **Enable LDAP for authentication**.
3. In the LDAP server hostname field, type the IP address or the host name of the LDAP server where the authentication occurs.

   Note: If you want to use encrypted communication between the MVE server and the LDAP server, then use the fully qualified domain name (FQDN).

4. Specify the server port number according to the encryption protocol selected.
5. Select the encryption protocol.
   - **None**
   - **TLS**—A security protocol that uses data encryption and certificate authentication to protect the communication between a server and a client. If this option is selected, then a START_TLS command is sent to the LDAP server after the connection is established. Use this setting if you want a secure communication over port 389.
   - **SSL/TLS**—A security protocol that uses public-key cryptography to authenticate the communication between a server and a client. Use this option if you want a secured communication from the start of the LDAP bind. This option is typically used for port 636 or other secured LDAP ports.
6. Select the binding type.
   - **Simple**—The MVE server produces the specified credentials to the LDAP server to use the LDAP server lookup facility.

     a. Type the bind user name.

     b. Type the bind password, and then confirm the password.
   - **Kerberos**—To configure the settings, do the following:

     a. Type the bind user name.

     b. Type the bind password, and then confirm the password.

     c. Click **Choose File**, and then browse to the krb5.conf file.
   - **SPNEGO**—To configure the settings, do the following:

     a. Type the service principal name.

     b. Click **Choose File**, and then browse to the krb5.conf file.

     c. Click **Choose File**, and then browse to the Kerberos keytab file.

     This option is used only for configuring the Simple and Protected GSSAPI Negotiation Mechanism (SPNEGO) to support the Single Sign-On functionality.

7. From the Advanced Options section, configure the following:

    - **Search Base**—The base distinguished name (DN) of the root node. In the LDAP community server hierarchy, this node must be the ancestor of the user node and group node. For example, **`dc=mvetest,dc=com`**.

      Note: When specifying the root DN, make sure that only **`dc`** and **`o`** are part of the root DN. If **`ou`** or **`cn`** is the ancestor of the user and group nodes, then use **`ou`** or **`cn`** in the user and group search bases.

    - **User search base**—The node in the LDAP community server where the user object exists. This node is under the root DN where all the user nodes are listed. For example, **`ou=people`**.
    - **User search filter**—The parameter for locating a user object in the LDAP community server. For example, **`(uid={0})`**.

      ### Examples of allowed multiple conditions and complex expressions

Log in using	In the User search filter field, type
Common name	**`(CN={0})`**
Login name	**`(sAMAccountName={0})`**
User Principal Name	**`(userPrincipalName={0})`**
Telephone number	**`(telephoneNumber={0})`**
Login name or common name	**`(|(sAMAccountName={0})(CN={0}))`**

      Note: The only valid pattern is **`{0}`**, which means that MVE searches for the MVE user login name.

    - **Search User base object and whole subtree**—The system searches all the nodes under the user search base.
    - **Group search base**—The node in the LDAP community server containing the user groups that correspond to the MVE roles. This node is under the root DN where all the group nodes are listed. For example, **`ou=group`**.
    - **Group search filter**—The parameter for locating a user within a group that corresponds to a role in MVE.

      Note: Only the **`{0}`** and **`{1}`** patterns can be used. If **`{0}`** is used, then MVE searches for the LDAP user DN. If **`{1}`** is used, then MVE searches for the MVE user login name.

    - **Group role attribute**—Type the LDAP attribute for the full name of the group. An LDAP attribute has a specific meaning and defines a mapping between the attribute and a field name. For example, the LDAP attribute **`cn`** is associated with the Full Name field. The LDAP attribute **`commonname`** is also mapped to the Full Name field. Generally, this attribute must be left to the default value of **`cn`**.
    - **Search User base object and whole subtree**—The system searches all the nodes under the group search base.

8. From the LDAP Groups to MVE Role Mapping section, type the names of the LDAP groups that correspond to the MVE roles.

    Notes:

    - For more information, see “Understanding user roles” on page 28.
    - You can assign one LDAP group to multiple MVE roles. You can also type more than one LDAP group in a role field, using the vertical bar character (**|**) to separate multiple groups. For example, to include the **`admin`** and **`assets`** groups for the Admin role, type **`admin|assets`** in the LDAP groups for Admin role field.

- If you want to use only the Admin role and not the other MVE roles, then leave the fields blank.

9 Click **Save Changes**.

Installing LDAP server certificates

To establish an encrypted communication between the MVE server and the LDAP server, MVE must trust the LDAP server certificate. In the MVE architecture, when MVE is authenticating with an LDAP server, MVE is the client and the LDAP server is the peer.

1 Click ⚙ on the upper-right corner of the page.

2 Click **LDAP**, and then configure the LDAP settings. For more information, see “Enabling LDAP server authentication” on page 30.

3 Click **Test LDAP**.

4 Enter a valid LDAP user name and password, and then click **Start Test**.

5 Examine the certificate for validity, and then accept it.

Discovering printers

Creating a discovery profile

Use a discovery profile to find printers in your network and add them to the system. In a discovery profile, do either of the following to include or exclude a list of IP addresses or host names:

- Adding entries one at a time
- Importing entries using a TXT or CSV file

You can also assign and enforce a configuration automatically to a compatible printer model. A configuration must contain printer settings, applications, licenses, firmware, and CA certificates that can be deployed to the printers.

1 From the Printers menu, click **Discovery Profiles** > **Create**.

2 From the General section, type a unique name and description for the discovery profile, and then configure the following:

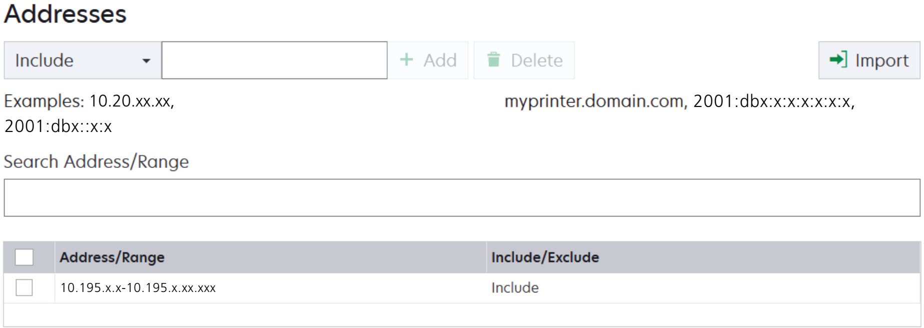
   - **Timeout**—How long the system waits for a printer to respond.
   - **Retries**—The number of times the system attempts to communicate with a printer.
   - **Automatically manage discovered printers**—Newly discovered printers are set to a Managed state automatically, and the New state is skipped during discovery.

3 From the Addresses section, do either of the following:

Add the addresses

a Select **Include** or **Exclude**.

b Type the IP address, host name, subnet, or IP address range.



Addresses

Examples: 10.20.xx.xx, myprinter.domain.com, 2001:dbx:x:x:x:x:x:x, 2001:dbx::x:x

Search Address/Range

□	Address/Range	Include/Exclude
□	10.195.x.x-10.195.x.xx.xxx	Include

Add only one entry at a time. Use the following formats for the addresses:

- **`10.195.10.1`** (single IPv4 address)
- **`myprinter.example.com`** (single host name)
- **`10.195.10.3-10.195.10.255`** (IPv4 address range)
- **`10.195.*.*`** (wildcards)
- **`10.195.10.1/22`** (IPv4 Classless Inter-Domain Routing or CIDR notation)
- **`2001:db8:0:0:0:0:2:1`** (full IPv6 address)
- **`2001:db8::2:1`** (collapsed IPv6 address)

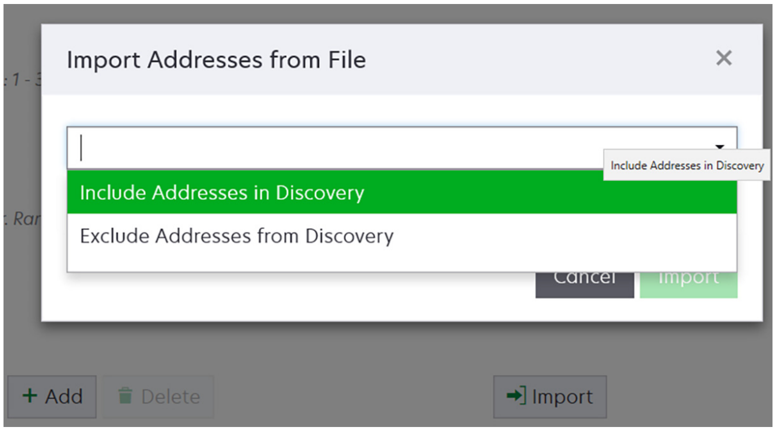
Note: If separate discovery profiles are created for the IPv6 and the IPv4 address for the same printer, then the last discovered address is shown. For example, if a printer is discovered using IPv6, and is discovered again using IPv4, then only the IPv4 address is shown in the printer list.

c Click **Add**.

Import the addresses

a Click **Import**.

b Select whether to include or exclude IP addresses during the discovery.


Import Addresses from File
×
Include Addresses in Discovery
Include Addresses in Discovery
Exclude Addresses from Discovery
Cancel
Import
+ Add
Delete
Import

c Browse to the text file that contains a list of addresses. Each address entry must be placed on a separate line.

Sample text file

```
10.195.10.1
myprinter.example.com
10.195.10.3-10.195.10.255
10.195.*.*
10.195.10.1/22
2001:db8:0:0:0:0:2:1
2001:db8::2:1
```

d Click **Import**.

4 From the SNMP section, select **Version 1**, **Version 2c** or **Version 3**, and then set the access permissions.

Note: To discover printers using SNMP version 3, create a user name and password in the printer Embedded Web Server, and then restart the printer. If a connection cannot be established, then rediscover the printers. For more information, see the *Embedded Web Server Administrator's Guide*.

5 If necessary, from the Enter Credentials section, select the authentication method that the printers are using, and then enter the credentials.

Note: This feature lets you establish communication with secured printers during discovery. The correct credentials must be provided to perform tasks on the secured printers, such as audit, status update, and firmware update.

6 If necessary, from the Assign Configurations section, associate a configuration with a printer model. For information on creating a configuration, see "Creating a configuration" on page 67.

7 If necessary, from the Assign Keywords section, associate a keyword with a printer model during discovery. For information on assigning keywords to printers, see "Assigning keywords to printers" on page 64

Notes:

- All the printers discovered through this profile are assigned with the new keywords.

- The new keywords are added to the existing list of keywords which are already assigned to a printer.

8 Click **Save Profile** or **Save and Run Profile**.

Note: A discovery can be scheduled to occur regularly. For more information, see "Creating a schedule" on page 139.

Managing discovery profiles

1 From the Printers menu, click **Discovery Profiles**.

2 Do any of the following:

Edit a profile

a Select a profile, and then click **Edit**.

b Configure the settings.

c Click **Save Profile** or **Save and Run Profile**.

Copy a profile

a Select a profile, and then click **Copy**.

b Configure the settings.

c Add the IP addresses. For more information, see "Add the addresses" on page 33.

d Click **Save Profile** or **Save and Run Profile**.

Delete a profile

a Select one or more profiles.

b Click **Delete**, and then confirm deletion.

Run a profile

a Select one or more profiles.

b Click **Run**. Check the discovery status from the Tasks menu.

Sample scenario: Discovering printers

Company ABC is a large manufacturing company occupying a nine-story building. The company just bought 30 new Lexmark printers, distributed among the nine floors. As the IT personnel, you must add these new printers to MVE. The printers are already connected to the network, but you do not know all the IP addresses.

You want to secure the following new printers in the Accounting department.

```
10.194.55.60
10.194.56.77
10.194.55.71
10.194.63.27
10.194.63.10
```

Sample implementation

1. Create a discovery profile for the printers in the Accounting department.
2. Add the five IP addresses.
3. Create a configuration that secures the specified printers.
4. Include the configurations in the discovery profile.
5. Save and run the profile.
6. Create another discovery profile for the rest of the printers.
7. Include the IP addresses using a wildcard. Use the following: **`10.194.*.*`**
8. Exclude the five printer IP addresses in the Accounting department.
9. Save, and then run the profile.

Managing the security dashboard

Overview

The Security dashboard lets you view the health of the device security settings. It is a visual representation of various security settings, such as, ports, protocols, disk encryption status, device administrator accounts, and default certificate status. It provides visibility to the security posture of your fleet, which helps administrators to identify and fix the settings which are out of compliance.

Accessing the security dashboard

1. From the MVE web portal, click **Dashboard**.

   Note: The security dashboard is the default landing page for Admin users.

2. Click either of the following widgets:
   - **Device Security Information**
   - **Device Conformance Check**

Managing Device Security Information

This widget summarizes the security view of the fleet.

1. Click any bar of the chart to go to the Device Security Information window.
2. Hover your mouse over the bars to view the following details:
   - Port number
   - Number of associated printers
   - Whether the printer settings are open/enabled
3. Click **Print** to get a printable format of the detailed view.

Notes:

- The Device Security Information window provides the user with a drill-down feature.
- Clicking any bar item in the chart enables the user to navigate to a filtered view of the printer listing page. For more information, see “Viewing the printer list” on page 39.

Managing Device Conformance Check

This widget summarizes the detailed view of the conformance check of the fleet.

1. Click any section of the pie chart to go to the Device Conformance Check window.
2. From the left pane, apply the Date Range filter.

   Note: Default range is 7 days.

3. Click **Print** to get a printable format of the detailed view.

Notes:

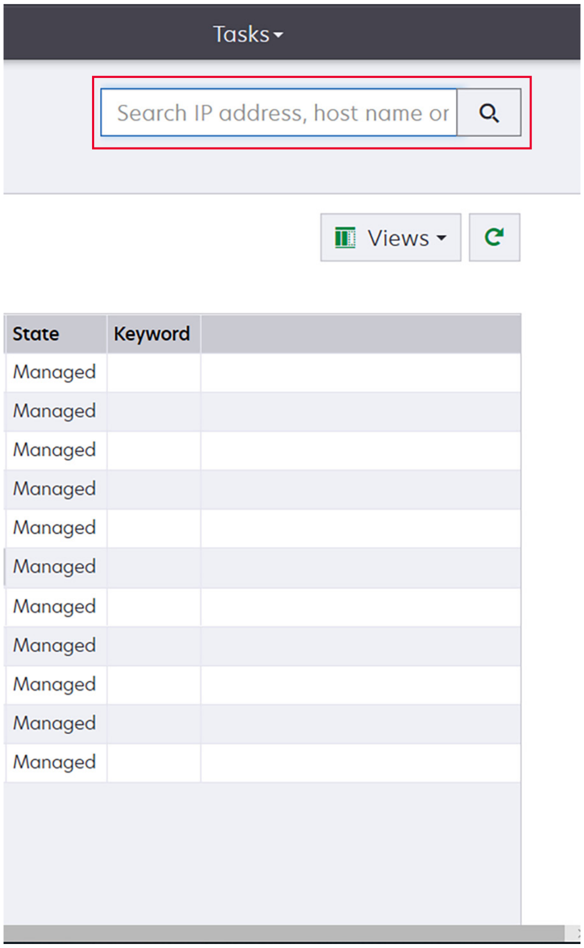
- The Device Conformance Check window provides the user with a drill-down feature.
- Clicking any section of the pie chart enables the user to navigate to a filtered view of the printer listing page. For more information, see “Viewing the printer list” on page 39.

Viewing printers

Viewing the printer list

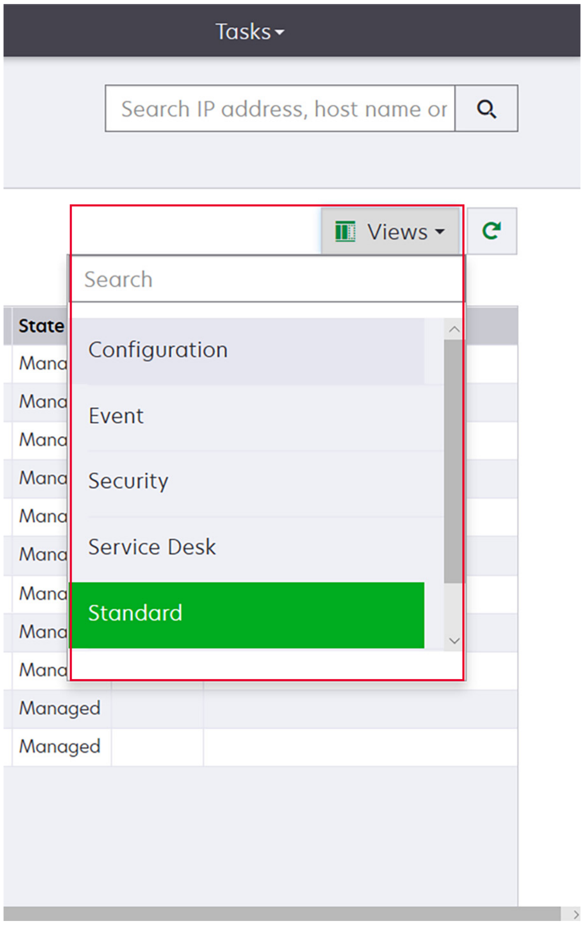
The Printer Listing page is the default landing page when you access MVE. The table shows the list of the printers that are added in MVE.

1. From the Printers menu, click **Printer Listing**.
2. From the Printer Listing page, do any of the following:
   - To search for specific printers, do any of the following:
     - Use the search box to search for an IP address, host name, system name, or serial number.



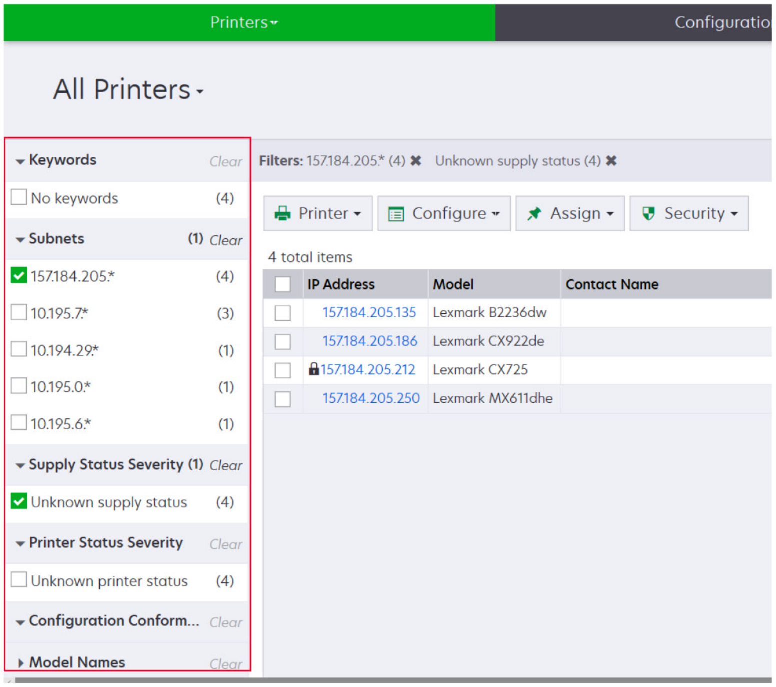
State	Keyword	
Managed		
Managed		
Managed		
Managed		
Managed		
Managed		
Managed		
Managed		
Managed		
Managed		
Managed		

– Change the printer listing view. For more information, see “Changing the printer listing view” on page 45.



Note: If you are using the search box, then the application searches for all the printers in the system. The selected filters and saved searches are ignored. If you run a saved search, then the criteria specified in the saved search are used. The selected filters and the IP address or host name typed in the search box are ignored. You can also use the filters to narrow down the current search results.

– Use the filters.



Keywords Clear

□ No keywords (4)

Subnets (1) Clear

☑ 157.184.205.* (4)

□ 10.195.7.* (3)

□ 10.194.29.* (1)

□ 10.195.0.* (1)

□ 10.195.6.* (1)

Supply Status Severity (1) Clear

☑ Unknown supply status (4)

Printer Status Severity Clear

□ Unknown printer status (4)

Configuration Conform... Clear

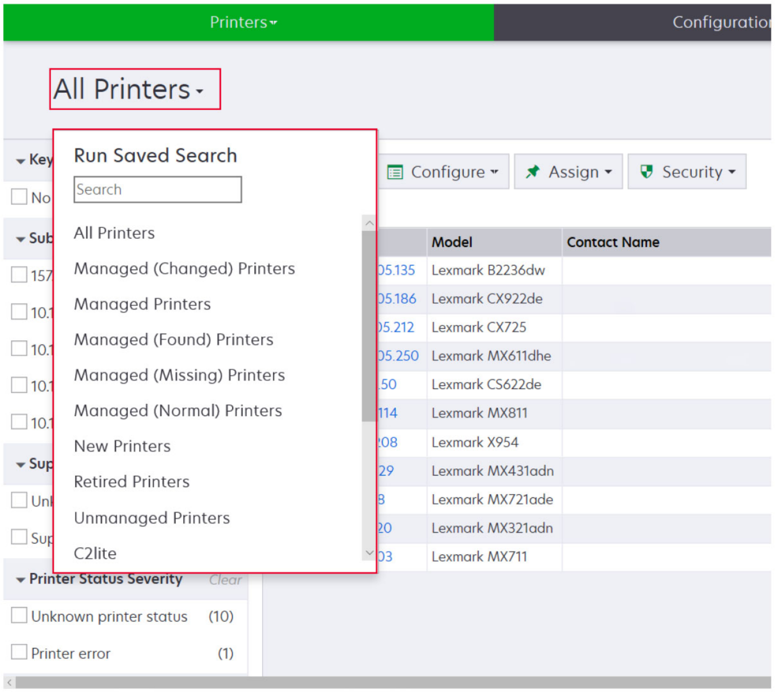
Model Names Clear

Filters: 157.184.205.* (4) ✖ Unknown supply status (4) ✖

4 total items

□	IP Address	Model	Contact Name
□	157.184.205.135	Lexmark B2236dw	
□	157.184.205.186	Lexmark CX922de	
□	🔒157.184.205.212	Lexmark CX725	
□	157.184.205.250	Lexmark MX611dhe	

– Run a saved search. For more information, see “Running a saved search” on page 48.



□ Unknown printer status (10)

□ Printer error (1)

	Model	Contact Name
05.135	Lexmark B2236dw	
05.186	Lexmark CX922de	
05.212	Lexmark CX725	
05.250	Lexmark MX611dhe	
50	Lexmark CS622de	
114	Lexmark MX811	
08	Lexmark X954	
29	Lexmark MX431adn	
3	Lexmark MX721ade	
20	Lexmark MX321adn	
03	Lexmark MX711	

- To sort the printers, from the printer list table, click any column header. The printers are sorted according to the selected column header.
- To view more information about the printers, resize the columns. Place your cursor over the vertical border of the column header, and then drag the border to the left or to the right.

Viewing the printer information

To see the complete list of information, make sure that an audit is performed on the printer. For more information, see “Auditing printers” on page 60.

1. From the Printers menu, click **Printer Listing**.
2. Click the IP address of the printer.
3. View the following information:
   - **Status**—The status of the printer.
   - **Supplies**—The supply details and remaining supply percentage.
   - **Identification**—The printer network identification information.

     Note: The time zone information is available only in some printer models.
   - **Dates**—The date the printer is added to the system, the discovery date, and the most recent audit date.
   - **Firmware**—The printer firmware properties and code levels.
   - **Capabilities**—The printer features.
   - **Memory Options**—The hard disk size and user flash free space.
   - **Input Options**—The settings for the available trays.
   - **Output Options**—The settings for the available bins.
   - **eSF Applications**—The information about the installed Embedded Solutions Framework (eSF) applications on the printer.
   - **Printer Statistics**—The specific values for each of the printer properties.
   - **Change Details**—The information about the changes in the printer.

     Note: This information is available only in printers that are in a Managed (Changed) state. For more information, see “Understanding printer life cycle states” on page 46.
   - **Printer Credentials**—The credentials used in the configuration assigned to the printer.
   - **Printer Certificate**—The properties of the following printer certificates:
     - **Default**
     - **HTTPS**
     - **802.1x**
     - **IPSec**

     Notes:

     - This information is available only in some printer models.
     - An Expiring Soon validity status indicates the expiry date, as set in the Certificate Authority section under System Configuration.
   - **Configuration Properties**—The properties of the configuration assigned to the printer.
   - **Active Alerts**—The printer alerts that are waiting to be cleared.
   - **Assigned Events**—The events assigned to the printer.

Exporting printer data

MVE lets you export the printer information that is available in your current view.

1. From the Printers menu, click **Printer Listing**.
2. Select one or more printers.
3. Click **Printer** > **Export data**.

   Notes:

   - The exported data is saved in a CSV file.
   - Exporting data can be scheduled to occur regularly. For more information, see "Creating a schedule" on page 139.

Managing views

The Views feature lets you customize the information that is shown in the printer listing page.

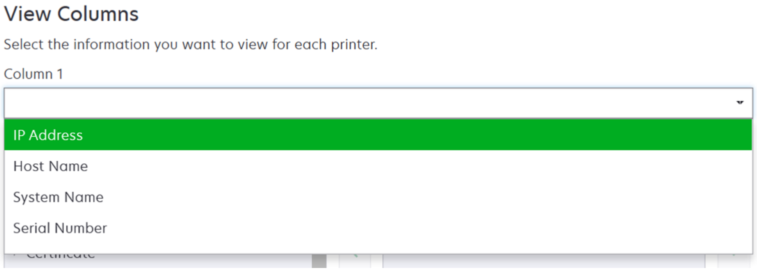
1. From the Printers menu, click **Views**.
2. Do any of the following:

Create a view

a. Click **Create**.

b. Type a unique name for the view and its description.

c. From the View Columns section, in the Column 1 menu, select the identifier column.

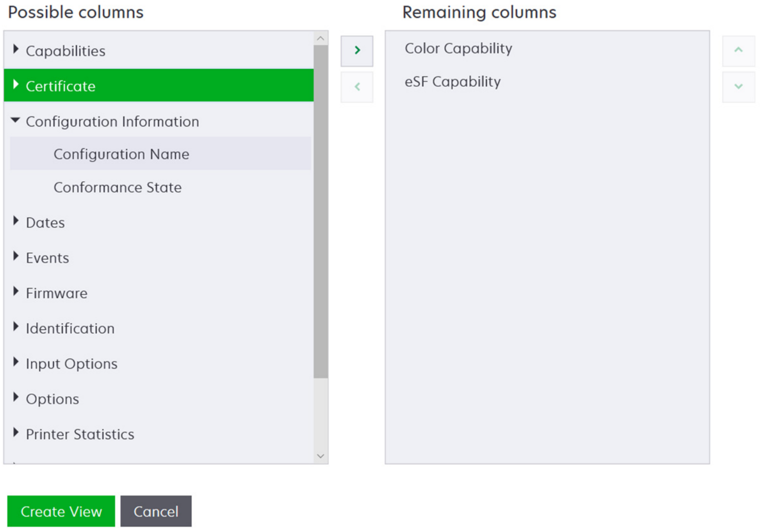


View Columns

Select the information you want to view for each printer.

Column 1

d From the Possible columns section, expand a category, select the information that you want to show as a column, and then click **>**.



- **Capabilities**—Shows whether the selected features are supported on the printer.
- **Certificate**—Shows the printer certificate creation date, enrolment status, expiration date, renewal date, revision number, certificate subject, validity, and signing status.
- **Configuration Information**—Shows configuration-related printer information, such as conformance, configuration name, and state.
- **Dates**—Shows the last audit, last conformance check, last discovery, and the date the printer was added to the system.
- **Events**—Shows event-related printer information.
- **Firmware**—Shows firmware-related information, such as the firmware version.
- **Identification**—Shows information about the printer, such as the IP address, host name, and serial number.
- **Input Options**—Shows information about the input options, such as the tray size and media type.
- **Options**—Shows information about the printer options, such as hard disk and flash drive.
- **Printer Statistics**—Shows information about the printer usage, such as the number of printed or scanned pages, and total number of faxed jobs.
- **Solutions**—Shows the eSF applications installed on the printer, and their version numbers.
- **Status**—Show the printer and supplies status.
- **Supplies**—Shows supplies-related information.
- **Printer Ports**—Shows ports-related information.

  Note: An **Unknown** option in the port value means that either the port does not exist on the printer or MVE cannot retrieve the port.
- **Printer Security Options**—Shows TLS and Cipher information.

e Click **Create View**.

Edit a view

a Select a view.

b Click **Edit**, and then edit the settings.

c. Click **Save Changes**.

Copy a view

a. Select a view.
b. Click **Copy**, and then configure the settings.
c. Click **Create View**.

Delete views

a. Select one or more views.
b. Click **Delete**, and then confirm deletion.

Set a default view

a. Select a view.
b. Click **Set As Default**.

The following views are system-generated, and cannot be edited or deleted:

- Configuration
- Printer List
- Event
- Security
- Service Desk
- Standard

Changing the printer listing view

For more information, see “Managing views” on page 43.

1. From the Printers menu, click **Printer Listing**.
2. Click **Views**, and then select a view.

Filtering printers using the search bar

Note the following when using the search bar to search for printers.

- To search for an IP address, make sure to type the complete IP address or range.

  For example:

  - `10.195.10.1`
  - `10.195.10.3-10.195.10.255`
  - `10.195.*.*`
  - `2001:db8:0:0:0:0:2:1`
- If the search string is not a full IP address, then the printers are searched according to their host name, system name, or serial number.
- The underscore character (_) can be used as a wildcard character.

Managing keywords

Keywords let you create custom tags and assign them to printers.

1. From the Printers menu, click **Keywords**.
2. Do either of the following:
   - Add, edit, or delete a category.

     Note: Categories group keywords together.
   - Add, edit, or delete a keyword.

For information on assigning keywords to printers, see “Assigning keywords to printers” on page 64.

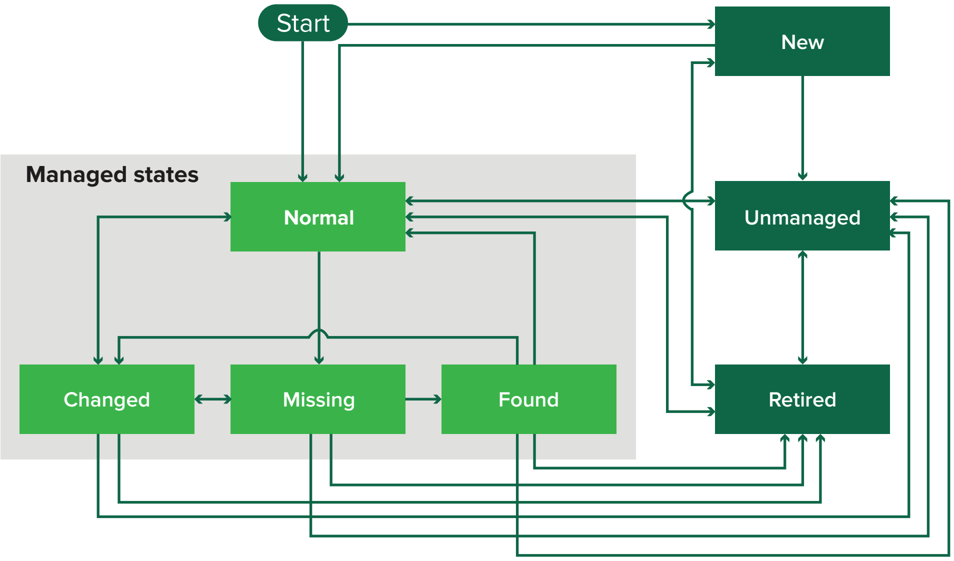
Using saved searches

Understanding printer life cycle states

System-generated saved searches show the printers in the following printer life cycle states:

- **All Printers**—All printers in the system.
- **Managed Printers**—Printers that appear can be in any of the following states:
  - Managed (Normal)
  - Managed (Changed)
  - Managed (Missing)
  - Managed (Found)
- **Managed (Changed) Printers**—Printers in the system whose following properties were changed at the last audit:
  - Property tag
  - Host name
  - Contact name
  - Contact location
  - Memory size
  - Duplex
  - Supplies (excluding levels)
  - Input options
  - Output options
  - eSF applications
  - Default printer certificate
- **Managed (Found) Printers**—Printers that were reported as missing, but have now been found.
- **Managed (Missing) Printers**—Printers that the system was unable to communicate with.
- **Managed (Normal) Printers**—Printers in the system whose properties have remained the same since the last audit.
- **New Printers**—Printers that are newly discovered and are not set to a Managed state automatically.

- **Retired Printers**—Printers marked as no longer active in the system.
- **Unmanaged Printers**—Printers marked for exclusion from activities performed in the system.



Beginning state	Ending state	Transition
Start	Normal	Discovered.[1]
Start	New	Discovered.[2]
Any	Normal, Unmanaged, or Retired	Manual (Missing does not change to Normal).
Retired	Normal	Discovered.[1]
Retired	New	Discovered.[2]
Normal, Missing, or Found	Changed	New address when discovered.
Normal	Changed	Audit properties do not match the database properties.
Normal, Changed, or Found	Missing	Not found on audit or update status.
Changed	Normal	Audit properties match the database properties.
Missing	Found	Discovered, audit, or update status.
Found	Normal	Discovered, audit, or update status.

[1] The "Automatically manage discovered printers" setting is enabled in the discovery profile.

[2] The "Automatically manage discovered printers" setting is disabled in the discovery profile.

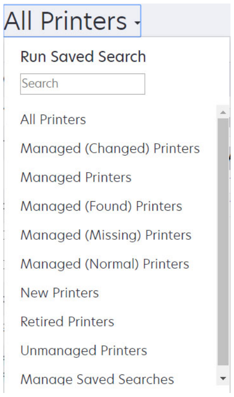
Running a saved search

A saved search is a saved set of parameters that returns the latest printer information that meets the parameters.

You can create and run a customized saved search, or run the default system-generated saved searches. The system-generated saved searches show the printers in their life cycle states. For more information, see "Understanding printer life cycle states" on page 46.

1 From the Printers menu, click **Printer Listing**.

2 In the drop-down menu, select a saved search.



Creating a saved search

Using filters

1 From the Printers menu, click **Printer Listing**.

2 On the left side of the page, select the filters.

Note: The selected filters are listed above the search results header.

3 Click **Save**, and then type a unique name for your saved search and its description.

4 Click **Create Saved Search**.

Using the Saved Search page

1 From the Printers menu, click **Saved Searches** > **Create**.

2 From the General section, type a unique name for your saved search and its description.

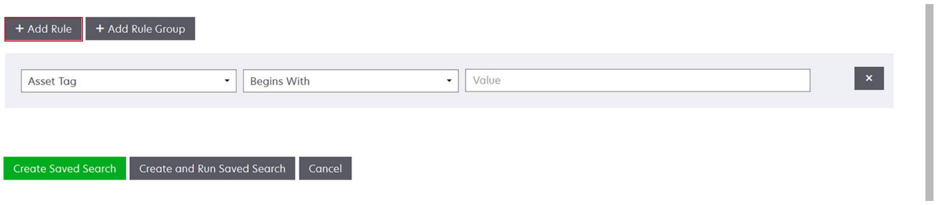
3 From the Rules and Rule Groups section, in the Match menu, specify whether the search results must match all or any of the rules.

4 Do either of the following:

Add a rule

a Click **Add Rule**.

b Specify the parameter, operation, and value for your search rule. For more information, see "Understanding search rules settings" on page 49.



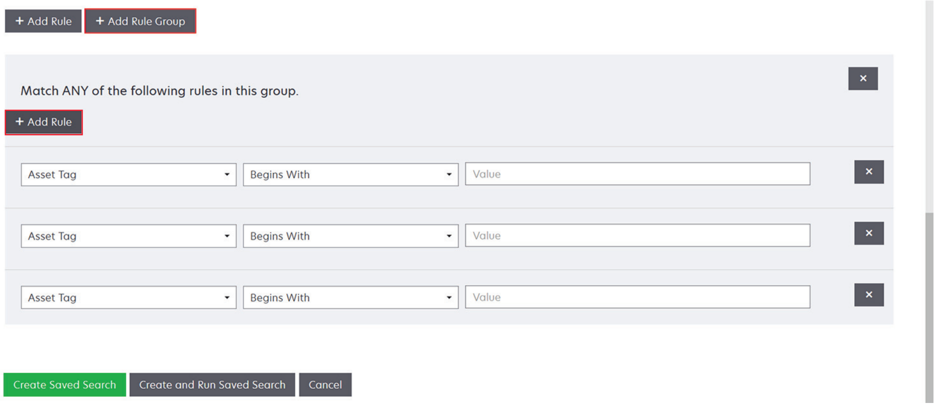
Add a rule group

A rule group may contain a combination of rules. If the Match menu is set to **ANY rules and rule groups**, then the system searches for printers that match all the rules in the rule group. If the Match menu is set to **ALL rules and rule groups**, then the system searches for printers that match any of the rules in the rule group.

a Click **Add Rule Group**.

b Specify the parameter, operation, and value for your search rule. For more information, see "Understanding search rules settings" on page 49.

c To add another rule, click **Add Rule**.


Match ANY of the following rules in this group.

5 Click **Create Saved Search** or **Create and Run Saved Search**.

Understanding search rules settings

Search for printers using one or more of the following parameters:

Parameter	Description
Asset Tag	The value of the asset tag setting on the printer.
Certificate Creation Date[1]	The date that the certificate was created.
Certificate Enrollment Status[1]	The enrollment status of the certificate.
Certificate Expiration Date[1]	The date that the certificate expires.
Certificate Renewal Date[1]	The date that the certificate is renewed.

Parameter	Description
Certificate Revision Number[1]	The revision number of the certificate.
Certificate Signing Status[1]	The status of the certificate.
Certificate Validity Status[1]	The validity of the certificate. **Note:** An Expiring Soon status indicates that the certificate expires within 30 days.
Color Capability	The printer prints in color or in black and white.
Configuration	The configuration name assigned to the printer.
Configuration Conformance	The conformance status of the printer against the assigned configuration.
Contact Location	The value of the contact location setting on the printer.
Contact Name	The value of the contact name setting on the printer.
Copy	The printer supports the copy function.
Date: Added to System	The date that the printer was added to the system.
Date: Last Audited	The date that the printer was last audited.
Date: Last Conformance Check	The date that the printer configuration conformance was last checked.
Date: Last Discovered	The date that the printer was last discovered.
Disk Encryption	The printer is configured for disk encryption.
Disk Wiping	The printer is configured for disk wiping.
Duplex	The printer supports two-sided printing.
eSF Capability	The printer supports managing eSF applications.
eSF Information	The information about the eSF application installed on the printer, such as name, state, and version.
Event Name	The name of the assigned events.
Fax Name	The value of the fax name setting on the printer.
Fax Number	The value of the fax number setting on the printer.
Fax Receive	The printer supports receiving fax.
Firmware Information	The information about the firmware installed on the printer. • **Name**—The name of the firmware. For example, `Base` or `Kernel`. • **Version**—The printer firmware version.
Host Name	The printer host name.
IP Address	The printer IP address. **Note:** You can use an asterisk in the last three octets to search for multiple entries. For example, `123.123.123.*`, `123.123.*.*`, `123.*.*.*`, `2001:db8::2:1`, and `2001:db8:0:0:0:0:2:1`.
Keyword	The assigned keywords.
Lifetime Page Count	The lifetime page count value of the printer.
MAC Address	The printer MAC address.

Parameter	Description
Maintenance Counter	The value of the printer maintenance counter.
Manufacturer	The printer manufacturer name.
Marking Technology	The marking technology that the printer supports.
MFP Capability	The printer is a multifunction product (MFP).
Model	The printer model name.
Modular Serial Number	The modular serial number.
Printer Status	The printer status. For example, **`Ready`**, **`Paper Jam`**, **`Tray 1 Missing`**.
Printer Status Severity	The value of the most severe status present on the printer. For example, **`Unknown`**, **`Ready`**, **`Warning`**, or **`Error`**.
Profile	The printer supports profiles.
Scan to E-mail	The printer supports Scan to E-mail.
Scan to Fax	The printer supports Scan to Fax.
Scan to Network	The printer supports Scan to Network.
Secure Communication State	The printer security or authentication state.
Serial Number	The printer serial number.
State	The current printer state in the database.
Supply Status	The printer supplies status.
Supply Status Severity	The value of the most severe supply status present on the printer. For example, **`Unknown`**, **`OK`**, **`Warning`**, or **`Error`**.
System Name	The printer system name.
Time Zone	The time zone of the region where the printer is located.
TLI	The value of the TLI setting on the printer.

[1] Certificate-related parameters are applicable for the following device certificates:

- **Default**
- **HTTPS**
- **802.1x**
- **IPSec**

Use the following operators when searching for printers:

- **Exactly Matches**—A parameter is equivalent to a specified value.
- **Is Not**—A parameter is not equivalent to a specified value.
- **Contains**—A parameter contains a specified value.
- **Does Not Contain**—A parameter does not contain a specified value.
- **Begins With**—A parameter begins with a specified value.
- **Ends With**—A parameter ends with a specified value.
- **Date**
  - **Older than**—A parameter to search days before the days specified.
  - **Within last**—A parameter to search within days specified before today.

- **Within the next**—A parameter to search within days specified after today.

Note: To search for printers that have parameters with empty values, use **`_EMPTY_OR_NULL_`**. For example, to search for printers that have empty Fax Name, in the Value field, type **`_EMPTY_OR_NULL_`**.

Managing saved searches

1 From the Printers menu, click **Saved Searches**.

2 Do any of the following:

Edit a saved search

a Select a saved search, and then click **Edit**.

Note: System-generated saved searches cannot be edited. For more information, see "Understanding printer life cycle states" on page 46.

b Configure the settings.

c Click **Save Changes** or **Save and Run**.

Copy a saved search

a Select a saved search, and then click **Copy**.

b Configure the settings.

c Click **Create Saved Search** or **Create and Run Saved Search**.

Delete saved searches

a Select one or more saved searches.

Note: System-generated saved searches cannot be deleted. For more information, see "Understanding printer life cycle states" on page 46.

b Click **Delete**, and then confirm deletion.

Sample scenario: Monitoring the toner levels of your fleet

As the IT personnel of Company ABC, you must organize the printer fleet to monitor them easily. You want to monitor the toner usage of the printers to determine whether the supplies need replacement.

Sample implementation

1 Create a saved search that retrieves the printers whose supplies have errors or warnings.

Sample rule for your saved search

Parameter: **`Supply Status Severity`**
Operation: **`Is Not`**
Value: **`Supplies OK`**

2 Create a view that shows the supply status, capacity, and level for each printer.

Sample columns to show in your supplies view

`Supply Status`
`Black Cartridge Capacity`

`Black Cartridge Level`

`Cyan Cartridge Capacity`

`Cyan Cartridge Level`

`Magenta Cartridge Capacity`

`Magenta Cartridge Level`

`Yellow Cartridge Capacity`

`Yellow Cartridge Level`

3 Run the saved search while using the view.

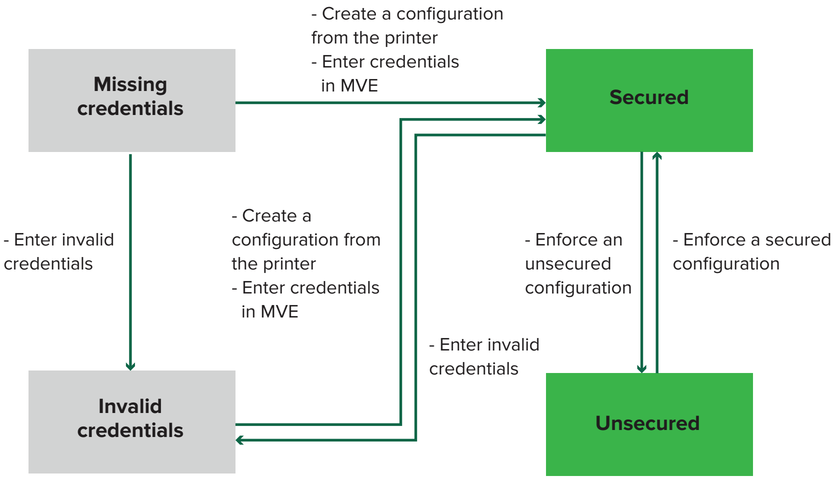
Note: The information shown in the printer listing view is based on the last audit. Perform an audit and status update to get the current printer status.

Securing printer communications

Understanding printer security states

During discovery, the printer can be in any of the following security states:

- **Unsecured**—MVE does not need credentials to communicate with the device.
- 🔒 **Secured**—MVE needs credentials and they were provided.
- 🔒 **Missing credentials**—MVE needs credentials but they were not provided.
- ⚠ **Invalid credentials**—MVE needs credentials but incorrect credentials were provided.


Missing credentials
Secured
Invalid credentials
Unsecured
- Create a configuration from the printer
- Enter credentials in MVE
- Enter invalid credentials
- Create a configuration from the printer
- Enter credentials in MVE
- Enter invalid credentials
- Enforce an unsecured configuration
- Enforce a secured configuration

A printer is in the Invalid credentials state when the credentials are found to be invalid during discovery, audit, status update, conformance check, or configuration enforcement.

The printer is in an Unsecured state only when it does not require credentials during discovery.

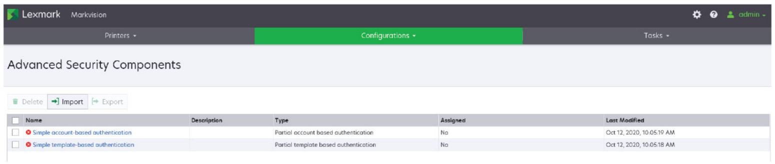
To change the status from Unsecured to Secured, enforce a secured configuration.

To move a printer from the Missing credentials or Invalid credentials state, enter the credentials in MVE manually or create a configuration from the printer.

Securing printers using the default configurations

On some printer models, there is no default administrator user. The Guest user has open access and is not logged in. This setup grants the user access to all printer permissions and access controls. MVE handles this risk through default configurations. After a fresh installation, two advanced security components are created automatically. Each component contains the default security settings and preconfigured local administrator account. You can use these security components when creating a configuration, and then deploy and enforce the configuration to the new printers.

From the Configurations menu, click **All Advanced Security Components**.

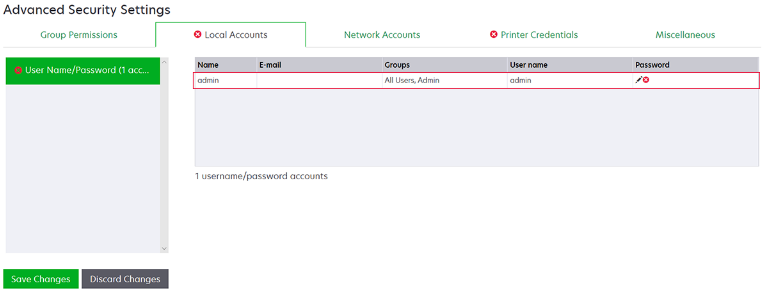


Advanced Security Components

□	Name	Description	Type	Assigned	Last Modified
□	Simple account-based authentication		Partial account based authentication	No	Oct 12, 2020, 10:05:19 AM
□	Simple template-based authentication		Partial template based authentication	No	Oct 12, 2020, 10:05:18 AM

Simple account-based authentication

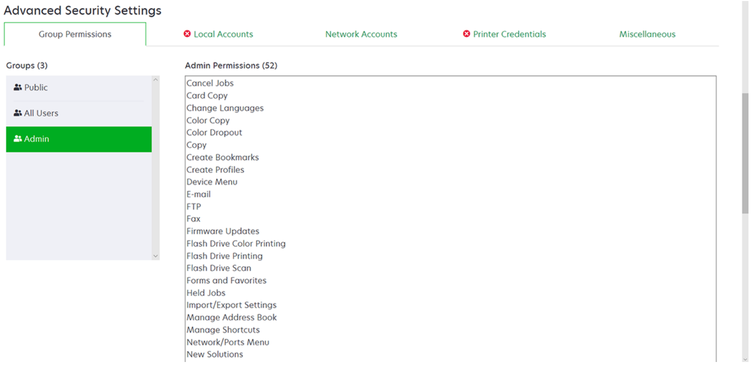
This security component contains a User Name/Password Local Account called **admin**.


Advanced Security Settings

Name	E-mail	Groups	User name	Password
admin		All Users, Admin	admin	

1 username/password accounts

The **admin** account is a member of the Admin Group, whose permissions include function access controls and permissions to secure the printer and restrict public access. For more information, see "Understanding permissions and function access controls" on page 57.

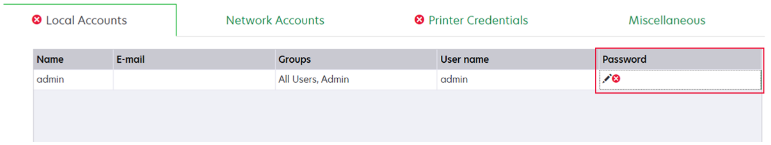

Advanced Security Settings

Groups (3)

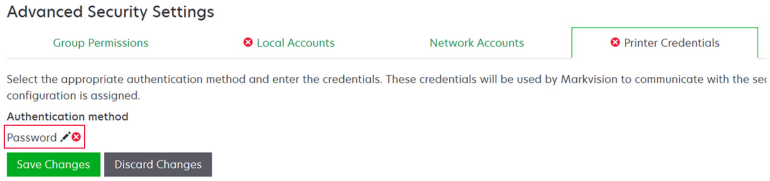
Admin Permissions (52)

Cancel Jobs
Card Copy
Change Languages
Color Copy
Color Dropout
Copy
Create Bookmarks
Create Profiles
Device Menu
E-mail
FTP
Fax
Firmware Updates
Flash Drive Color Printing
Flash Drive Printing
Flash Drive Scan
Forms and Favorites
Held Jobs
Import/Export Settings
Manage Address Book
Manage Shortcuts
Network/Ports Menu
New Solutions

Before adding this component to a configuration, make sure to set the **admin** password and the printer credentials.



Name	E-mail	Groups	User name	Password
admin		All Users, Admin	admin	

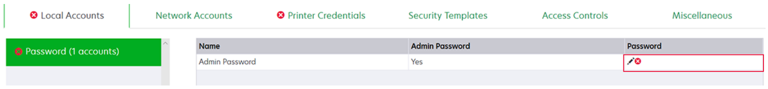

Advanced Security Settings

Select the appropriate authentication method and enter the credentials. These credentials will be used by Markvision to communicate with the sec configuration is assigned.

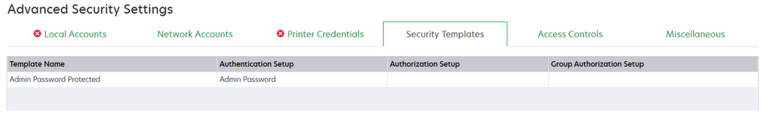
Authentication method: Password

Simple template-based authentication

This security component contains a security template called Admin Password Protected that is configured with a Password Local Account.



Name	Admin Password	Password
Admin Password	Yes	


Advanced Security Settings

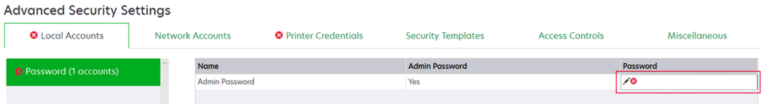
Template Name	Authentication Setup	Authorization Setup	Group Authorization Setup
Admin Password Protected	Admin Password		

This security template is applied to the following access controls:

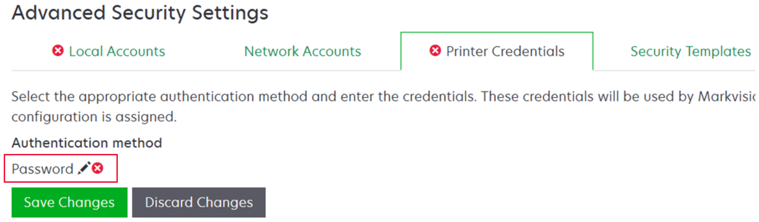
- Firmware Updates
- Remote Management
- Security Menu remotely

The remaining access controls are set to **No Security**. However, you can always set the other administrative printer menus to use the security template for more protection. For more information on the access controls, see “Understanding permissions and function access controls” on page 57.

Before adding this component to a configuration, make sure to set the password and the printer credentials.


Advanced Security Settings

Name	Admin Password	Password
Admin Password	Yes	


Advanced Security Settings

Select the appropriate authentication method and enter the credentials. These credentials will be used by Markvisic configuration is assigned.

Authentication method: Password

Understanding permissions and function access controls

Printers can be configured to restrict public access to administrative menus and device management features. In newer printer models, permissions to access printer functions can be secured through different types of authentication methods. In older printer models, a security template can be applied to a function access control (FAC).

To communicate with these secured printers and manage them, MVE requires certain permissions or FACs, depending on the printer model.

The following table explains what printer management functions can be managed in MVE and what permissions or FACs are required.

Note that MVE requires the authentication credentials when Remote Management is secured. If other administrative menus and device management permissions or FACs are secured, then Remote Management must also be secured. Otherwise, MVE cannot perform the functions.

These permissions and function access controls are predefined in MVE as default advanced security components, and can readily be used in a configuration. For more information, see "Securing printers using the default configurations" on page 55.

If you are not using the default advanced security components, then make sure that these permissions and function access controls are configured in the printer manually. For more information, see "Configuring printer security" on page 57.

Permissions or FACs	Description
Remote Management	The ability to read and write settings remotely. If any other permissions or FACs listed in this table are secured, then Remote Management must also be secured.
Firmware Updates	The ability to update firmware from any method.
Apps Configuration	The ability to install or remove applications from the printer and send application settings files to the printer.
Import / Export All Settings or **Configuration File Import / Export**	The ability to send configuration files to the printer.
Security Menu or **Security Menu Remotely**	The ability to manage login methods and configure printer security options.

To secure newer printer models in MVE, disable public access for the Remote Management and Security Menu permissions. For older printer models, apply a security template to the Remote Management FAC.

Configuring printer security

1. From the Printers menu, click **Printer Listing**.
2. Click the IP address of the printer, and then click **Open Embedded Web Server**.
3. Click **Settings** or **Configuration**.
4. Depending on your printer model, do either of the following:
   - Click **Security** > **Login Methods**, and then do the following:

For newer printer models

a. From the Security section, create a login method.
b. Click **Manage Group/Permissions** or **Manage Permissions** beside the login method.
c. Expand **Administrative Menus**, and then select **Security Menu**.
d. Expand **Device Management**, and then select the following permissions:
   - **Remote Management**
   - **Firmware Updates**
   - **Apps Configuration**
   - **Import / Export All Settings**
e. Click **Save**.
f. From the Public section, click **Manage Permissions**.
g. Expand **Administrative Menus**, and then clear **Security Menu**.
h. Expand **Device Management**, and then clear **Remote Management**.
i. Click **Save**.

- Click **Security** > **Security Setup** or **Edit Security Setup**, and then do the following:

For older printer models

a. From the Advanced Security Setup section, create a building block and a security template.
b. Click **Access Controls**, and then expand **Administrative Menus**.
c. In the Security Menu Remotely menu, select the security template.
d. Expand **Management**, and then select the security template for the following function access controls:
   - **Apps Configuration**
   - **Remote Management**
   - **Firmware Updates**
   - **Configuration File Import / Export**
e. Click **Submit**.

Securing printer communications on your fleet

1. Discover a secured printer. For more information, see “Discovering printers” on page 33.

   Notes:

   - A printer is secured when 🔒 appears next to it. For information on securing a printer, see the **help document**.
   - For more information on printer security states, see “Understanding printer security states” on page 54.

2. Create a configuration from a printer. For more information, see “Creating a configuration from a printer” on page 70.

3. Assign the configuration to your fleet. For more information, see “Assigning configurations to printers” on page 61.

4. Enforce the configuration. For more information, see “Enforcing configurations” on page 61. A padlock symbol appears next to the secured printer.

Other ways to secure your printers

For more information on configuring printer security settings, see the *Embedded Web Server Administrator's Guide* for your printer.

Check your printers for the following settings:

- Disk encryption is enabled.
- The following ports are restricted:
  - TCP 79 (Finger)
  - TCP 21 (FTP)
  - UDP 69 (TFTP)
  - TCP 5001 (IPDS)
  - TCP 9600 (IPDS)
  - TCP 10000 (Telnet)
- The default cipher list is the OWASP Cipher String ‘B.’

Managing printers

Restarting the printer

1. From the Printers menu, click **Printer Listing**.
2. Click the IP address of the printer.
3. Click **Restart Printer**.

Viewing the printer Embedded Web Server

The Embedded Web Server is a software built into the printer that provides a control panel for configuring the printer from any web browser.

1. From the Printers menu, click **Printer Listing**.
2. Click the IP address of the printer.
3. Click **Open Embedded Web Server**.

Auditing printers

An audit collects information from any printers in the Managed state, and then stores the information in the system. To make sure that the information in the system is current, perform an audit regularly.

1. From the Printers menu, click **Printer Listing**.
2. Select one or more printers.
3. Click **Printer** > **Audit**.

   Note: An audit can be scheduled to occur regularly. For more information, see "Creating a schedule" on page 139.

Updating printer status

The Update Status feature lets you update the printer status and supplies information. To make sure that the printer status and supplies information is current, update the status regularly.

1. From the Printers menu, click **Printer Listing**.
2. Select one or more printers.
3. Click **Printer** > **Update status**.

   Note: A status update can be scheduled to occur regularly. For more information, see "Creating a schedule" on page 139.

Setting the printer state

For more information on the printer states, see “Understanding printer life cycle states” on page 46.

1. From the Printers menu, click **Printer Listing**.
2. Select one or more printers.
3. Click **Printer**, and then select one of the following:
   - **Set state to managed**—The printer is included in all activities that can be performed in the system.
   - **Set state to unmanaged**—The printer is excluded in all activities that can be performed in the system.
   - **Set state to retired**—The printer is removed from the network. The system retains the printer information, but does not expect to see the printer on the network again.

Assigning configurations to printers

Before you begin, make sure that a configuration for the printer is created. Assigning a configuration to a printer allows the system to run conformance checks and enforcements. For more information, see “Creating a configuration” on page 67.

1. From the Printers menu, click **Printer Listing**.
2. Select one or more printers.
3. Click **Configure** > **Assign configurations**.
4. From the Configuration section, select a configuration.

   Note: If the system is set to **Use Markvision to manage device certificates**, then select **Trust the selected devices**. This confirmation is the way for the user to verify that the printers are real devices and not spoofed.
5. Click **Assign Configurations**.

Unassigning configurations

1. From the Printers menu, click **Printer Listing**.
2. Select one or more printers.
3. Click **Configure** > **Unassign configurations**.
4. Click **Unassign Configurations**.

Enforcing configurations

MVE runs a conformance check against the printer. If some settings are out of conformance, then MVE changes those settings on the printer. MVE runs a final conformance check after changing the settings. Updates that require the printer to reboot, such as firmware updates, may require a second enforcement to complete.

Before you begin, make sure that a configuration is assigned to the printer. For more information, see "Assigning configurations to printers" on page 61.

1. From the Printers menu, click **Printer Listing**.
2. Select one or more printers.
3. Click **Configure** > **Enforce configurations**.

Notes:

- If the printer is in an error state, then some settings may not be updated.
- For MVE to deploy firmware and solution files to a printer, the Firmware Updates function access control must be set to **No Security**. If security is applied, then the Firmware Updates function access control must use the same security template as the Remote Management function access control. For more information, see "Deploying files to printers" on page 62.
- An enforcement can be scheduled to occur regularly. For more information, see "Creating a schedule" on page 139.

Checking the printer conformance with a configuration

During a conformance check, MVE checks the printer settings, and verifies whether they match the assigned configuration. MVE does not make changes to the printer during this operation.

Before you begin, make sure that a configuration is assigned to the printer. For more information, see "Assigning configurations to printers" on page 61.

1. From the Printers menu, click **Printer Listing**.
2. Select one or more printers.
3. Click **Configure** > **Check conformance**.

   Notes:

   - You can view the results in the task status page.
   - A conformance check can be scheduled to occur regularly. For more information, see "Creating a schedule" on page 139.

Deploying files to printers

You can deploy the following files to the printer:

- **CA Certificates**—**.cer** or **.pem** files that are added to the printer trust store.
- **Configuration bundle**—**.zip** files that are exported from a supported printer or obtained directly from Lexmark.
- **Firmware update**—An **.fls** file that is flashed to the printer.
- **Generic file**—Any file that you want to send to the printer.
  - **Raw socket**—Sent over port 9100. The printer treats it like any other print data.
  - **FTP**—Send file over FTP. This deployment method is not supported on secured printers.
- **Printer certificate**—A signed certificate that is installed on the printer as the default certificate.

- **Universal Configuration File (UCF)**—A configuration file exported from a printer.
  - **Web service**—The HTTPS web service is used when the printer model supports it. Otherwise, the printer uses the HTTP web service.
  - **FTP**—Send file over FTP. This deployment method is not supported on secured printers.

1. From the Printers menu, click **Printer Listing**.
2. Select one or more printers.
3. Click **Configure** > **Deploy file to printers**.
4. Click **Choose File**, and then browse to the file.
5. Select a file type, and then select a deployment method.
6. Click **Deploy File**.

Notes:

- For MVE to deploy firmware and solution files to a printer, the Firmware Updates function access control must be set to **No Security**. If security is applied, then the Firmware Updates function access control must use the same security template as the Remote Management function access control.
- A file deployment can be scheduled to occur regularly. For more information, see “Creating a schedule” on page 139.

Updating the printer firmware

1. From the Printers menu, click **Printer Listing**.
2. Select one or more printers.
3. Click **Configure** > **Update firmware to printers**.
4. Select a firmware file from the resource library, or click **Choose File**, and then browse to the firmware file.

   Note: For more information on adding firmware files to the library, see “Importing files to the resource library” on page 73.

5. If necessary, to schedule the update, select **Define update window**, and then select the start date, start and pause time, and days of the week.

   Note: The firmware is sent to the printers within the specified start time and pause time. The task is paused after the pause time, and then resumes at the next start time until it is completed.

6. Click **Update Firmware**.

Note: For MVE to update the printer firmware, the Firmware Updates function access control must be set to **No Security**. If security is applied, then the Firmware Updates function access control must use the same security template as the Remote Management function access control. In this case, MVE must manage the printer securely. For more information, see “Securing printer communications” on page 54.

Uninstalling applications from printers

MVE can uninstall only applications that have been added to the system in the Package Builder format. For more information on uploading applications to the system, see “Importing files to the resource library” on page 73.

1. From the Printers menu, click **Printer Listing**.
2. Select one or more printers.
3. Click **Configure** > **Uninstall Apps from printers**.
4. Select the applications.
5. Click **Uninstall Apps**.

Assigning events to printers

Assigning events to printers lets MVE perform the associated action whenever one of the associated alerts occurs on the assigned printer. For more information on creating events, see “Managing printer alerts” on page 129.

Note: Events can be assigned only to unsecured printers.

1. From the Printers menu, click **Printer Listing**.
2. Select one or more printers.
3. Click **Assign** > **Events**.
4. Select one or more events.

   Note: If some of the selected printers already have the event assigned to them, then a dash in the check box appears. If you leave it as a dash, then the event does not change. If you select the check box, then the event is assigned to all the selected printers. If you clear the check box, then the event is unassigned from the printers it was previously assigned to.
5. Click **Assign Events**.

Assigning keywords to printers

Assigning keywords to printers lets you organize your printers. For more information on creating keywords, see “Managing keywords” on page 46.

1. From the Printers menu, click **Printer Listing**.
2. Select one or more printers.
3. Click **Assign** > **Keywords**.
4. If necessary, in the View menu, select a category.

5. Select one or more keywords.

   Note: Keywords are listed following a category. If some of the selected printers already have the keyword assigned to them, then a dash in the check box appears. If you leave it as a dash, then the keyword is not assigned or unassigned to the selected printers. If you select the check box, then the keyword is assigned to all the selected printers. If you clear the check box, then the keyword is unassigned from the printers it was previously assigned to.

6. Click **Assign Keywords**.

Entering credentials to secured printers

Secured printers can be discovered and enrolled. To communicate with these printers, you can either enforce a configuration or enter the credentials in MVE directly.

Note: A printer is secured when a 🔒 appears next to it.

To enter the credentials, do the following:

1. From the Printers menu, click **Printer Listing**.
2. Select one or more secured printers.
3. Click **Security** > **Enter Credentials**.
4. Select the authentication method, and then enter the credentials.
5. Click **Enter Credentials**.

   Note: Enrolled printers that are secured but do not have the correct credentials saved in MVE are tagged as Missing credentials under the Communications filter. After the correct credentials are entered, the printers are tagged as Secured.

Configuring default printer certificates manually

When not using the automated certificate management feature, MVE can help facilitate the process of signing the default printer certificate on a fleet of printers. MVE gathers the certificate-signing requests from the fleet, and then deploys the signed certificates to the proper printers after they are signed.

A system administrator must do the following:

1. Generate the printer certificate-signing requests.

   a. From the Printers menu, click **Printer Listing**.

   b. Select one or more printers.

   c. Click **Security** > **Generate printer certificate signing requests**.

   Note: You can select one or more printers when generating certificate-signing requests, but only one set of requests can exist at a time. To avoid overwriting any existing certificate-signing requests, you must download the certificate-signing requests before generating another set.

2. Wait for the task to finish, and then download the printer certificate-signing requests.

   a. From the Printers menu, click **Printer Listing**.

   b. Click **Security** > **Download printer certificate signing requests**.

3. Use a trusted CA to sign the certificate-signing requests.

4. Save the signed certificates in a ZIP file.

   Note: All the signed certificates must be in the root location of the ZIP file. Otherwise, MVE cannot parse the file.

5. From the Printers menu, click **Printer Listing**.
6. Select one or more printers.
7. Click **Configure** > **Deploy file to printers**.
8. Click **Choose File**, and then browse to the ZIP file.
9. In the File type menu, select **Printer Certificates**.
10. Click **Deploy File**.

Removing printers

1. From the Printers menu, click **Printer Listing**.
2. Select one or more printers.
3. Click **Printer**.
4. If necessary, to remove the printer certificate, select **Delete associated device certificate(s)**.

   Note: If MVE is managing the device certificates, then removing the printer certificate deletes the default certificate from the printer. The printer then generates a new self-signed certificate.

5. Do either of the following:
   - To retain the printer information, click **Retire Printer**.
   - To remove the printer from the system, click **Delete Printer**.

Managing configurations

Overview

MVE uses configurations to manage the printers in your fleet.

A configuration is a collection of settings that can be assigned and enforced to a printer or a group of printer models. Within a configuration, you can modify printer settings and deploy applications, licenses, firmware, and printer certificates.

You can create a configuration that is composed of the following:

- Basic printer settings
- Advanced security settings
- Color print permissions

  Note: This setting is available only in configurations for supported color printers.
- Printer firmware
- Applications
- CA certificates
- Resource Files

Using configurations, you can do the following to manage the printers:

- Assign a configuration to printers.
- Enforce the configuration to the printers. The settings that are specified in the configuration are applied to the printers. The firmware, applications, printer certificate, application files (.fls), and CA certificates are installed.
- Check whether the printers are in conformance against a configuration. If a printer is out of conformance, then the configuration can be enforced to the printer.

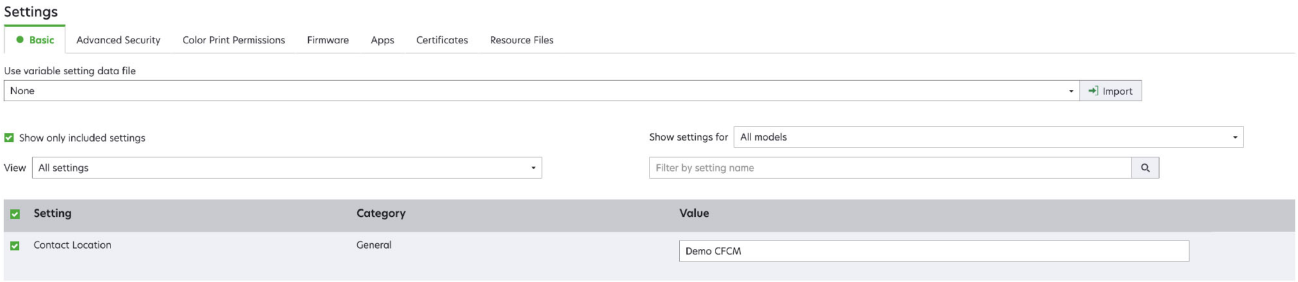
  Note: Configuration enforcement and conformance checking can be scheduled to occur regularly.
- If the printer supports the configuration settings but the values are not applicable, then the printer shows as out of conformance.

Creating a configuration

A configuration is a collection of settings that can be assigned and enforced to a printer or a group of printers. Within a configuration, you can modify printer settings and deploy applications, licenses, firmware, and CA certificates to printers.

1. From the Configurations menu, click **All Configurations** > **Create**.
2. Type a unique name for the configuration and its description.
3. In the Setting list, do one or more of the following:
   - From the Basic tab, select one or more settings, and then specify the values. If the value is a variable setting, then enclose the header with **`${}`**. For example, **`${Contact_Name}`**. To use a variable setting

file, select the file from the Use variable setting data file menu, or import the file. For more information, see “Understanding variable settings” on page 71.



Use variable setting data file: None

☑ Show only included settings

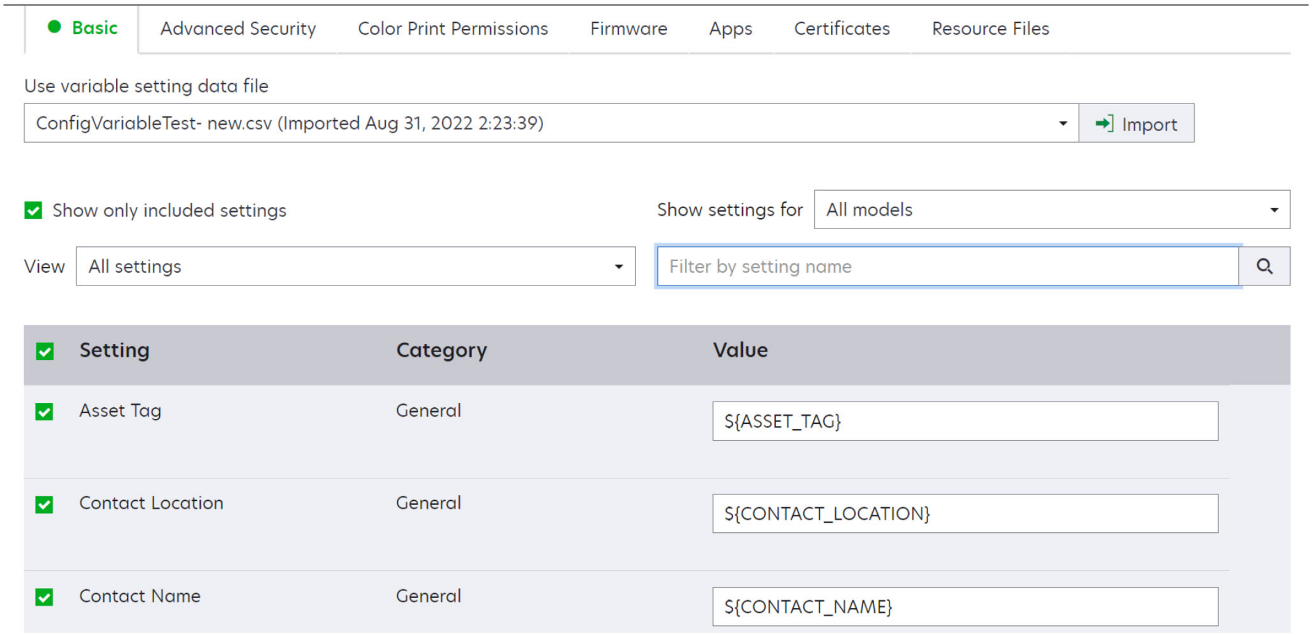
Show settings for: All models

View: All settings

Filter by setting name

☑ Setting	Category	Value
☑ Contact Location	General	Demo CFCM

- Select one or more settings, and then specify the values. If the value is a variable setting, then enclose the header with **`${}`**. For example, **`${Contact_Name}`**. To use a variable setting file, select the file from the Use variable setting data file menu, or import the file. For more information, see “Understanding variable settings” on page 71.



Use variable setting data file: ConfigVariableTest- new.csv (Imported Aug 31, 2022 2:23:39)

☑ Show only included settings

Show settings for: All models

View: All settings

Filter by setting name

☑ Setting	Category	Value
☑ Asset Tag	General	${ASSET_TAG}
☑ Contact Location	General	${CONTACT_LOCATION}
☑ Contact Name	General	${CONTACT_NAME}

- If one or more certificates are added to this configuration, you can select any of the certificates from the **Value** drop-down menu.

- From the Advanced Security tab, select an advanced security component.

  Notes:

  - To create an advanced security component, see “Creating an advanced security component from a printer” on page 70.
  - You can manage the advanced security settings only when creating a configuration from a selected printer. For more information, see “Creating a configuration from a printer” on page 70.

- From the Color Print Permissions tab, configure the settings. For more information, see “Configuring the color print permissions” on page 72.

  Note: This setting is available only in configurations for supported color printers.

- From the Firmware tab, select a firmware file. If multiple versions of the same firmware are present in a configuration, only the higher firmware version is considered during conformance and enforcement. To import a firmware file, see "Importing files to the resource library" on page 73.
- From the Apps tab, select one or more applications to deploy. For more information, see "Creating an applications package" on page 72.

  Note: MVE does not support deploying applications with trial licenses. You can deploy only free applications or applications with production licenses.
- From the Certificates tab, select one or more certificates to deploy. To import a certificate file, see "Importing files to the resource library" on page 73.

  Note: Select **Use Markvision to manage device certificates** for MVE to assess missing, invalid, revoked, and expired certificates, and then replace them automatically.

  Select either of the following options:

  - Default Device Certificate
  - Named Device Certificate

    Note: By default, a user can add 10 named certificates per MVE installation and 5 named certificates per MVE configuration.

  Note: For more information, see "Configuring MVE for automated certificate management" on page 76.
- From the Resource Files tab, select any of the following file types to deploy:
  - **Application file (.fls)**
  - **Configuration bundle (.zip)**
  - **Universal configuration file (.ucf)**

  Notes:

  - Any option under the resource tab is not conformance checked.
  - We do not recommend using multiple UCF and configuration bundles in a single configuration.
  - This method is not applicable to UCF files when configuring scan to network on legacy printers. UCF files must be deployed using the **Deploy file to printer** action.

4. Click **Create Configuration**.

   Note: The following list shows the deployment sequence in a configuration:

   - **CA Certificates**
   - **Application Files**
   - **Solution Packages**
   - **Advanced Security**
   - **Device Certificates**
   - **Basic Settings**
   - **UCF and configuration bundle**
   - **Firmware**

Creating a configuration from a printer

The following components are not included:

- Printer firmware
- Applications
- Certificates

To add the firmware, applications, and certificates, edit the configuration in MVE.

1. From the Printers menu, click **Printer Listing**.
2. Select the printer, and then click **Configure** > **Create configuration from printer**.
3. If necessary, select **Include advanced security settings** to create an advanced security component from the selected printer.
4. If the printer is secured, then select the authentication method, and then enter the credentials.
5. Type a unique name for the configuration and its description, and then click **Create Configuration**.
6. From the Configurations menu, click **All Configurations**.
7. Select the configuration, and then click **Edit**.
8. If necessary, edit the settings.
9. Click **Save Changes**.

Sample scenario: Cloning a configuration

Fifteen Lexmark MX812 printers were added to the system after discovery. As the IT personnel, you must apply the settings of the existing printers to the newly discovered printers.

Note: You can also clone a configuration from a printer, and then enforce the configuration to a group of printer models.

Sample implementation

1. From the existing printers list, select a Lexmark MX812 printer.
2. Create a configuration from the printer.

   Note: To secure the printers, include the advanced security settings.
3. Assign, and then enforce the configuration to the newly discovered printers.

Creating an advanced security component from a printer

Create an advanced security component from a printer to manage the advanced security settings. MVE reads all the settings from that printer, and then creates a component that includes the settings. The component can be associated to multiple configurations for printer models that have the same security framework.

1. From the Printers menu, click **Printer Listing**.
2. Select the printer, and then click **Configure** > **Create advanced security component from printer**.
3. Type a unique name for the component and its description.

4 If the printer is secured, then select the authentication method, and then enter the credentials.

5 Click **Create Component**.

Note: When you create and enforce a configuration with an advanced security component that contains local accounts, the local accounts are added to the printers. Any existing local accounts that are preconfigured in the printer are retained.

Generating a printable version of the configuration settings

1 Edit a configuration or advanced security component.

2 Click **Printer-friendly version**.

Understanding dynamic settings

- These settings include 802.1x Device Certificate, HTTPS Device Certificate, and IPSec Device Certificate which are listed under the Basic tab of a configuration.
- The options for each of these settings are populated with the certificates selected in the Certificate tab.
- When you clone, export, or import a configuration, the preselected values of these settings are cleared. You must select the values manually.

Understanding variable settings

Variable settings let you manage settings across your fleet that are unique to each printer, such as host name or asset tag. When creating or editing a configuration, you can select a CSV file to be associated with the configuration.

Sample CSV format:

```
IP_ADDRESS,Contact_Name,Address,Disp_Info
1.2.3.4,John Doe,1600 Penn. Ave., Blue
4.3.2.1,Jane Doe,1601 Penn. Ave., Red
2.3.6.5,"Joe, Jane and Douglas",1601 Penn. Ave.,Yellow
2.3.6.7,"Joe, Jane and Douglas",1600 Penn. Ave.,He is 6’7” tall
```

In the header row of the variable file, the first column is a unique printer identifier token. The token must be one of the following:

- **HOSTNAME**
- **IP_ADDRESS**
- **SYSTEM_NAME**
- **SERIAL_NUMBER**

Each subsequent column in the header row of the variable file is a user-defined replacement token. This token must be referenced within the configuration using the ${HEADER} format. It is replaced with the values in the subsequent rows when the configuration is enforced. Make sure that the tokens do not contain any spaces.

You can import the CSV file containing the variable settings when creating or editing a configuration. For more information, see “Creating a configuration” on page 67.

Configuring the color print permissions

MVE lets you restrict color printing for host computers and specific users.

Note: This setting is available only in configurations for supported color printers.

1 From the Configurations menu, click **All Configurations**.

2 Create or edit a configuration.

3 From the Color Print Permissions tab, do either of the following:

Configure the color print permissions for host computers

a In the View menu, select **Host computers**, and then select **Include color print permissions for host computers**.

b Click **Add**, and then type the host computer name.

c To let the host computer print in color, select **Allow color printing**.

d To let users that log in to the host computer print in color, select **Override user permission**.

e Click **Save and Add** or **Save**.

Configure the color print permissions for users

a In the View menu, select **Users**, and then select **Include color print permissions for users**.

b Click **Add**, and then type the user name.

c Select **Allow color printing**.

d Click **Save and Add** or **Save**.

Creating an applications package

1 Export the Printer List view from MVE using the Export Data feature.

a From the Printers menu, click **Views**.

b Select **Printer List**, and then click **Export Data**.

c Select a saved search.

d In the “Select file type for data export” menu, select **CSV**.

e Click **Export Data**.

2 Access Package Builder.

Note: If you need access to Package Builder, then contact your Lexmark representative.

a Log in to Package Builder at **cdp.lexmark.com/package-builder**.

b Import the printer list, and then click **Next**.

c Type the package description, and then type your e-mail address.

d In the Product menu, select the applications, and then if necessary, add licenses.

e Click **Next** > **Finish**. The package download link is sent to your e-mail.

3 Download the package.

Notes:

- MVE does not support deploying applications with trial licenses. You can deploy only free applications or applications with production licenses. If you need activation codes, then contact your Lexmark representative.
- To add the applications to a configuration, import the applications package to the resource library. For more information, see "Importing files to the resource library" on page 73.

Importing or exporting a configuration

Before you begin importing a configuration file, make sure that it is exported from the same version of MVE.

1 From the Configurations menu, click **All Configurations**.

2 Do either of the following:

- To import a configuration file, click **Import**, browse to the configuration file, and then click **Import**.
- To export a configuration file, select a configuration, and then click **Export**.

Notes:

- When you export a configuration, the passwords are excluded. After importing, manually add the passwords.
- UCF, configuration bundles, and application files are not part of an exported configuration.

Importing files to the resource library

The resource library is a collection of firmware files, CA certificates, and application packages that are imported to MVE. These files can be associated with one or more configurations.

1 From the Configurations menu, click **Resource Library**.

2 Click **Import** > **Choose File**, and then browse to the file.

Note: Only firmware files (.fls), application files (.fls), application packages or configuration bundles (.zip), CA certificates (.pem), and universal configuration files (.ucf) can be imported.

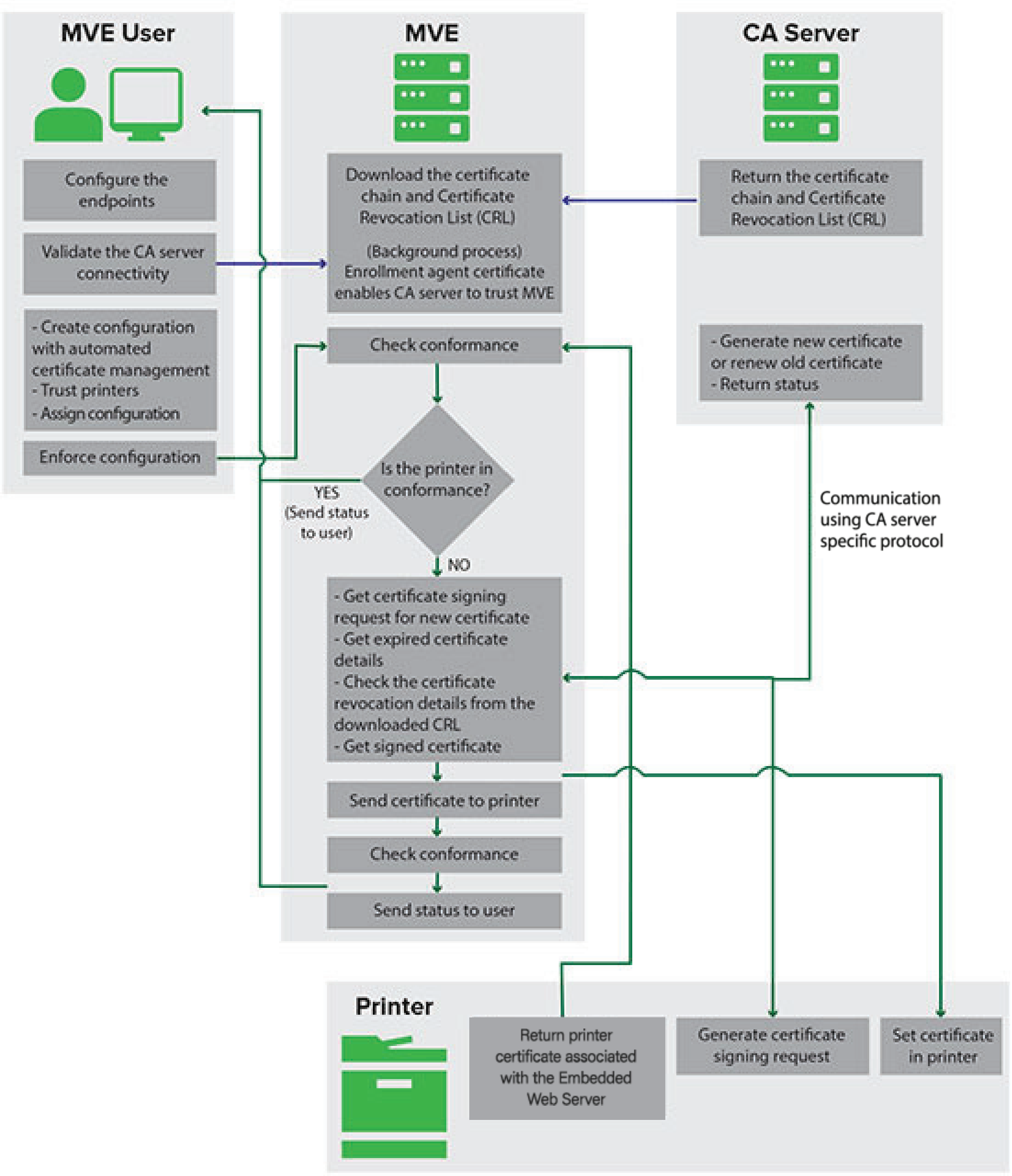
3 Click **Import Resource**.

Managing certificates

Setting up MVE to manage certificates automatically

Understanding the automated certificate management feature

You can configure MVE to manage printer certificates automatically, and then install them to the printers through configuration enforcement. The following diagram describes the end-to-end process of the automated certificate management feature.


MVE User
Configure the endpoints
Validate the CA server connectivity
- Create configuration with automated certificate management
- Trust printers
- Assign configuration
Enforce configuration
MVE
Download the certificate chain and Certificate Revocation List (CRL)
(Background process) Enrollment agent certificate enables CA server to trust MVE
Check conformance
Is the printer in conformance?
YES (Send status to user)
NO
- Get certificate signing request for new certificate
- Get expired certificate details
- Check the certificate revocation details from the downloaded CRL
- Get signed certificate
Send certificate to printer
Check conformance
Send status to user
CA Server
Return the certificate chain and Certificate Revocation List (CRL)
- Generate new certificate or renew old certificate
- Return status
Communication using CA server specific protocol
Printer
Return printer certificate associated with the Embedded Web Server
Generate certificate signing request
Set certificate in printer

The certificate authority endpoints, such as the CA server and server address, must be defined in MVE.

The following CA servers are supported:

- **OpenXPKI CA**—Users can use either of the following protocols:
  - Secure Certificate Encryption Protocol (SCEP)
  - EST Connector

  Notes:

  - EST is the recommended way to connect to the OpenXPKI server.
  - For more information on configuring OpenXPKI CA using EST protocol, see “Managing certificates using OpenXPKI Certificate Authority through EST” on page 112
  - For more information on configuring OpenXPKI CA using SCEP protocol, see “Managing certificates using OpenXPKI Certificate Authority through SCEP” on page 96
- **Microsoft CA Enterprise**—Users can use either of the following protocols
  - Secure Certificate Encryption Protocol (SCEP)
  - Microsoft Certificate Enrollment Web Services (MSCEWS)

  Notes:

  - MSCEWS is the recommended way to connect to the Microsoft CA Enterprise server.
  - For more information on configuring Microsoft CA using MSCEWS protocol, see “Managing certificates using Microsoft Certificate Authority through MSCEWS” on page 85
  - For more information on configuring Microsoft CA using SCEP protocol, see “Managing certificates using Microsoft Certificate Authority through SCEP” on page 78

The connection between MVE and the CA servers must be validated. During validation, MVE communicates with the CA server to download the certificate chain and the Certificate Revocation List (CRL). The enrollment agent certificate or test certificate is also generated. This certificate enables the CA server to trust MVE.

For more information on defining the endpoints and validation, see “Configuring MVE for automated certificate management” on page 76.

A configuration that is set to **Use Markvision to manage device certificates** must be assigned and enforced to the printer.

For more information, see the following topics:

- “Creating a configuration” on page 67
- “Enforcing configurations” on page 61

During enforcement, MVE checks the printer for conformance.

For **Default Device Certificate**

- The certificate is validated against the certificate chain downloaded from the CA server.
- If the printer is out of conformance, a Certificate Signing Request (CSR) is raised for the printer.

For **Named Device Certificate**

- The certificate is validated against the certificate chain downloaded from the CA server.
- MVE creates a self-signed named device certificate on the device.
- If the printer is out of conformance, a CSR is raised for the printer.

Notes:

- MVE communicates with the CA server using the configured protocols.

- The CA server generates the new certificate, and then MVE sends the certificate to the printer.
- If a named certificate exists in the printer, then a new named certificate is not created, but a CSR is raised for the printer.

Configuring MVE for automated certificate management

1. Click ⚙ on the upper-right corner of the page.
2. Click **Certificate Authority** > **Use Certificate Authority Server**.

   Note: The Use Certificate Authority Server button appears only when configuring the certificate authority for the first time, or when the certificate is deleted.
3. Configure the server endpoints.
   - **CA Server**—The Certificate Authority (CA) server that generates the printer certificates. You can select either of the following:
     - **OpenXPKI CA**
     - **Microsoft CA- Enterprise**

     Note: User can also configure a CA server which supports the **Enrollment over Secure Transport (EST)** protocol.

     - The CA server must implement the EST protocol as defined in RFC 7030.

       Note: Any deviation from the specification may result in an invalid setup.
     - EST is the recommended protocol to connect to the OpenXPKI CA server.

       Note: Microsoft CA Enterprise server does not support the EST protocol.
   - **CA Server Address**—The IP address or host name of your CA server. This field is only applicable for SCEP and EST protocols.

     Note: Type any of the following:

     - For MSCA server (using SCEP): <Server IP Address or Hostname>/certsrv/mscep/mscep.dll
     - For OpenXPKI server (using SCEP): <Server IP Address or Hostname>/scep/scep
     - For EST, type any of the following:
       - https://172.87.95.240
       - https://estserver.com
       - estserver.com
   - **CA Server Label (Optional)**— If the user creates a new realm, the same realm name must be put in this field.
   - **CEP Server Address**— This field is only applicable for the MSCEWS protocol.

     Note: Type any of the following:

     - For Username and Password Authentication: https://democep.com/ADPolicyProvider_CEP_UsernamePassword/service.svc/CEP
     - For Windows Integrated Authentication: https://democep.com/ADPolicyProvider_CEP_Kerberos/service.svc/CEP
     - For Client Certificate Authentication: https://democep.com/ADPolicyProvider_CEP_Certificate/service.svc/CEP

- **CA Server Hostname**—The host name of your CA server.

  Note: For example, for MSCEWS protocol, user may select `democa.lexmark.com`
- **CES Server Hostname**—The host name of your CES server.

  Note: For example, for MSCEWS protocol, user may select `democes.lexmark.com`
- **Challenge Password**—Challenge Password is required to assert the identity of MVE to the CA server. This password is only required for OpenXPKI CA. It is not supported in Microsoft CA Enterprise.

Note: Depending on your CA server, you must configure the server authentication mode. Do either of the following:

- If you select **EST** protocol, then from the **CA Server Authentication Mode** menu, select any of the following:
  - **Username and Password Authentication**
  - **Client Certificate Authentication**
- If you select **MSCEWS** protocol, then from the **CA Server Authentication Mode** menu, select any of the following:
  - **Username and Password Authentication**
  - **Client Certificate Authentication**
  - **Windows Integrated Authentication**
- **SCEP** protocol only supports the **Challenge Password** authentication mode.

Note: Depending on your CA server, see any of the sections:

- “Managing certificates using OpenXPKI Certificate Authority through SCEP” on page 96
- “Managing certificates using Microsoft Certificate Authority through SCEP” on page 78
- “Managing certificates using Microsoft Certificate Authority through MSCEWS” on page 85
- “Managing certificates using OpenXPKI Certificate Authority through EST” on page 112

4 Click **Save Changes and Validate** > **OK**.

Notes:

- The **Discard Changes** option only works if the changes are not yet saved or saved and validated.
- User cannot recover data from an invalid configuration as MVE does not store the last valid state of any configuration. MVE only stores one single certificate configuration at a time, which may or may not be valid.

Notes:

- The connection between MVE and the CA servers must be validated. During validation, MVE communicates with the CA server to download the certificate chain and the Certificate Revocation List (CRL). The enrollment agent certificate or test certificate is also generated. This certificate enables the CA server to trust MVE.
- You can select one or multiple CEP templates when using MSCEWS protocol. Do the following:

a After clicking **Save Changes and Validate**, the CEP Template Selection window appears.

b Select one or more from the available templates.

- The Use Certificate Authority Server dialog fetches the certificate revocation list.
- A dialog confirms that certificate validation is successful.

c You can see the selected CEP templates in the CA server configuration page.

Note: When you enforce this configuration to any device, a certificate is created according to the selected template.

5. Navigate back to the System Configuration page, and then review the CA certificate.

   Note: You can also download or delete the CA certificate.

Configuring Microsoft Enterprise CA with NDES

Overview

In the following deployment scenario, all permissions are based on permissions set on certificate templates that are published in the domain controller. The certificate requests sent to the CA are based on certificate templates.

For this setup, make sure that you have the following:

- A machine hosting the subordinate CA
- A machine hosting the NDES service
- A domain controller

Required users

Create the following users in the domain controller:

- Service Administrator
  - Named as **SCEPAdmin**
  - Must be a member of the **local admin** and **Enterprise Admin** groups
  - Must be logged locally when the installation of NDES role is triggered
  - Has **Enroll permission** for the certificate templates
  - Has **Add template permission** on CA
- Service Account
  - Named as **SCEPSvc**
  - Must be member of the local **IIS_IUSRS** group
  - Must be a domain user and has **read** and **enroll** permissions on the configured templates
  - Has **request** permission on CA
- Enterprise CA Administrator
  - Named as **CAAdmin**
  - Member of **Enterprise Admin** group
  - Must be a part of the **local admin** group

Managing certificates using Microsoft Certificate Authority through SCEP

This section provides instructions on the following:

- Configuring Microsoft Enterprise Certificate Authority (CA) using Microsoft Network Device Enrollment Service (NDES)
- Create a root CA server

Note: The Windows Server 2016 operating system is used for all setups in this document.

Overview

The root CA server is the main CA server in any organization, and is the top of the PKI infrastructure. The root CA authenticates the subordinate CA server. This server is generally kept in offline mode to prevent any intrusion and to secure the private key.

To configure the root CA server, do the following:

1. Make sure that the root CA server is installed. For more information, see “Installing the root CA server” on page 79.
2. Configure the Certification Distribution Point and Authority Information Access settings. For more information, see “Configuring the Certification Distribution Point and Authority Information Access settings” on page 82.
3. Configure the CRL accessibility. For more information, see “Configuring CRL accessibility” on page 83.

Installing the root CA server

1. From Server Manager, click **Manage** > **Add Roles and Feature**.
2. Click **Server Roles**, select **Active Directory Certificate Services** and all its features, and then click **Next**.
3. From the AD CS Role Services section, select **Certification Authority**, and then click **Next** > **Install**.
4. After installation, click **Configure Active Directory Certificate Services on the destination server**.
5. From the Role Services section, select **Certification Authority** > **Next**.
6. From the Setup Type section, select **Standalone CA**, and then click **Next**.
7. From the CA Type section, select **Root CA**, and then click **Next**.
8. Select **Create a new private key**, and then click **Next**.
9. From the Select a cryptographer provider menu, select **RSA#Microsoft Software Key Storage Provider**.
10. From the Key length menu, select **4096**.
11. In the hash algorithm list, select **SHA512**, and then click **Next**.
12. In the Common name for this CA field, type the hosting server name.
13. In the Distinguished name suffix field, type the domain component.

    ### Sample CA name configuration

    Machine Fully Qualified Domain Name (FQDN): **`test.dev.lexmark.com`**
    Common Name (CN): **`TEST`**
    Distinguished name suffix: **`DC=DEV,DC=LEXMARK,DC=COM`**

14. Click **Next**.
15. Specify the validity period, and then click **Next**.

    Note: Generally, the validity period is 10 years.

16 Do not change anything in the database locations window.

17 Complete the installation.

Configuring Microsoft Enterprise CA with NDES

Overview

In the following deployment scenario, all permissions are based on permissions set on certificate templates that are published in the domain controller. The certificate requests sent to the CA are based on certificate templates.

For this setup, make sure that you have the following:

- A machine hosting the subordinate CA
- A machine hosting the NDES service
- A domain controller

Required users

Create the following users in the domain controller:

- Service Administrator
  - Named as **SCEPAdmin**
  - Must be a member of the **local admin** and **Enterprise Admin** groups
  - Must be logged locally when the installation of NDES role is triggered
  - Has **Enroll permission** for the certificate templates
  - Has **Add template permission** on CA
- Service Account
  - Named as **SCEPSvc**
  - Must be member of the local **IIS_IUSRS** group
  - Must be a domain user and has **read** and **enroll** permissions on the configured templates
  - Has **request** permission on CA

Configuring subordinate CA server

Overview

The subordinate CA server is the intermediate CA server and is always online. It generally handles the management of certificates.

To configure the subordinate CA server, do the following:

1 Make sure that the subordinate CA server is installed. For more information, see "Installing the subordinate CA server" on page 81.

2 Configure the Certification Distribution Point and Authority Information Access settings. For more information, see "Configuring the Certification Distribution Point and Authority Information Access settings" on page 82.

3 Configure the CRL accessibility. For more information, see "Configuring CRL accessibility" on page 83.

Installing the subordinate CA server

1. From the server, log in as a **CAAdmin** domain user.
2. From Server Manager, click **Manage** > **Add Roles and Feature**.
3. Click **Server Roles**, select **Active Directory Certificate Services** and all its features, and then click **Next**.
4. From the AD CS Role Services section, select **Certification Authority** and **Certificate Authority Web Enrollment**, and then click **Next**.

   Note: Make sure that all the features of Certificate Authority Web Enrollment are added.
5. From the Web Server Role (IIS) Role Services section, retain the default settings.
6. After installation, click **Configure Active Directory Certificate Services on the destination server**.
7. From the Role Services section, select **Certification Authority** and **Certificate Authority Web Enrollment**, and then click **Next**.
8. From the Setup Type section, select **Enterprise CA**, and then click **Next**.
9. From the CA Type section, select **Subordinate CA**, and then click **Next**.
10. Select **Create a new private key**, and then click **Next**.
11. From the Select a cryptographer provider menu, select **RSA#Microsoft Software Key Storage Provider**.
12. From the Key length menu, select **4096**.
13. In the hash algorithm list, select **SHA512**, and then click **Next**.
14. In the Common name for this CA field, type the host server name.
15. In the Distinguished name suffix field, type the domain component.

    Sample CA name configuration

    Machine Fully Qualified Domain Name (FQDN): **`test.dev.lexmark.com`**
    Common Name (CN): **`TEST`**
    Distinguished name suffix: **`DC=DEV,DC=LEXMARK,DC=COM`**
16. In the Certificate Request dialog box, save the request file, and then click **Next**.
17. Do not change anything in the database locations window.
18. Complete the installation.
19. Sign the CA request of the root CA, and then export the signed certificate in PKCS7 format.
20. From the subordinate CA, open **Certification Authority**.
21. From the left panel, right-click the CA, and then click **All Tasks** > **Install CA Certificate**.
22. Select the signed certificate, and then start the CA service.

Configuring the Certification Distribution Point and Authority Information Access settings

Note: Configure the Certification Distribution Point (CDP) and Authority Information Access (AIA) settings for Certificate Revocation List (CRL).

1. From Server Manager, click **Tools** > **Certification Authority**.
2. From the left panel, right-click the CA, and then click **Properties** > **Extensions**.
3. In the Select extension menu, select **CRL Distribution Point (CDP)**.
4. In the certificate revocation list, select the **C:\Windows\system32\** entry, and then do the following:
   a. Select **Publish CRLs to this location**.
   b. Clear **Publish Delta CRLs to this location**.
5. Delete all other entries except for **C:\Windows\system32\**.
6. Click **Add**.
7. In the Location field, add **`http://`*`serverIP`*`/CertEnroll/<CAName><CRLNameSuffix><DeltaCRLAllowed>.crl`**, where ***`serverIP`*** is the IP address of the server.

   Note: If your server is reachable by using the FQDN, then use the **<ServerDNSName>** instead of the server IP address.
8. Click **OK**.
9. Select **Include in the CDP extension of issued certificates** for the created entry.
10. In the Select extension menu, select **Authority Information Access (AIA)**.
11. Delete all other entries except for **C:\Windows\system32\**.
12. Click **Add**.
13. In the Location field, add **`http://`*`serverIP`*`/CertEnroll/<ServerDNSName>_<CAName><CertificateName>.crt`**, where ***`serverIP`*** is the IP address of the server.

    Note: If your server is reachable by using the FQDN, then use the **<ServerDNSName>** instead of the server IP address.
14. Click **OK**.
15. Select **Include in the AIA extension of issued certificates** for the created entry.
16. Click **Apply** > **OK**.

    Note: If necessary, restart the certification service.
17. From the left panel, expand the CA, right-click **Revoked Certificates**, and then click **Properties**.
18. Specify the value for CRL publication interval and for Publish Delta CRLs Publication interval, and then click **Apply** > **OK**.
19. From the left panel, right-click **Revoked Certificates**, click **All Tasks**, and then publish the New CRL.

Configuring CRL accessibility

Note: Before you begin, make sure that Internet Information Services (IIS) Manager is installed.

1. From IIS Manager, expand the CA, and then expand **Sites**.
2. Right-click **Default Web Site**, and then click **Add Virtual Directory**.
3. In the Alias field, type **`CertEnroll`**.
4. In the Physical path field, type **`C:\Windows\System32\CertSrv\CertEnroll`**.
5. Click **OK**.
6. Right-click **CertEnroll**, and then click **Edit Permissions**.
7. From the Security tab, remove any write access except for the system.
8. Click **OK**.

Configuring the NDES server

1. From the server, log in as an **SCEPAdmin** domain user.
2. From Server Manager, click **Manage** > **Add Roles and Feature**.
3. Click **Server Roles**, select **Active Directory Certificate Services** and all its features, and then click **Next**.
4. From the AD CS Role Services section, clear **Certification Authority**.
5. Select **Network Device Enrollment Service** and all its features, and then click **Next**.
6. From the Web Server Role (IIS) Role Services section, retain the default settings.
7. After installation, click **Configure Active Directory Certificate Services on the destination server**.
8. From the Role Services section, select **Network Device Enrollment Service**, and then click **Next**.
9. Select the **SCEPSvc** service account.
10. From the CA for NDES section, select either **CA name** or **Computer name**, and then click **Next**.
11. From the RA Information section, specify the information, and then click **Next**.
12. From the Cryptography for NDES section, do the following:
    - Select the appropriate signature and encryption key providers.
    - From the Key length menu, select the same key length as the CA server.
13. Click **Next**.
14. Complete the installation.

You can now access the NDES server from a web browser as an SCEPSvc user. From the NDES server, you can view the CA certificate thumbprint, the enrollment challenge password, and the validity period of the challenge password.

Accessing the NDES server

Open a web browser, and then type **`http://`*`NDESserverIP`*`/certsrv/mscep_admin`**, where ***`NDESserverIP`*** is the IP address of the NDES server.

Configuring NDES for MVE

Note: Before you begin, make sure that the NDES server is working properly.

Creating a certificate template

1. From the subordinate CA (certserv), open **Certification Authority**.
2. From the left panel, expand the CA, right-click **Certificate Templates**, and then click **Manage**.
3. In Certificate Templates Console, create a copy of **Web Server**.
4. From the General tab, type **`MVEWebServer`** as the template name.
5. From the Security tab, give the **SCEPAdmin** and **SCEPSvc** users the appropriate permissions.

   Note: For more information, see "Required users" on page 80.
6. From the Subject Name tab, select **Supply in the request**.
7. From the subordinate CA (certserv), open **Certification Authority**.
8. From the Extensions tab, select **Application Policies** > **Edit**.
9. Click **Add** >**Client Authentication** > **OK**.
10. From the left panel, expand the CA, right-click **Certificate Templates**, and then click **New** > **Certificate Template to Issue**.
11. Select the newly created certificates, and then click **OK**.

You can now access the templates using the CA web enrollment portal.

Accessing the templates

1. Open a web browser, and then type **`http://`*`CAserverIP`*`/certsrv/certrqxt.asp`**, where ***`CAserverIP`*** is the IP address of the CA server.
2. In the Certificate template menu, view the templates.

Setting certificate templates for NDES

1. From your computer, launch the registry editor.
2. Navigate to **HKEY_LOCAL_MACHINE** >**SOFTWARE** >**Microsoft** > **Cryptography** > **MSCEP**.
3. Configure the following, and then set them to **MVEWebServer**:
   - EncryptionTemplate
   - GeneralPurposeTemplate
   - SignatureTemplate
4. Give the SCEPSvc user full permission to MSCEP.
5. From IIS Manager, expand the CA, and then click **Application Pools**.
6. From the right panel, click **Recycle** to restart the SCEP application pool.
7. From IIS Manager, expand the CA, and then expand **Sites** > **Default Web Site**.
8. From the right panel, click **Restart**.

Disabling Challenge Password in Microsoft CA server

1. From your computer, launch the registry editor.
2. Navigate to **HKEY_LOCAL_MACHINE** > **SOFTWARE** > **Microsoft** > **Cryptography** > **MSCEP**.
3. Set EnforcePassword to **0**.
4. From IIS Manager, expand the CA, click **Application Pools**, and then select **SCEP**.
5. From the right panel, click **Advanced Settings**.
6. Set Load User Profile to **True**, and then click **OK**.
7. From the right panel, click **Recycle** to restart the SCEP application pool.
8. From IIS Manager, expand the CA, and then expand **Sites** > **Default Web Site**.
9. From the right panel, click **Restart**.

When opening the NDES from web browser, you can now only view the CA thumbprint.

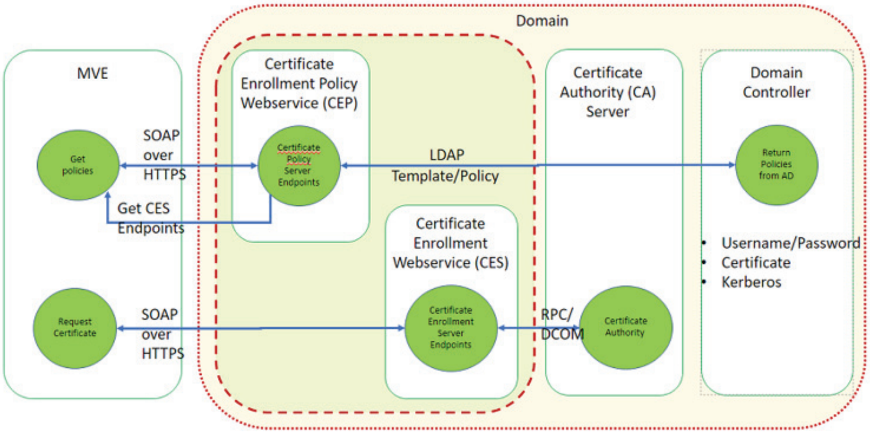
Managing certificates using Microsoft Certificate Authority through MSCEWS

This section provides information on configuring Certificate Enrollment Policy Web Service (CEP) and Certificate Enrollment Web Service (CES). As Microsoft recommends installing CEP and CES in two different machines, we are following the same in this document. We refer to these web services as CEP server and CES server, respectively.

Note: The user must have a preconfigured Enterprise Certificate Authority (CA) and a domain controller.

System requirements

The Windows Server 2012 R2 and onwards operating system is used for all setups in this section. The following installation requirements and capabilities apply to both CEP and CES, unless otherwise specified.



Create the following types of accounts in the domain controller:

- Service Administrator: Named as **CEPAdmin** and **CESAdmin**
  - This user must be a part of the **local admin group** in the respective CEP and CES servers.
  - This user must be a member of the **Enterprise Admin** group.
- Service Account: Named as **CEPSvc** and **CESSvc**
  - This user must be a part of the **local IIS_IUSRS** group.
  - Requires **Request Certificates** permission on the CA for the respective **CEPSvc** and **CESSvc**.

Network connectivity requirements

- Network connectivity requirements are a key part of deployment planning, particularly for scenarios where the CEP and CES are hosted in a perimeter network.
- All client connectivity to both services occurs within an HTTPS session, so only HTTPS traffic is allowed between the client and the web services.
- CEP communicates with Active Directory Domain Services (AD DS), using standard Lightweight Directory Access Protocol (LDAP) and secure LDAP (LDAPS) ports (TCP 389 and 636 respectively).
- CES communicates with CA using Distributed Component Object Model (DCOM).

  Notes:

  - By default, DCOM uses random ephemeral ports.
  - CA can be configured to reserve a specific range of ports to simplify firewall configuration.

Creating SSL certificates for CEP and CES servers

CES and CEP must use Secure Sockets Layer (SSL) for communication with clients (by using HTTPS). Each service must have a valid certificate that has an Enhanced Key Usage (EKU) policy of server authentication in the local computer certificate store.

1. Install the IIS service in the server.
2. Log in to the CEP server, and then add the Root CA certificate in the Trusted Root Certification Authority store.
3. Launch the IIS Manager Console and then, select **Server Home**.
4. From the main view section, open **Server Certificates**.
5. Click **Actions** > **Create Certificate Request**.
6. In the Distinguished Name Properties window, provide the necessary information and then, click **Next**.
7. In the Cryptographic Service Provider Properties dialog, select the bit length, and then click **Next**.
8. Save the file.
9. Get the file signed by the CA that you are planning to use for CEP and CES.

   Note: Make sure that Server Authentication EKU is enabled in the signed certificate.
10. Copy the signed file back to the CEP server.
11. From the IIS Manager Console, select **Server Home**.
12. From the Main View section, open **Server Certificates**.

13 Click **Actions** > **Complete Certificate Request**.

14 In Specify Certificate Authority Response window, select the signed file.

15 Type a name, and then in the Certificate Store menu, select **Personal**.

16 Complete the certificate installation.

17 From IIS Manager Console, select the default website.

18 Click **Actions** > **Bindings**.

19 In the Site Bindings dialog, click **Add**.

20 In the Add Site Binding dialog, set Type to **https**, and then from the SSL certificate, browse for the newly created certificate.

21 From the IIS Manager Console, select **Default Web Site**, and then open the SSL settings.

22 Enable Require SSL and set Client certificates to **Ignore**.

23 Restart IIS.

Note: Follow the same process for CES server.

Creating certificate templates

The user must create a certificate template for the certificate enrollment. Do the following to copy from an existing certificate template:

1 Log in to the Enterprise CA with CA administrator credentials.

2 Expand the CA, right-click **Certificate Templates**, and then click **Manage**.

3 In the Certificate Templates Console, right-click **Web Server Certificate Template**, and then click **Duplicate Template**.

4 From the General tab of the template, name the template **MVEWebServer**.

5 In the Security tab, give the CA administrator **Read**, **Write**, and **Enroll** permissions.

6 Give **Read** and **Enroll** permissions to the authenticated users.

7 In the Subject Name tab, select **Supply** in the request.

8 In the General tab, set the certificate validity period.

9 If you plan to use this certificate template for issuing a **802.1X Certificate** for printers, then do the following:

   a From the **Extensions** tab, select **Application Policies** from the list of extensions included in this template.

   b Click **Edit** > **Add**.

   c In Add Application Policy dialog box, select **Client Authentication**.

   d Click **OK**.

10 In the Certificate Template Properties dialog box, click **OK**.

11 In the CA window, right-click **Certificate Templates**, and then click **New** > **Certificate template**.

12 Select **MVEWebServer**, and then click **OK**.

Understanding authentication methods

CEP and the CES support the following authentication methods:

- Windows-integrated authentication, also known as **Kerberos Authentication**
- Client certificate authentication, also known as **X.509 Certificate Authentication**
- **Username and Password Authentication**

Windows-integrated authentication

Windows-integrated authentication uses Kerberos to provide an uninterrupted authentication flow for devices connected to the internal network. This method is preferred for internal deployments because it uses the existing Kerberos infrastructure within AD DS. It also requires minimal changes to certificate client computers.

Note: Use this authentication method if you need clients to access *only* the web service while connected directly to your internal network.

Client certificate authentication

This method is preferred over user name and password authentication because it is more secure. It does not require a direct connection to the corporate network.

Notes:

- Use this authentication method if you plan to provide clients with digital X.509 certificates for authentication.
- This method enables the web services available on the Internet.

User name and password authentication

The user name and password method is the simplest form of authentication. This method is typically used for servicing clients who are not directly connected to the internal network. It is a less secure authentication option than client certificate authentication, but it does not require provisioning a certificate.

Note: Use this authentication method when you can access the web service on the internal network or over the Internet.

Delegation requirements

Delegation enables a service to impersonate a user or computer account to access resources throughout the network.

Delegation is required for the CES server when all the following scenarios apply:

- CA and CES are not residing on the same computer.
- CES can process initial enrollment requests, as opposed to only processing certificate renewal requests.
- The authentication type is set to **Windows-integrated authentication** or **Client certificate authentication**.

Delegation is not required for the CES server in the following scenarios:

- CA and CES are residing on the same computer.
- User name and password is the authentication method.

Notes:

- Microsoft recommends running CEP and CES as domain user accounts.
- Users must create an appropriate service principal name (SPN) before configuring delegation on the domain user account.

Enabling delegation

1. To create an SPN for a domain user account, use the `setspn` command as follows:

   ```
   setspn -s http/ces.msca.com msca\CESSvc
   ```

   Notes:

   - The account name is CESSvc.
   - CES is running on a computer with a fully qualified domain name (FQDN) of **ces.msca.com** in the msca.com domain.

2. Open the CESSvc domain user account in the domain controller.
3. From the Delegation tab, select **Trust this user for delegation to specified services only**.
4. Select the appropriate delegation based on the authentication method.

   Notes:

   - If you select Windows-integrated authentication, then configure delegation to use **Kerberos only**.
   - If the service is using client certificate authentication, then configure delegation to use any authentication protocol.
   - If you plan to configure multiple authentication methods, then configure delegation to use any authentication protocol.

5. Click **Add**.
6. In the Add Services dialog, select **Users** or **Computers**.
7. Type your CA server host name, and then click **Check Names**.
8. From the Add Services dialog, select either of the following services to delegate:
   - Host service (HOST) for that CA server
   - Remote Procedure Call System Service (RPCSS) for that CA server
9. Close the domain user properties dialog.

For CEP domain users using Windows-integrated authentication, do the following:

1. To create an SPN for a domain user account, use the `setspn` command as follows:

   ```
   setspn -s http/cep.msca.com msca\CEPSvc
   ```

   Note: The account name is CEPSvc.

2. Open the CEPSvc domain user account in the domain controller.
3. From the Delegation tab, select **Do not trust this user for delegation**.

Configuring windows-integrated authentication

To install CEP and CES, use Windows PowerShell.

Configuring CEP

The **Install-AdcsEnrollmentPolicyWebService** cmdlet configures the Certificate Enrollment Policy Web Service (CEP). It is also used to create other instances of the service within an existing installation.

1. Log in to the CEP server using CEPAdmin user name, and then launch PowerShell in administrative mode.
2. Run the command `Import-Module ServerManager`.
3. Run the command `Add-WindowsFeature Adcs-Enroll-Web-Pol`.
4. Run the command `Install-AdcsEnrollmentPolicyWebService -AuthenticationType Kerberos -SSLCertThumbprint "sslCertThumbPrint"`.

   Note: Replace <*sslCertThumbPrint*> with the thumbprint of the SSL certificate created for the CEP server, after deleting the spaces between the thumbprint values.
5. Complete the installation either by selecting either **Y** or **A**.
6. Launch the IIS Manager Console.
7. In the Connections pane, expand the web server that is hosting CEP.
8. Expand **Sites**, expand **Default Web Site**, and then click the appropriate installation virtual application name, **ADPolicyProvider_CEP_Kerberos**.
9. In the virtual application called **Home** , double-click the application settings, and then double-click **FriendlyName**.
10. Type a name under Value, and then close the dialog.
11. Double-click **URI**, and then copy **Value**.

    Notes:

    - If you want to configure another authentication method on the same CEP server, then you must change the ID.
    - This URL is used in MVE or any client application.
12. From the left pane, click **Application Pools**.
13. Select **WSEnrollmentPolicyServer**, and then from the right pane, click **Actions** > **Advanced Settings** .
14. Select the identity field under Process Model.
15. In the Application Pool Identity dialog box, select the custom account, and then type `CEPSvc` as the domain user name.
16. Close all dialog boxes, and then recycle IIS from the right pane of the IIS Manager Console.
17. From PowerShell, type `iisreset` to restart IIS.

Configuring CES

The **Install-AdcsEnrollmentWebService** cmdlet configures the Certificate Enrollment Web Service (CES). It is also used to create other instances of the service within an existing installation.

1. Log in to the CES server using `CESAdmin` as user name, and then launch PowerShell in administrative mode.
2. Run the command `Import-Module ServerManager`.
3. Run the command `Add-WindowsFeature Adcs-Enroll-Web-Svc`.

4. Run the command `Install-AdcsEnrollmentWebService -ApplicationPoolIdentity -CAConfig "CA1.contoso.com\contoso-CA1-CA" -SSLCertThumbprint "sslCertThumbPrint" -AuthenticationType Kerberos`.

   Notes:

   - Replace <*sslCertThumbPrint*> with the thumbprint of the SSL certificate created for the CES server, after deleting the spaces between the thumbprint values.
   - Replace `CA1.contoso.com` with your CA computer name.
   - Replace `contoso-CA1-CA` with your CA common name.

5. Complete the installation by selecting either **Y** or **A**.
6. Launch the IIS Manager Console.
7. In the Connections pane, expand the web server that is hosting CES.
8. Expand **Sites**, expand **Default Web Site**, and then click the appropriate installation virtual application name: **contoso-CA1-CA _CES_Kerberos**.
9. From the left pane, click **Application Pools**.
10. Select **WSEnrollmentServer**, and then from the right pane, click **Actions** > **Advanced Settings** .
11. Select the identity field under Process Model.
12. In the `Application Pool Identity` dialog, select the custom account, and then type `CESSvc` as the domain user name.
13. Close all dialogs, and then recycle IIS from the right pane of IIS Manager Console.
14. From PowerShell, type `iisreset` to restart IIS.
15. For CESSvc domain users, enable delegation. For more information, see "Enabling delegation" on page 89.

Configuring client certificate authentication

Configuring CEP

The **Install-AdcsEnrollmentPolicyWebService** cmdlet configures CEP. It is also used to create other instances of the service within an existing installation.

1. Log in to the CEP server using CEPAdmin user name, and then launch PowerShell in administrative mode.
2. Run the command `Import-Module ServerManager`.
3. Run the command `Add-WindowsFeature Adcs-Enroll-Web-Pol`.
4. Run the command `Install-AdcsEnrollmentPolicyWebService -AuthenticationType Certificate -SSLCertThumbprint “sslCertThumbPrint”`.

   Note: Replace <*sslCertThumbPrint*> with the thumbprint of the SSL certificate created for the CEP server, after deleting the spaces between the thumbprint values.

5. Complete the installation by selecting either **Y** or **A**.
6. Launch the IIS Manager Console.

7. In the Connections pane, expand the web server that is hosting CEP.
8. Expand **Sites**, expand **Default Web Site**, and then click the appropriate installation virtual application name **ADPolicyProvider_CEP_Certificate**.
9. In the virtual application called **Home** , double-click the application settings, and then double-click **FriendlyName**.
10. Type a name under Value and close the dialog.
11. Double-click **URI**, and then copy **Value**.

    Notes:

    - If you want to configure another authentication method on the same CEP server, then you must change the ID.
    - This URL is used in MVE or any client application.
12. From the left pane, click **Application Pools**.
13. Select **WSEnrollmentPolicyServer**, and then from the right pane, click **Actions** > **Advanced Settings**.
14. Select the identity field under Process Model.
15. In the Application Pool Identity dialog box, select the custom account, and then type `CEPSvc` as the domain user name.
16. Close all dialog boxes, and then recycle IIS from the right pane of the IIS Manager Console.
17. From PowerShell, type `iisreset` to restart IIS.

Configuring CES

The **Install-AdcsEnrollmentWebService** cmdlet configures the Certificate Enrollment Web Service (CES). It is also used to create other instances of the service within an existing installation.

1. Log in to the CES server using `CESAdmin` as user name, and then launch PowerShell in administrative mode.
2. Run the command `Import-Module ServerManager`.
3. Run the command `Add-WindowsFeature Adcs-Enroll-Web-Svc`.
4. Run the command `Install-AdcsEnrollmentWebService -ApplicationPoolIdentity -CAConfig “CA1.contoso.com\contoso-CA1-CA” -SSLCertThumbprint “sslCertThumbPrint” -AuthenticationType Certificate`.

    Notes:

    - Replace <*sslCertThumbPrint*> with the thumbprint of the SSL certificate created for the CES server, after deleting the spaces between the thumbprint values.
    - Replace `CA1.contoso.com` with your CA computer name.
    - Replace `contoso-CA1-CA` with your CA common name.
    - If you have already configured one authentication method in the host, then remove `ApplicationPoolIdentity` from the command.
5. Complete the installation either by selecting **Y** or **A**.
6. Launch the IIS Manager Console.
7. In the Connections pane, expand the web server that is hosting CEP.

8. Expand **Sites**, expand **Default Web Site**, and then click the appropriate installation virtual application name: **contoso-CA1-CA _CES_Certificate**.
9. From the left pane, click the **Application Pools**.
10. Select **WSEnrollmentServer**, and then from the right pane, click **Actions** > **Advanced Settings**.
11. Select the identity field under Process Model.
12. In the Application Pool Identity dialog, select the custom account, and then type **CESSvc** as the domain user name.
13. Close all dialogs, and then recycle IIS from the right pane of the IIS Manager Console.
14. From PowerShell, type `iisreset` to restart IIS.
15. For CESSvc domain user, enable delegation. For more information, see “Enabling delegation” on page 89.

Creating a client certificate

1. From any domain user account, open **certlm.msc**.
2. Click **Certificates** > **Personal** > **Certificates** > **All Tasks** > **Request New Certificate**.
3. Click **Next**.
4. Click **Active Directory Enrollment** > **Client access**.

   Note: Do the following if you do not want to use **Active Directory Enrollment** options:

   a. Click **Configured by You** > **Add New**.
   b. Enter the Enrollment Policy Server URI as CEP server address for either Username_Password or Kerberos Authentication.
   c. Select Authentication type as **Windows Integrated**.
   d. Click **Validate Server**.
   e. After successful validation, click **Add**.
   f. Click **Next**.
   g. Select any template.
5. Click **Details** > **Properties**.
6. Click **Enroll**.
7. In the Subject tab, provide a fully qualified domain name (FQDN).
8. In the Private Key tab, select **Make private key exportable**.
9. Click **Apply** > **Enroll**.

After enrolling the client certificate, do the following to export the client certificate in PFX format.

1. Click **Certificate** > **All Tasks** > **Export**.
2. Click **Next** > **Yes, export the private key**.
3. Click **Next**.
4. Type the password provided by the client.

5. Click **Next**.
6. Specify the file name in the Certificate Export dialog box.
7. Click **Next** > **Finish**.

Configuring username-password authentication

Configuring CEP

The **Install-AdcsEnrollmentPolicyWebService** cmdlet configures the Certificate Enrollment Policy Web Service (CEP). It is also used to create other instances of the service within an existing installation.

1. Log in to the CEP server using CEPAdmin user name, and then launch PowerShell in administrative mode.
2. Run the command `Import-Module ServerManager`.
3. Run the command `Add-WindowsFeature Adcs-Enroll-Web-Pol`.
4. Run the command `Install-AdcsEnrollmentPolicyWebService -AuthenticationType UserName -SSLCertThumbprint “sslCertThumbPrint”`.

   Note: Replace <*sslCertThumbPrint*> with the thumbprint of the SSL certificate created for the CEP server, after deleting the spaces between the thumbprint values.
5. Complete the installation by selecting either **Y** or **A**.
6. Launch the IIS Manager Console.
7. In the Connections pane, expand the web server that is hosting CEP.
8. Expand **Sites**, expand **Default Web Site**, and then click the appropriate installation virtual application name: **ADPolicyProvider_CEP_UsernamePassword**.
9. In the virtual application called **Home** , double-click the application settings, and then double click **FriendlyName**.
10. Type a name under **Value** and close the dialog.
11. Double-click **URI**, and then copy **Value**.

    Notes:

    - If you want to configure another authentication method on the same CEP server, then you must change the ID.
    - This URL is used in MVE or any client application.
12. From the left pane, click **Application Pools**.
13. Select **WSEnrollmentPolicyServer**, and then from the right pane, click **Actions** > **Advanced Settings**.
14. Select the identity field under Process Model.
15. In the Application Pool Identity dialog box, select the custom account, and then type `CEPSvc`.
16. Close all dialog boxes, and then recycle IIS from the right pane of the IIS Manager Console.
17. From PowerShell, type `iisreset` to restart IIS.

Configuring CES

The **Install-AdcsEnrollmentWebService** cmdlet configures the Certificate Enrollment Web Service (CES). It is also used to create other instances of the service within an existing installation.

1. Log in to the CES server using **`CESAdmin`** as user name, and then launch PowerShell in administrative mode.
2. Run the command **`Import-Module ServerManager`**.
3. Run the command **`Add-WindowsFeature Adcs-Enroll-Web-Svc`**.
4. Run the command **`Install-AdcsEnrollmentWebService -ApplicationPoolIdentity -CAConfig "CA1.contoso.com\contoso-CA1-CA" -SSLCertThumbprint "sslCertThumbPrint" -AuthenticationType UserName`**.

   Notes:

   - Replace <*sslCertThumbprint*> with the thumbprint of the SSL certificate created for the CES server, after deleting the spaces between the thumbprint values.
   - Replace **`CA1.contoso.com`** with your CA computer name.
   - Replace **`contoso-CA1-CA`** with your CA common name.
   - If you have already configured one authentication method in the host, then remove **`ApplicationPoolIdentity`** from the command.
5. Complete the installation by selecting either **Y** or **A**.
6. Launch the IIS Manager Console.
7. In the Connections pane, expand the web server that is hosting CES.
8. Expand **Sites**, expand **Default Web Site**, and then click the appropriate installation virtual application name: **contoso-CA1-CA_CES_UsernamePassword**.
9. From the left pane, click **Application Pools**.
10. Select **WSEnrollmentServer**, and then from the right pane, click **Actions** > **Advanced Settings** under Actions.
11. Select the identity field under Process Model.
12. In the Application Pool Identity dialog, select the custom account, and then type **`CESSvc`** as the domain user name.
13. Close all dialogs, and then recycle IIS from the right pane of IIS Manager Console.
14. From PowerShell, type **`iisreset`** to restart IIS.

Managing certificates using OpenXPKI Certificate Authority through SCEP

This section provides instructions on how to configure OpenXPKI CA version 2.5.x using Simple Certificate Enrollment Protocol (SCEP).

Notes:

- Make sure that you are using the Debian 8 Jessie operating system.
- For more information on OpenXPKI, go to **www.openxpki.org**.

Configuring OpenXPKI CA

Installing OpenXPKI CA

1. Connect the machine using PuTTY or another client.
2. From the client, run the **`sudo su -`** command to go to the root user.
3. Enter the root password.
4. In **nano /etc/apt/sources.list**, change the source for installing the updates.
5. Update the file. For example:

```
#

# deb cdrom:[Debian GNU/Linux 8.11.1 _Jessie_ - Official amd64 CD Binary-1
20190211-02:10]/ jessie local main
# deb cdrom:[Debian GNU/Linux 8.11.1 _Jessie_ - Official amd64 CD Binary-1
20190211-02:10]/ jessie local main

deb http://security.debian.org/ jessie/updates main
deb-src http://security.debian.org/ jessie/updates main

# jessie-updates, previously known as 'volatile'
# A network mirror was not selected during install.  The following entries
# are provided as examples, but you should amend them as appropriate
# for your mirror of choice.
#
deb http://ftp.debian.org/debian/jessie-updates main
deb-src http://ftp.debian.org/debian/jessie-updates main
deb http://ftp.us.debian.org/debian/jessie main
```

6. Save the file.
7. Run the following commands:
   - **`apt-get update`**
   - **`apt-get upgrade`**
8. Update the CA certificate lists in the server using **`apt-get install ca-certificates`**.
9. Install **en_US.utf8 locale** using **`dpkg-reconfigure locales`**.
10. Select the **en_US.UTF-8 UTF-8** locale, and then make it the default locale for the system.

    Note: Use the Tab and spacebar keys for selecting and navigating the menu.

11 Check the locales that you have generated using **`locale -a`**.

Sample output

```
C
C.UTF-8
en_IN
en_IN.utf8
en_US.utf8
POSIX
```

12 Copy the fingerprint of the OpenXPKI package using **`nano /home/Release.key`**. For this instance, copy the key in **/home**.

13 Type **`9B156AD0 F0E6A6C7 86FABE7A D8363C4E 1611A2BE 2B251336 01D1CDB4 6C24BEF3`** as the value.

14 Run the following command:

```
gpg --print-md sha256 /home/Release.key
```

15 Add the package using the **`wget https://packages.openxpki.org/v2/debian/Release.key -O - | apt-key add -`** command.

16 Add the repository to your source list (jessie) using **`echo "deb http://packages.openxpki.org/v2/debian/jessie release" > /etc/apt/sources.list.d/openxpki.list`**, and then **`aptitude update`**.

17 Install MySQL and Perl MySQL binding using **`aptitude install mysql-server libdbd-mysql-perl`**.

18 Install apache2.2-common using **`aptitude install apache2.2-common`**.

19 In **nano /etc/apt/sources.list**, install the fastcgi module to speed up the user interface.

Note: We recommend using **`mod_fcgid`**.

20 Add the **`deb http://http.us.debian.org/debian/jessie main`** line in the file, and then save it.

21 Run the following commands:

```
apt-get update
aptitude install libapache2-mod-fcgid
```

22 Enable the fastcgi module using **`a2enmod fcgid`**.

23 Install the OpenXPKI core package using **`aptitude install libopenxpki-perl openxpki-cgi-session-driver openxpki-i18n`**.

24 Restart the Apache® server using **`service apache2 restart`**.

25 Check whether the installation is successful using **`openxpkiadm version`**.

Note: If the installation is successful, then the system shows the version of the installed OpenXPKI. For example, **Version (core): 2.5.5**.

26 Create the empty database, and then assign the database user using **`mysql -u root -p`**.

Notes:

- This command must be typed in the client. Otherwise, you cannot enter the password.
- Type the password for the MySQL. For this instance, **root** is the MySQL user.
- **`openxpki`** is the user on which OpenXPKI is installed.

```
CREATE DATABASE openxpki CHARSET utf8;
CREATE USER 'openxpki'@'localhost' IDENTIFIED BY 'openxpki';
GRANT ALL ON openxpki.* TO 'openxpki'@'localhost';
flush privileges;
```

If the MySQL service is not running, then run **`/etc/init.d/mysql start`** to start the service.

27. Type **`quit`** to exit from MySQL.
28. Store the used credentials in **/etc/openxpki/config.d/system/database.yaml**.

Sample file content

```
debug: 0
type: MySQL
name: openxpki
host: localhost
port: 3306
user: openxpki
passwd: openxpki
```

Note: Change **`user`** and **`passwd`** to match the MySQL user name and password.

29. Save the file.
30. For empty database schema, run **`zcat /usr/share/doc/libopenxpki-perl/examples/schema-mysql.sql.gz | \mysql -u root --password --database openxpki`** from the provided schema file.
31. Enter the password for the database.

Configuring OpenXPKI CA using default script

Note: The default script configures only the default realm, **ca-one**. The CDP and CRLs are not configured.

1. Unzip the sample script for installing the certificate using **`gunzip -k /usr/share/doc/libopenxpki-perl/examples/sampleconfig.sh.gz`**.
2. Run the script using **`bash /usr/share/doc/libopenxpki-perl/examples/sampleconfig.sh`**.
3. Confirm the setup using **`openxpkiadm alias --realm ca-one`**.

Sample output

```
=== functional token ===
scep (scep):
Alias    : scep-1
Identifier: YsBNZ7JYTbx89F_-Z4jn_RPFFWo
NotBefore : 2015-01-30 20:44:40
NotAfter  : 2016-01-30 20:44:40

vault (datasafe):
Alias    : vault-1
Identifier: lZILS1l6Km5aIGS6pA7P7azAJic
NotBefore : 2015-01-30 20:44:40
NotAfter  : 2016-01-30 20:44:40

ca-signer (certsign):
Alias    : ca-signer-1
Identifier: Sw_IY7AdoGUp28F_cFEdhbtI9pE
NotBefore : 2015-01-30 20:44:40
NotAfter  : 2018-01-29 20:44:40

=== root ca ===
current root ca:
Alias      : root-1
Identifier: fVrqJAlpotPaisOAsnxa9cglXCc
NotBefore : 2015-01-30 20:44:39
NotAfter  : 2020-01-30 20:44:39

upcoming root ca:
  not set
```

4 Check whether the installation is successful using **`openxpkictl start`**.

Sample output

```
Starting OpenXPKI...
OpenXPKI Server is running and accepting requests.
DONE.
```

5 Do the following to access the OpenXPKI server:

  a From a web browser, type **`http://ipaddress/openxpki/`**.

  b Log in as **Operator**. The default password is **`openxpki`**.

  Note: The Operator login has two preconfigured operator accounts, **raop** and **raop2**.

6 Create one certificate request, and then test it.

Configuring OpenXPKI CA manually

Overview

Note: Before you begin, make sure that you have a basic knowledge on creating OpenSSL certificates.

To configure OpenXPKI CA manually, create the following:

1 Root CA certificate. For more information, see “Creating a root CA certificate” on page 101.

2 CA signer certificate, signed by the root CA. For more information, see “Creating a signer certificate” on page 101.

3 Data vault certificate, self‑signed. For more information, see “Creating a vault certificate” on page 102.

4 SCEP certificate, signed by the signer certificate.

Notes:

- When selecting the signature hash, use either SHA256 or SHA512.
- Changing the public key size is optional.

For this instance, we are using the **/etc/certs/openxpki_ca-one/** directory for certificate generation. However, you can use any directory.

Creating an OpenSSL configuration file

1 Run the following command:

```
nano /etc/certs/openxpki_ca-one/openssl.conf
```

Note: If your server is reachable using the fully qualified domain name (FQDN), then use the DNS of the server instead of its IP address.

Sample file

```
# x509_extensions               = v3_ca_extensions
# x509_extensions               = v3_issuing_extensions
# x509_extensions               = v3_datavault_extensions
# x509_extensions               = v3_scep_extensions
# x509_extensions               = v3_web_extensions
# x509_extensions               = v3_ca_reqexts # not for root self-signed, only for issuing
## x509_extensions              = v3_datavault_reqexts # not required self-signed
# x509_extensions               = v3_scep_reqexts
# x509_extensions               = v3_web_reqexts

[ req ]
default_bits            = 4096
distinguished_name      = req_distinguished_name

[ req_distinguished_name ]
domainComponent         = Domain Component
commonName              = Common Name

[ v3_ca_reqexts ]
subjectKeyIdentifier    = hash
keyUsage                = digitalSignature, keyCertSign, cRLSign

[ v3_datavault_reqexts ]
subjectKeyIdentifier    = hash
keyUsage                = keyEncipherment
extendedKeyUsage        = emailProtection

[ v3_scep_reqexts ]
subjectKeyIdentifier    = hash

[ v3_web_reqexts ]
subjectKeyIdentifier    = hash
keyUsage                = critical, digitalSignature, keyEncipherment
extendedKeyUsage        = serverAuth, clientAuth

[ v3_ca_extensions ]
subjectKeyIdentifier    = hash
keyUsage                = digitalSignature, keyCertSign, cRLSign
basicConstraints        = critical,CA:TRUE
authorityKeyIdentifier  = keyid:always,issuer

[ v3_issuing_extensions ]
subjectKeyIdentifier    = hash
keyUsage                = digitalSignature, keyCertSign, cRLSign
basicConstraints        = critical,CA:TRUE
authorityKeyIdentifier  = keyid:always,issuer:always
crlDistributionPoints   = URI:http://FQDN of the server/CertEnroll/MYOPENXPKI.crl
authorityInfoAccess     = caIssuers;URI:http://FQDN of the server/CertEnroll/MYOPENXPKI.crt

[ v3_datavault_extensions ]
subjectKeyIdentifier    = hash
keyUsage                = keyEncipherment
extendedKeyUsage        = emailProtection
basicConstraints        = CA:FALSE
authorityKeyIdentifier  = keyid:always,issuer

[ v3_scep_extensions ]
subjectKeyIdentifier    = hash
basicConstraints        = CA:FALSE
authorityKeyIdentifier  = keyid,issuer

[ v3_web_extensions ]
subjectKeyIdentifier    = hash
keyUsage                = critical, digitalSignature, keyEncipherment
extendedKeyUsage        = serverAuth, clientAuth
basicConstraints        = critical,CA:FALSE
subjectAltName          = DNS:stlopenxpki.lexmark.com
crlDistributionPoints   = URI:http://FQDN of the server/CertEnroll/MYOPENXPKI_ISSUINGCA.crl
authorityInfoAccess     = caIssuers;URI:http://FQDN of the
server/CertEnroll/MYOPENXPKI_ISSUINGCA.crt
```

2. Change the IP address and CA certificate name with your setup information.
3. Save the file.

Creating a password file for certificate keys

1. Run the following command:

   ```
   nano /etc/certs/openxpki_ca-one/pd.pass
   ```

2. Type your password.
3. Save the file.

Creating a root CA certificate

Note: You can create a self-signed root CA certificate or generate a certificate request, and then get it signed by the root CA.

Run the following commands:

Note: Replace the key length, signature algorithm, and certificate name with the appropriate values.

1.
   ```
   openssl genrsa -out /etc/certs/openxpki_ca-one/ca-root-1.key -passout file:/etc/certs/openxpki_ca-one/pd.pass 4096
   ```

2.
   ```
   openssl req -new -key /etc/certs/openxpki_ca-one/ca-root-1.key -subj /DC=COM/DC=LEXMARK/DC=DEV/DC=CA-ONE/CN=MYOPENXPKI_ROOTCA -out /etc/certs/openxpki_ca-one/ca-root-1.csr
   ```

3.
   ```
   openssl req -config /etc/certs/openxpki_ca-one/openssl.conf -extensions v3_ca_extensions -x509 -days 3560 -in /etc/certs/openxpki_ca-one/ca-root-1.csr -key /etc/certs/openxpki_ca-one/ca-root-1.key -out /etc/certs/openxpki_ca-one/ca-root-1.crt -sha256
   ```

Creating a signer certificate

Note: Replace the key length, signature algorithm, and certificate name with the appropriate values.

1. Run the following command:

   ```
   openssl genrsa -out /etc/certs/openxpki_ca-one/ca-signer-1.key -passout file:/etc/certs/openxpki_ca-one/pd.pass 4096
   ```

2. Change the subject in the request with your CA information using **openssl req -config /etc/certs/openxpki_ca-one/openssl.conf -reqexts v3_ca_reqexts -new -key /etc/certs/openxpki_ca-one/ca-signer-1.key -subj /DC=COM/DC=LEXMARK/DC=DEV/DC=CA-ONE/CN=MYOPENXPKI_ISSUINGCA -out /etc/certs/openxpki_ca-one/ca-signer-1.csr**.
3. Get the certificate signed by the root CA using **openssl x509 -req -extfile /etc/certs/openxpki_ca-one/openssl.conf -extensions v3_issuing_extensions -days 3650 -in /etc/certs/openxpki_ca-one/ca-signer-1.csr -CA /etc/certs/openxpki_ca-one/ca-root-1.crt -CAkey /etc/certs/openxpki_ca-one/ca-root-1.key -CAcreateserial -out /etc/certs/openxpki_ca-one/ca-signer-1.crt -sha256**.

Creating a vault certificate

Notes:

- The vault certificate is self-signed.
- Replace the key length, signature algorithm, and certificate name with the appropriate values.

1. Run the following command:

   ```
   openssl genrsa -out /etc/certs/openxpki_ca-one/vault-1.key -passout
   file:/etc/certs/openxpki_ca-one/pd.pass 4096
   ```

2. Change the subject in the request with your CA information using **`openssl req -config /etc/certs/openxpki_ca-one/openssl.conf -reqexts v3_datavault_reqexts -new -key /etc/certs/openxpki_ca-one/vault-1.key -subj /DC=COM/DC=LEXMARK/DC=DEV/DC=CA-ONE/DC=STLOPENXPKI_INTERNAL/CN=MYOPENXPKI_DATAVAULT -out /etc/certs/openxpki_ca-one/vault-1.csr`**.

3. Run the following command:

   ```
   openssl req -config /etc/certs/openxpki_ca-one/openssl.conf -extensions
   v3_datavault_extensions -x509 -days 3560 -in /etc/certs/openxpki_ca-
   one/vault-1.csr -key /etc/certs/openxpki_ca-one/vault-1.key -
   out /etc/certs/openxpki_ca-one/vault-1.crt
   ```

Creating an SCEP certificate

Note: The SCEP certificate is signed by the signer certificate.

Run the following commands:

Note: Replace the key length, signature algorithm, and certificate name with the appropriate values.

1.
   ```
   openssl genrsa -out /etc/certs/openxpki_ca-one/scep-1.key -passout
   file:/etc/certs/openxpki_ca-one/pd.pass 4096
   ```

2.
   ```
   openssl req -config /etc/certs/openxpki_ca-one/openssl.conf -reqexts
   v3_scep_reqexts -new -key /etc/certs/openxpki_ca-one/scep-1.key -
   subj /DC=COM/DC=LEXMARK/DC=DEV/DC=CA-ONE/CN=MYOPENXPKI_SCEPCA -
   out /etc/certs/openxpki_ca-one/scep-1.csr
   ```

3.
   ```
   openssl x509 -req -extfile /etc/certs/openxpki_ca-one/openssl.conf -
   extensions v3_scep_extensions -days 900 -in /etc/certs/openxpki_ca-
   one/scep-1.csr -CA /etc/certs/openxpki_ca-one/ca-signer-1.crt -
   CAkey /etc/certs/openxpki_ca-one/ca-signer-1.key -CAcreateserial -
   out /etc/certs/openxpki_ca-one/scep-1.crt -sha256
   ```

Copying the key file and creating a symlink

1. Copy the key files to **/etc/openxpki/ca/ca-one/**.

   Note: The key files must be readable by OpenXPKI.

   ```
   cp /etc/certs/openxpki_ca-one/ca-signer-1.key /etc/openxpki/ca/ca-one/
   ```

   ```
   cp /etc/certs/openxpki_ca-one/vault-1.key /etc/openxpki/ca/ca-one/
   ```

```
cp /etc/certs/openxpki_ca-one/scep-1.key /etc/openxpki/ca/ca-one/
```

2. Create the symlink.

   Note: Symlinks are aliases used by the default configuration.

   ```
   ln -s /etc/openxpki/ca/ca-one/ca-signer-1.key /etc/openxpki/ca/ca-one/ca-signer-1.pem
   ```

   ```
   ln -s /etc/openxpki/ca/ca-one/scep-1.key /etc/openxpki/ca/ca-one/scep-1.pem
   ```

   ```
   ln -s /etc/openxpki/ca/ca-one/vault-1.key /etc/openxpki/ca/ca-one/vault-1.pem
   ```

Importing certificates

Import the root certificate, signer certificate, vault certificate, and SCEP certificate into the database with the appropriate tokens.

Run the following commands:

1. **`openxpkiadm certificate import --file /etc/certs/openxpki_ca-one/ca-root-1.crt`**
2. **`openxpkiadm certificate import --file /etc/certs/openxpki_ca-one/ca-signer-1.crt --realm ca-one --token certsign`**
3. **`openxpkiadm certificate import --file /etc/certs/openxpki_ca-one/scep-1.crt --realm ca-one --token scep`**
4. **`openxpkiadm certificate import --file /etc/certs/openxpki_ca-one/vault-1.crt --realm ca-one --token datasafe`**
5. Check whether the import is successful using **`openxpkiadm alias --realm ca-one`**.

Sample output

```
=== functional token ===
scep (scep):
Alias    : scep-1
Identifier: YsBNZ7JYTbx89F_-Z4jn_RPFFWo
NotBefore : 2015-01-30 20:44:40
NotAfter  : 2016-01-30 20:44:40

vault (datasafe):
Alias    : vault-1
Identifier: lZILS1l6Km5aIGS6pA7P7azAJic
NotBefore : 2015-01-30 20:44:40
NotAfter  : 2016-01-30 20:44:40

ca-signer (certsign):
Alias    : ca-signer-1
Identifier: Sw_IY7AdoGUp28F_cFEdhbtI9pE
NotBefore : 2015-01-30 20:44:40
NotAfter  : 2018-01-29 20:44:40

=== root ca ===
current root ca:
Alias     : root-1
Identifier: fVrqJAlpotPaisOAsnxa9cglXCc
NotBefore : 2015-01-30 20:44:39
NotAfter  : 2020-01-30 20:44:39

upcoming root ca:
  not set
```

Starting OpenXPKI

1 Run the **openxpkictl start** command.

Sample output

```
Starting OpenXPKI...
OpenXPKI Server is running and accepting requests.
DONE.
```

2 Do the following to access the OpenXPKI server:

a From a web browser, type **http://ipaddress/openxpki/**.

Note: Instead of **ipaddress**, you can also use the FQDN of the server.

b Log in as **Operator**. The default password is **openxpki**.

Note: The Operator login has two preconfigured operator accounts, **raop** and **raop2**.

3 Create one certificate request, and then test it.

Generating CRL information

Note: If your server is reachable using the FQDN, then use the DNS of the server instead of its IP address.

1 Stop the OpenXPKI service using **Openxpkictl stop**.

2 In **nano /etc/openxpki/config.d/realm/ca-one/publishing.yaml**, update the **connectors: cdp** section to the following:

```
class: Connector::Builtin::File::Path
LOCATION: /var/www/openxpki/CertEnroll/
file: "[% ARGS.0 %].crl"
content: "[% pem %]"
```

a In **nano /etc/openxpki/config.d/realm/ca-one/profile/default.yaml**, update the following:

- **crl_distribution_points:** section

```
critical: 0
uri:
    - http://FQDN of the server/CertEnroll/[% ISSUER.CN.0 %].crl
    - ldap://localhost/[% ISSUER.DN %]
```

- **authority_info_access:** section

```
critical: 0
ca_issuers: http://FQDN of the server/CertEnroll/MYOPENXPKI.crt
ocsp: http://ocsp.openxpki.org/
```

Change the IP address and CA certificate name according to your CA server.

b In **nano /etc/openxpki/config.d/realm/ca-one/crl/default.yaml**, do the following:

- If necessary, update **nextupdate** and **renewal**.
- Add **ca_issuers** to the following section:

```
extensions:
            authority_info_access:
                    critical: 0
                    # ca_issuers and ocsp can be scalar or list
                    ca_issuers: http://FQDN of the server/CertEnroll/MYOPENXPKI.crt
                   #ocsp: http://ocsp.openxpki.org/
```

Change the IP address and CA certificate name according to your CA server.

3 Start the OpenXPKI service using **Openxpkictl start**.

Configuring CRL accessibility

1 Stop the Apache service using **service apache2 stop**.

2 Create a **CertEnroll** directory for crl in the **/var/www/openxpki/** directory.

3 Set **openxpki** as the owner of this directory, and then configure the permissions to let Apache read and execute, and other services to read only.

chown openxpki /var/www/openxpki/CertEnroll

chmod 755 /var/www/openxpki/CertEnroll

4 Add a reference to the Apache alias.conf file using **nano /etc/apache2/mods-enabled/alias.conf**.

5 After the **<Directory "/usr/share/apache2/icons">** section, add the following:

```
Alias /CertEnroll/ "/var/www/openxpki/CertEnroll/"
 <Directory "/var/www/openxpki/CertEnroll">
   Options FollowSymlinks
   AllowOverride None
   Require all granted
 </Directory>
```

6 Add a reference in the apache2.conf file using **nano /etc/apache2/apache2.conf**.

7 Add the following in the **Apache2 HTTPD server** section:

```
<Directory /var/www/openxpki/CertEnroll>
  Options FollowSymlinks
  AllowOverride None
  Allow from all
</Directory>
```

8 Start the Apache service using **service apache2 start**.

Enabling the SCEP service

1 Stop the OpenXPKI service using **openxpkictl stop**.

2 Install the openca-tools package using **aptitude install openca-tools**.

3 Start the OpenXPKI service using **openxpkictl start**.

Test the service using any client, such as certnanny with SSCEP.

Note: SSCEP is a command line client for SCEP. You can download SSCEP from **https://github.com/certnanny/sscep**.

Enabling the Signer on Behalf (enrollment agent) certificate

For automatic certificate requests, we are using the Signer on Behalf certificate feature of OpenXPKI.

1. Stop the OpenXPKI service using **`openxpkictl stop`**.
2. In **nano /etc/openxpki/config.d/realm/ca-one/scep/generic.yaml**, from the **`authorized_signer:`** section, add a rule for the subject name of the signer certificate.

   ```
   rule1:
                   # Full DN
                       subject: CN=Markvision_.*
   ```

   Notes:

   - In this rule, any certificate CN starting with **`Markvision_`** is the Signer on Behalf certificate.
   - The subject name is set in MVE for generating the Signer on Behalf certificate.
   - Review the space and indention in the script file.
   - If the CN is changed in MVE, then add the updated CN in OpenXPKI.
   - You can specify only one certificate as Signer on Behalf, and then specify the full CN.
3. Save the file.
4. Start the OpenXPKI service using **`openxpkictl start`**.

Enabling automatic approval of certificate requests in OpenXPKI CA

1. Stop the OpenXPKI service using **`openxpkictl stop`**.
2. In **nano /etc/openxpki/config.d/realm/ca-one/scep/generic.yaml**, update the **`eligible:`** section:

Old content

```
eligible:
            initial:
                value@: connector:scep.generic.connector.initial
               args: '[% context.cert_subject_parts.CN.0 %]'
               expect:
                   - Build
                   - New
```

New content

```
eligible:
            initial:
                value: 1
                # value@: connector:scep.generic.connector.initial
                # args: '[% context.cert_subject_parts.CN.0 %]'
                # expect:
                #    - Build
                #    - New
```

Notes:

- Review the space and indention in the script file.
- To approve certificates manually, comment **`value: 1`**, and then uncomment the other lines that are previously commented.

3 Save the file.

4 Start the OpenXPKI service using **`openxpkictl start`**.

Creating a second realm

In OpenXPKI, you can configure multiple PKI structures in the same system. The following topics show how to create another realm for MVE named **ca-two**.

Copying and setting the directory

1 Copy the **/etc/openxpki/config.d/realm/ca-one** sample directory tree to a new directory (**cp -avr /etc/openxpki/config.d/realm/ca-one /etc/openxpki/config.d/realm/ca-two**) within the realm directory.

2 In **/etc/openxpki/config.d/system/realms.yaml**, update the following section:

Old content

```
# This is the list of realms in this PKI
# You only need to enable the realms which are visible on the server

ca-one:
    label: Verbose name of this realm
    baseurl: https://pki.example.com/openxpki/

#ca-two:
#    label: Verbose name of this realm
#    baseurl: https://pki.acme.org/openxpki/
```

New content

```
# This is the list of realms in this PKI
# You only need to enable the realms which are visible on the server

ca-one:
    label: CA-ONE
    baseurl: https://pki.example.com/openxpki/

ca-two:
    label: CA-TWO
    baseurl: https://pki.example.com/openxpki/
```

3 Save the file.

Creating certificates

The following instructions show how to generate the signer certificate, vault certificate, and SCEP certificate. The root CA signs the signer certificate, and then the signer certificate signs the SCEP certificate. The vault certificate is self-signed.

1 Generate, and then sign the certificates. For more information, see “Configuring OpenXPKI CA manually” on page 99.

Note: Change the certificate common name so that the user can easily distinguish between different certificates for different realms. You may change **`DC=CA-ONE`** to **`DC=CA-TWO`**. The certificate files are created in the **/etc/certs/openxpki_ca-two/** directory.

2 Copy the key files to **/etc/openxpki/ca/ca-two/**.

Note: The key files must be readable by OpenXPKI.

```
cp /etc/certs/openxpki_ca-two/ca-signer-1.key /etc/openxpki/ca/ca-two/

cp /etc/certs/openxpki_ca-two/vault-1.key /etc/openxpki/ca/ca-two/

cp /etc/certs/openxpki_ca-two/scep-1.key /etc/openxpki/ca/ca-two/
```

3 Create the symlink. Also, create a symlink for the root CA certificate.

Note: Symlinks are aliases used by the default configuration.

```
ln -s /etc/openxpki/ca/ca-one/ca-root-1.crt /etc/openxpki/ca/ca-two/ca-root-1.crt

ln -s /etc/openxpki/ca/ca-two/ca-signer-1.key /etc/openxpki/ca/ca-two/ca-signer-1.pem

ln -s /etc/openxpki/ca/ca-two/scep-1.key /etc/openxpki/ca/ca-two/scep-1.pem

ln -s /etc/openxpki/ca/ca-two/vault-1.key /etc/openxpki/ca/ca-two/vault-1.pem
```

4 Import the signer certificate, vault certificate, and SCEP certificate into the database with the appropriate tokens for **`ca-two`**.

```
openxpkiadm certificate import --file /etc/certs/openxpki_ca-two/ca-signer-1.crt --realm
ca-two –issuer /etc/openxpki/ca/ca-two/ca-one-1.crt --token certsign

openxpkiadm certificate import --file /etc/certs/openxpki_ca-two/scep-1.crt --realm ca-
two --token scep

openxpkiadm certificate import --file /etc/certs/openxpki_ca-two/vault-1.crt --realm ca-
two --token datasafe
```

5 Check whether the import is successful using **`openxpkiadm alias --realm ca-two`**.

Sample output

```
=== functional token ===
scep (scep):
Alias    : scep-1
Identifier: YsBNZ7JYTbx89F_-Z4jn_RPFFWo
NotBefore : 2015-01-30 20:44:40
NotAfter  : 2016-01-30 20:44:40

vault (datasafe):
Alias    : vault-1
Identifier: lZILS1l6Km5aIGS6pA7P7azAJic
NotBefore : 2015-01-30 20:44:40
NotAfter  : 2016-01-30 20:44:40

ca-signer (certsign):
Alias    : ca-signer-1
Identifier: Sw_IY7AdoGUp28F_cFEdhbtI9pE
NotBefore : 2015-01-30 20:44:40
NotAfter  : 2018-01-29 20:44:40

=== root ca ===
current root ca:
Alias     : root-1
Identifier: fVrqJAlpotPaisOAsnxa9cglXCc
NotBefore : 2015-01-30 20:44:39
NotAfter  : 2020-01-30 20:44:39

upcoming root ca:
  not set
```

In this instance, the root CA information is the same for **`ca-one`** and **`ca-two`**.

6 If you changed the certificate key password during certificate creation, then update **nano /etc/openxpki/config.d/realm/ca-two/crypto.yaml**.

7 Generate the CRLs for this realm. For more information, see “Generating CRL information” on page 104.

8 Publish the CRLs for this realm. For more information, see “Configuring CRL accessibility” on page 105.

9 Restart the OpenXPKI service using **openxpkictl restart**.

Sample output

```
Stopping OpenXPKI
Stopping gracefully, 3 (sub)processes remaining...
DONE.
Starting OpenXPKI...
OpenXPKI Server is running and accepting requests.
DONE.
```

10 Do the following to access the OpenXPKI server:

a From a web browser, type **http://ipaddress/openxpki/**.

b Log in as **Operator**. The default password is **openxpki**.

Note: The Operator login has two preconfigured operator accounts, **raop** and **raop2**.

Configuring SCEP endpoint for multiple realms

The default realm SCEP endpoint is **http://<ipaddress>/scep/scep**. If you have multiple realms, then configure a unique SCEP endpoint (different configuration file) for each realm. In the following instructions, we use two PKI realms, **ca-one** and **ca-two**.

1 Copy the default configuration file in **cp /etc/openxpki/scep/default.conf /etc/openxpki/scep/ca-one.conf**.

Note: Name the file as **ca-one.conf**.

2 In **nano /etc/openxpki/scep/ca-one.conf**, change the realm value to **realm=ca-one**.

3 Create another configuration file in **cp /etc/openxpki/scep/default.conf /etc/openxpki/scep/ca-two.conf**.

Note: Name the file as **ca-two.conf**.

4 In **nano /etc/openxpki/scep/ca-two.conf**, change the realm value to **realm=ca-two**.

5 Restart the OpenXPKI service using **openxpkictl restart**.

The SCEP endpoints are the following:

- **ca-one—http://ipaddress/scep/ca-one**
- **ca-two—http://ipaddress/scep/ca-two**

If you want to differentiate between login credentials and default certificate templates for different PKI realms, then you may need advanced configuration.

Enabling multiple active certificates with same subject to be present at a time

By default, in OpenXPKI only one certificate with the same subject name can be active at a time. But when you are enforcing multiple Named Certificates, multiple active certificates with the same subject name must be present at a time.

1 In **/etc/openxpki/config.d/realm/REALM NAME/scep/generic.yaml**, from the **policy** section, change the value of **max_active_certs** from **1** to **0**.

Notes:

- REALM NAME is the name of the realm. For example, **ca-one**.
- Review the space and indentation in the script file.

2 Restart the OpenXPKI service using **`openxpkictl restart`**.

Setting the default port number for OpenXPKI CA

By default, Apache listens in port number 80. Set the default port number for OpenXPKI CA to avoid conflicts.

1 In **/etc/apache2/ports.conf**, add or modify a port. For example, **`Listen 8080`**.

2 In **/etc/apache2/sites-enabled/000-default.conf**, add or modify the **`VirtualHost`** section to map new port. For example, **`<VirtualHost *:8080>`**.

3 Restart the Apache server using **`systemctl restart apache2`**.

To check the status, run **`netstat -tlpn| grep apache`**. The OpenXPKI SCEP URL is now **http://ipaddress:8080/scep/ca-one**, and the web URL is **http://ip address:8080/openxpki**.

Rejecting certificate requests without Challenge Password in OpenXPKI CA

By default, OpenXPKI accepts requests without checking the challenge password. The certificate request is not rejected, and the CA and CA administrator determine whether to approve or reject the request. To avoid potential security concerns, disable this feature so that any certificate requests that contain invalid passwords are rejected immediately. In MVE, Challenge Password is required only when generating the enrollment agent certificate.

1 In **etc/openxpki/config.d/realm/REALM NAME/scep/generic.yaml**, from the **`policy`** section, change the value of **`allow_man_authen`** from **`1`** to **`0`**.

Notes:

- REALM NAME is the name of the realm. For example, **ca-one**.
- Review the space and indentation in the script file.

2 Restart the OpenXPKI service using **`openxpkictl restart`**.

Adding client authentication EKU in certificates

1 In **/etc/openxpki/config.d/realm/REALM NAME/profile/I18N_OPENXPKI_PROFILE_TLS_SERVER.yaml**, from the **`extended_key_usage:`** section, change the value of **`client_auth:`** to **`1`**.

Notes:

- REALM NAME is the name of the realm. For example, **ca-one**.
- Review the space and indentation in the script file.

2 Restart the OpenXPKI service using **`openxpkictl restart`**.

Getting the full certificate subject when requesting through SCEP

By default, OpenXPKI reads only the CN of the subject of the requesting certificate. The rest of the information, such as country, locality, and DC, are hard-coded. For example, if a certificate subject is **`C=US`**, **`ST=KY`**, **`L=Lexington`**, **`O=Lexmark`**, **`OU=ISS`**, **`CN=ET0021B7C34AEC.dhcp.dev.lexmark.com`**, then after signing the certificate through SCEP, the subject is changed to **`DC=Test Deployment`**, **`DC= OpenXPKI`**, **`CN=ET0021B7C34AEC.dhcp.dev.lexmark.com`**.

Note: REALM NAME is the name of the realm. For example, **ca-one**.

1. In **/etc/openxpki/config.d/realm/REALM NAME/profile/I18N_OPENXPKI_PROFILE_TLS_SERVER.yaml**, from the **`enroll`** section, change the value of **`dn`** to the following:

   ```
   CN=[% CN.0 %][% IF OU %][% FOREACH entry = OU %],OU=[% entry %][% END %][% END %][% IF O
   %][% FOREACH entry = O %],O=[% entry %][% END %][% END %][% IF L %],L=[% L.0 %][% END %]
   [% IF ST %],ST=[% ST.0 %][% END %][% IF C %],C=[% C.0 %][% END %][% IF DC %][% FOREACH
   entry = DC %],DC=[% entry %][% END %][% END %][% IF EMAIL %][% FOREACH entry = EMAIL
   %],EMAIL=[% entry %][% END %][% END %]
   ```

2. Save the file.

3. Create a file titled **l.yaml** in the **/etc/openxpki/config.d/realm/REALM NAME/profile/template** directory.

4. Add the following:

   ```
   id: L
   label: L
   description: I18N_OPENXPKI_UI_PROFILE_L_DESC
   preset: L
   type: freetext
   width: 60
   placeholder: Kolkata
   ```

5. Save the file.

6. Create a file titled **st.yaml** in the **/etc/openxpki/config.d/realm/REALM NAME/profile/template** directory.

7. Add the following:

   ```
   id: ST
   label: ST
   description: I18N_OPENXPKI_UI_PROFILE_ST_DESC
   preset: ST
   type: freetext
   width: 60
   placeholder: WB
   ```

8. Save the file.

   Note: OpenXPKI must own both files and must be readable, writable, and executable.

9. Restart the OpenXPKI service using **`openxpkictl restart`**.

Revoking certificates and publishing CRL

1. Access the OpenXPKI server.

   a. From a web browser, type **`http://ipaddress/openxpki/`**.

   b. Log in as **Operator**. The default password is **`openxpki`**.

      Note: The Operator login has two preconfigured operator accounts, **raop** and **raop2**.

2. Click **Workflow Search** > **Search now**.

3. Click a certificate to revoke, and then click the certificate link.

4. From the Action section, click **revocation request**.
5. Type the appropriate values, and then click **Continue** > **Submit request**.
6. On the next page, approve the request. The certificate revocation is waiting for the next CRL publish.
7. From the PKI Operation section, click **Issue a certificate revocation list (CRL)**.
8. Click **Enforce creation of revocation lists** > **Continue**.
9. From the PKI Operation section, click **Publish CA/CRL**.
10. Click **Workflow Search** > **Search now**.
11. Click the revoked certificate with a **certificate_revocation_request_v2** type.
12. Click **Force wake up**.

In the new CRL, you can find the serial number and the revocation reason of the revoked certificate.

Managing certificates using OpenXPKI Certificate Authority through EST

This section helps user to configure OpenXPKI CA version 3.x.x using EST protocol..

Notes:

- Make sure that you are using the Debian 10 Buster operating system.
- For more information on OpenXPKI, go to **www.openxpki.org**.

Configuring OpenXPKI CA

Installing OpenXPKI CA

1. Connect the machine using PuTTY or another client.
2. From the client, run the **`sudo su -`** command to go to the root user.
3. Enter the root password.
4. In **nano /etc/apt/sources.list**, change the source for installing the updates.
5. Update the file. For example:

```
#

# deb cdrom:[Debian GNU/Linux testing _Buster_ - Official Snapshot amd64 DVD Binary-1
20190527-04:04]/ buster contrib main
# deb cdrom:[Debian GNU/Linux testing _Buster_ - Official Snapshot amd64 DVD Binary-1
20190527-04:04]/ buster contrib main

deb http://security.debian.org/debian-security buster/updates main contrib
deb-src http://security.debian.org/debian-security buster/updates main contrib

# buster-updates, previously known as 'volatile'
# A network mirror was not selected during install. The following entries
# are provided as examples, but you should amend them as appropriate
# for your mirror of choice.
#
deb http://ftp.debian.org/debian/ buster-updates main
```

```
deb-src http://ftp.debian.org/debian/ buster-updates main
deb http://ftp.us.debian.org/debian/ buster main
```

6 Save the file.

7 Run the following commands:

- **`apt-get update`**
- **`apt-get upgrade`**

8 Update the CA certificate lists in the server using **`apt-get install ca-certificates`**.

9 Install **en_US.utf8 locale** using **`dpkg-reconfigure locales`**.

10 Select the **en_US.UTF-8 UTF-8** locale, and then make it the default locale for the system.

Note: Use the Tab and spacebar keys for selecting and navigating the menu.

11 Check the locales that you have generated using **`locale -a`**.

Sample output

```
C
C.UTF-8
en_IN
en_IN.utf8
en_US.utf8
POSIX
```

12 Copy the fingerprint of the OpenXPKI package using **`nano /home/Release.key`**. For this instance, copy the key in **/home**.

13 Type **`55D89776 006F632B E0196E3E D2495509 BAFDDC74 22FEAAD2 F055074E 0FE3A724`** as the value.

14 Run the following command:

```
gpg --print-md sha256 /home/Release.key
```

15 Add the package using the **`wget https://packages.openxpki.org/v3/debian/Release.key -O - | apt-key add -`** command.

16 Add the repository to your source list (buster) using **`echo " deb http://packages.openxpki.org/v3/debian/ buster release" > /etc/apt/sources.list.d/openxpki.list`**, and then **`apt update`**.

17 Install MySQL and Perl MySQL binding using **`apt install mariadb-server libdbd-mariadb-perl`**.

18 Install apache2.2-common using **`apt install apache2`**.

19 In **nano /etc/apt/sources.list**, install the fastcgi module to speed up the user interface.

Note: We recommend using **`mod_fcgid`**.

20 Add the **`deb http://http.us.debian.org/debian/ buster main`** line in the file, and then save it.

21 Run the following commands:

```
apt-get update
apt install libapache2-mod-fcgid
```

22 Enable the fastcgi module using **`a2enmod fcgid`**.

23. Install the OpenXPKI core package using **`apt install libopenxpki-perl openxpki-cgi-session-driver openxpki-i18n`**.

24. Restart the Apache server using **`service apache2 restart`**.

25. Check whether the installation is successful using **`openxpkiadm version`**.

    Note: If the installation is successful, then the system shows the version of the installed OpenXPKI. For example, **Version (core): 3.18.2**.

26. Create the empty database, and then assign the database user using **`mariadb -u root -p`**.

    Notes:

    - This command must be typed in the client. Otherwise, you cannot enter the password.
    - Type the password for the MySQL. For this instance, **root** is the MySQL user.
    - **`openxpki`** is the user on which OpenXPKI is installed.

    ```
    CREATE DATABASE openxpki CHARSET utf8;
    CREATE USER 'openxpki'@'localhost' IDENTIFIED BY 'openxpki';
    GRANT ALL ON openxpki.* TO 'openxpki'@'localhost';
    flush privileges;
    ```

    If the MySQL service is not running, then run **`/etc/init.d/mysql start`** to start the service.

27. Type **`quit`** to exit from MySQL.

28. Store the used credentials in **/etc/openxpki/config.d/system/database.yaml**.

Sample file content

```
main:
debug: 0
type: MariaDB
name: openxpki
host: localhost
port: 3306
user: openxpki
passwd: openxpki
```

Note: Change **`user`** and **`passwd`** to match the MariaDB user name and password.

29. Save the file.

30. For empty database schema, run **`zcat /usr/share/doc/libopenxpki-perl/examples/schema-mariadb.sql.gz | \ mysql -u root --password --database openxpki`** from the provided schema file.

31. Type the password for the database.

Configuring OpenXPKI CA using the default script

Note: The default script configures only the default realm, **ca-one**. The CDP and CRLs are not configured.

1. Run the script using **`bash /usr/share/doc/libopenxpki-perl/examples/sampleconfig.sh`**.
2. Confirm the setup using **`openxpkiadm alias --realm democa`**.

Sample output

```
=== functional token ===
scep (scep):
Alias    : scep-1
Identifier: YsBNZ7JYTbx89F_-Z4jn_RPFFWo
NotBefore : 2015-01-30 20:44:40
NotAfter  : 2016-01-30 20:44:40

vault (datasafe):
Alias    : vault-1
Identifier: lZILS1l6Km5aIGS6pA7P7azAJic
NotBefore : 2015-01-30 20:44:40
NotAfter  : 2016-01-30 20:44:40

ca-signer (certsign):
Alias    : ca-signer-1
Identifier: Sw_IY7AdoGUp28F_cFEdhbtI9pE
NotBefore : 2015-01-30 20:44:40
NotAfter  : 2018-01-29 20:44:40

=== root ca ===
current root ca:
Alias     : root-1
Identifier: fVrqJAlpotPaisOAsnxa9cglXCc
NotBefore : 2015-01-30 20:44:39
NotAfter  : 2020-01-30 20:44:39

upcoming root ca:
  not set
```

3. Check whether the installation is successful using **`openxpkictl start`**.

Sample output

```
Starting OpenXPKI...
OpenXPKI Server is running and accepting requests.
DONE.
```

4. Do the following to access the OpenXPKI server:
   a. From a web browser, type **`http://ipaddress/openxpki/`**.
   b. Add the user name and their corresponding passwords in a **`userdb.yaml`** file. To add the user name and the password, do the following:
      - Check out to **/home/pkiadm**, and then **nano userdb.yaml**.
      - Paste the following:

        ```
        estRA:
               digest:"{ssha256}somePassword”
               role: RA Operator
        ```

        Note: In this instance, estRA refers to the user name. To generate the password, type **`openxpkiadm hashpwd`**. When a message asking for the password and a ssha256 encrypted password appears, copy and paste it to the digest of any user.

   Note: The available roles in the Operator login are RA Operator, CA Operator, and user.

5 Enter the user name and password.

6 Create one certificate request, and then test it.

Configuring OpenXPKI CA manually

Overview

Note: Before you begin, make sure that you have a basic knowledge on creating OpenSSL certificates.

To configure OpenXPKI CA manually, create the following:

1. Root CA certificate. For more information, see "Creating a root CA certificate" on page 101.
2. CA signer certificate, signed by the root CA. For more information, see "Creating a signer certificate" on page 101.
3. Data vault certificate, self-signed. For more information, see "Creating a vault certificate" on page 102.
4. Web certificate, signed by the signer certificate. For more information, see "Setting up the webserver" on page 119.

Notes:

- When selecting the signature hash, use either SHA256 or SHA512.
- Changing the public key size is optional.

For version 3.10 or later, you can manage the keys directly using the openxpkiadm alias command:

- Run **mkdir -p /etc/openxpki/local/keys** to create the directory. The default location of the directory is **/etc/openxpki/local/keys**.
- Run **openxpkictl start** to start the server.

For this instance, we are using the **/etc/certs/openxpki_democa/** directory for certificate generation. However, you can use any directory.

Creating an OpenSSL configuration file

The OpenSSL configuration file contains X.509 extensions for generating and signing certificate requests.

1 Run the following command:

```
nano /etc/certs/openxpki_democa/openssl.conf
```

Note: If your server is reachable using the fully qualified domain name (FQDN), then use the DNS of the server instead of its IP address.

Sample file

```
# x509_extensions               = v3_ca_extensions
# x509_extensions               = v3_issuing_extensions
# x509_extensions               = v3_datavault_extensions
# x509_extensions               = v3_scep_extensions
# x509_extensions               = v3_web_extensions
# x509_extensions               = v3_ca_reqexts # not for root self-signed, only for issuing
## x509_extensions              = v3_datavault_reqexts # not required self-signed
# x509_extensions               = v3_scep_reqexts
# x509_extensions               = v3_web_reqexts

[ req ]
default_bits            = 4096
```

```
distinguished_name      = req_distinguished_name

[ req_distinguished_name ]
domainComponent         = Domain Component
commonName              = Common Name

[ v3_ca_reqexts ]
subjectKeyIdentifier    = hash
keyUsage                = digitalSignature, keyCertSign, cRLSign

[ v3_datavault_reqexts ]
subjectKeyIdentifier    = hash
keyUsage                = keyEncipherment
extendedKeyUsage        = emailProtection

[ v3_scep_reqexts ]
subjectKeyIdentifier    = hash

[ v3_web_reqexts ]
subjectKeyIdentifier    = hash
keyUsage                = critical, digitalSignature, keyEncipherment
extendedKeyUsage        = serverAuth, clientAuth

[ v3_ca_extensions ]
subjectKeyIdentifier    = hash
keyUsage                = digitalSignature, keyCertSign, cRLSign
basicConstraints        = critical,CA:TRUE
authorityKeyIdentifier  = keyid:always,issuer

[ v3_issuing_extensions ]
subjectKeyIdentifier    = hash
keyUsage                = digitalSignature, keyCertSign, cRLSign
basicConstraints        = critical,CA:TRUE
authorityKeyIdentifier  = keyid:always,issuer:always
crlDistributionPoints   = URI:https://FQDN of your system/openxpki/CertEnroll/MYOPENXPKI.crl
authorityInfoAccess     = caIssuers;URI:https://FQDN of your system/download/MYOPENXPKI.crt

[ v3_datavault_extensions ]
subjectKeyIdentifier    = hash
keyUsage                = keyEncipherment
extendedKeyUsage        = emailProtection
basicConstraints        = CA:FALSE
authorityKeyIdentifier  = keyid:always,issuer

[ v3_scep_extensions ]
subjectKeyIdentifier    = hash
basicConstraints        = CA:FALSE
authorityKeyIdentifier  = keyid,issuer

[ v3_web_extensions ]
subjectKeyIdentifier    = hash
keyUsage                = critical, digitalSignature, keyEncipherment
extendedKeyUsage        = serverAuth, clientAuth
basicConstraints        = critical,CA:FALSE
subjectAltName          = DNS:FQDN of est server
crlDistributionPoints     = URI:https://FQDN of your
system/openxpki/CertEnroll/MYOPENXPKI_ISSUINGCA.cr
authorityInfoAccess     = caIssuers;URI:https://FQDN of your
system/download/MYOPENXPKI_ISSUINGCA.crt
```

2. Replace the IP address and CA certificate name with your setup information.
3. Save the file.

Creating a password file for certificate keys

1. Run the following command:

   `nano /etc/certs/openxpki_democa/pd.pass`

2. Type your password.

3 Save the file.

Creating a root CA certificate

You can create a self-signed root CA certificate, or generate a certificate request and then get it signed by the root CA.

Note: Replace the key length, signature algorithm, and certificate name with the appropriate values.

1 Run the following command:

```
openssl genrsa -out /etc/certs/openxpki_democa/ca-root-1.key -passout
file:/etc/certs/openxpki_democa/pd.pass 4096
```

2 Replace the subject in the request with your CA information using **`openssl req -new -key /etc/certs/openxpki_democa/ca-root-1.key -out /etc/certs/openxpki_democa/ca-root-1.csr`**.

3 Get the certificate signed by the root CA using **`openssl req -config /etc/certs/openxpki_democa/openssl.conf -extensions v3_ca_extensions -x509 -days 3560 -in /etc/certs/openxpki_democa/ca-root-1.csr -key /etc/certs/openxpki_democa/ca-root-1.key -out /etc/certs/openxpki_democa/ca-root-1.crt - sha256`**.

4 Go to **/etc/certs/openxpki_democa/** where **ca-root-1.crt** is saved.

5 Run the following command:

```
openxpkiadm certificate import --file ca-root-1.crt
```

Creating a signer certificate

Note: Replace the key length, signature algorithm, and certificate name with the appropriate values.

1 Run the following command:

```
openssl genrsa -out /etc/certs/openxpki_democa/ca-signer-1.key -passout
file:/etc/certs/openxpki_democa/pd.pass 4096
```

2 Replace the subject in the request with your CA information using **`openssl req -config /etc/certs/openxpki_democa/openssl.conf -reqexts v3_ca_reqexts -new -key /etc/certs/openxpki_democa/ca-signer-1.key -subj /DC=COM/DC=LEXMARK/DC=DEV/DC=CA-ONE/CN=MYOPENXPKI_ISSUINGCA -out /etc/certs/openxpki_democa/ca-signer-1.csr`**.

3 Get the certificate signed by the root CA using **`openssl x509 -req -extfile /etc/certs/openxpki_democa/openssl.conf -extensions v3_issuing_extensions -days 3650 -in /etc/certs/openxpki_democa/ca-signer-1.csr -CA /etc/certs/openxpki_democa/ca-root-1.crt -CAkey /etc/certs/openxpki_democa/ca-root-1.key -CAcreateserial -out /etc/certs/openxpki_democa/ca-signer-1.crt -sha256`**.

4 Run the following command:

```
openxpkiadm alias --realm democa --token certsign --file ca-signer-1.crt --
key ca-signer-1.key
```

Creating a vault certificate

Notes:

- The vault certificate is self-signed.
- Replace the key length, signature algorithm, and certificate name with the appropriate values.

1 Run the following command:

```
openssl req -new -x509 -keyout vault.key -out vault.crt -days 1100 -
config /etc/certs/openxpki_democa/openssl.conf
```

2 Change the subject in the request with your CA information using **`openxpkiadm certificate import --file vault.crt`**.

3 Run the following command:

```
openxpkiadm alias --realm democa --token datasafe --file vault.crt --key
vault.key
```

Note: Provide the necessary values, but keep **`/CN=DataVault`** as the subject.

Creating a web certificate

1 Run the following command:

```
openssl genrsa -out /etc/certs/openxpki_democa/web-1.key -passout
file:/etc/certs/openxpki_democa/pd.pass 4096
```

2 Replace the subject in the request with your CA information using **`openssl req -config /etc/certs/openxpki_democa/openssl.conf -reqexts v3_web_reqexts -new -key /etc/certs/openxpki_democa/web-1.key -subj /DC=COM/DC=LEXMARK/DC=DEV/DC=CA-ONE/CN=FQDN of your system -out /etc/certs/openxpki_democa/web-1.csr`**.

3 Run the following command:

```
openssl x509 -req -extfile /etc/certs/openxpki_democa/openssl.conf -
extensions v3_web_extensions -days 900 -
in /etc/certs/openxpki_democa/web-1.csr -CA /etc/certs/openxpki_democa/ca-
signer-1.crt -CAkey /etc/certs/openxpki_democa/ca-signer-1.key -
CAcreateserial -out /etc/certs/openxpki_democa/web-1.crt -sha256
```

Setting up the webserver

1 Run the following commands:

```
a2enmod ssl rewrite headers
a2ensite openxpki
a2dissite 000-default default-ssl
mkdir -m755 -p /etc/openxpki/tls/chain
cp /etc/certs/openxpki_democa/ca-root-1.crt /etc/openxpki/tls/chain/
cp /etc/certs/openxpki_democa/ca-signer-1.crt /etc/openxpki/tls/chain/
c_rehash /etc/openxpki/tls/chain/
mkdir -m755 -p /etc/openxpki/tls/endentity
mkdir -m700 -p /etc/openxpki/tls/private
```

```
cp /etc/certs/openxpki_democa/web-1.crt /etc/openxpki/tls/endentity/openxpki.crt
cat /etc/certs/openxpki_democa/ca-signer-1.crt >> /etc/openxpki/tls/endentity/openxpki.crt
openssl rsa -in /etc/certs/openxpki_democa/web-1.key -passin file:/etc/certs/openxpki_democa/pd.pass -out /etc/openxpki/tls/private/openxpki.pem
chmod 400 /etc/openxpki/tls/private/openxpki.pem
```

2 Restart the Apache service using **apache2 restart**.

3 Run the following command to check the successful import of the files:

```
openxpkiadm alias --realm democa
```

Sample output

```
=== functional token ===
ca-signer (certsign):
          Alias     : ca-signer-2
          Identifier: XjC6MPbsnyfLZkI9Poi9vm4Z5rk
          NotBefore : 2022-04-06 10:03:01
          NotAfter  : 2032-04-03 10:03:01

vault (datasafe):
          Alias     : vault-2
          Identifier: G8ekluAsskGVC0N-jZhB2n9kvdM
          NotBefore : 2022-04-06 09:53:57
          NotAfter  : 2025-04-10 09:53:57

scep (scep):
          not set

ratoken (cmcra):
          not set

=== root ca ===
current root ca:
          Alias     : root-2
          Identifier: prTHU5vCfcJuCnQWyb5wUknvXQM
          NotBefore : 2022-04-06 09:40:27
          NotAfter  : 2032-01-04 09:40:27
```

Making the certificate key password available to OpenXPKI

1 Change the value in the **`nano /etc/openxpki/config.d/system/crypto.yaml`** file.

2 Uncomment the cache: **`daemon under secret: default`**:

```
secret:
  default:
    label: Global Secret group
    export: 0
    method: literal
    value: root
    cache: daemon
```

Starting OpenXPKI

1 Run the **openxpkictl start** command.

Sample output

```
Starting OpenXPKI...
OpenXPKI Server is running and accepting requests.
DONE.
```

2 Access the OpenXPKI server:

a From a web browser, type **http://ipaddress/openxpki/**.

b Add the user names and corresponding passwords in a **userdb.yaml** file:

- Check out to **/home/pkiadm** and then to **nano userdb.yaml**.
- Paste the following:

```
estRA:
       digest:"{ssha256}somePassword”
       role: RA Operator
```

Note: Here estRA refers to the user name.

- To generate the password, type **openxpkiadm hashpwd**. A message showing the password and an ssha256 encrypted password appears.
- Copy the password, and then paste it in the digest of any user.

Note: The Operator login has two preconfigured available roles: RA Operator, CA Operator, and user.

3 Type the user name and password.

4 Create one certificate request, and then test it.

Generating CRL information

Note: If your server is reachable using the FQDN, then use the DNS of the server instead of its IP address.

1 Stop the OpenXPKI service using **openxpkictl stop**.

2 In **nano /etc/openxpki/config.d/realm/democa/publishing.yaml**, update the **connectors: cdp** section to the following:

```
class: Connector::Builtin::File::Path
LOCATION: /var/www/openxpki/CertEnroll/
file: "[% ARGS.0 %].crl"
content: "[% pem %]"
```

a In **nano /etc/openxpki/config.d/realm/democa/profile/default.yaml**, update the following:

- **crl_distribution_points:** section

```
critical: 0
uri:
    - https://FQDN of the est/openxkpi/CenrtEnroll/[% ISSUER.CN.0 %].crl
    - ldap://localhost/[% ISSUER.DN %]
```

- **authority_info_access:** section

```
critical: 0
ca_issuers: http://FQDN of the est/download/MYOPENXPKI.crt
ocsp: http://ocsp.openxpki.org/
```

Change the IP address and CA certificate name according to your CA server.

Note: The authority_info_access (AIA) path is saved in the Download folder, but you can set the location according to your preference.

b In **nano /etc/openxpki/config.d/realm/democa/crl/default.yaml**, do the following:

- If necessary, update **`nextupdate`** and **`renewal`**.
- Add **`ca_issuers`** to the following section:

```
extensions:
            authority_info_access:
                    critical: 0
                    # ca_issuers and ocsp can be scalar or list
                    ca_issuers: https://FQDN of the est/download/MYOPENXPKI.crt
                   #ocsp: http://ocsp.openxpki.org/
```

Change the IP address and CA certificate name according to your CA server.

3 Start the OpenXPKI service using **`openxpkictl start`**.

Publishing CRL information

After creating the CRLs, you must publish them to be accessed by all.

1 Stop the Apache service using **`service apache2 stop`**.

2 Create a **CertEnroll** directory for the CRL in the **/var/www/openxpki/** directory.

3 Set **openxpki** as the owner of this directory, and then configure the permissions to let Apache read and execute, and other services to read only.

chown openxpki /var/www/openxpki/CertEnroll

chmod 755 /var/www/openxpki/CertEnroll

4 Add a reference to the Apache alias.conf file using **`nano /etc/apache2/mods-enabled/alias.conf`**.

5 After the **`<Directory "/usr/share/apache2/icons">`** section, add the following:

```
Alias /CertEnroll/ "/var/www/openxpki/CertEnroll/"
 <Directory "/var/www/openxpki/CertEnroll">
   Options FollowSymlinks
   AllowOverride None
   Require all granted
 </Directory>
```

6 Add a reference in the apache2.conf file using **nano /etc/apache2/apache2.conf**.

7 Add the following in the **`Apache2 HTTPD server`** section:

```
<Directory /var/www/openxpki/CertEnroll>
  Options FollowSymlinks
  AllowOverride None
  Allow from all
</Directory>
```

8 Start the Apache service using **`service apache2 start`**.

Enabling automatic approval of certificate requests in OpenXPKI CA

1. Stop the OpenXPKI service using **`openxpkictl stop`**.
2. In **/etc/openxpki/config.d/realm/democa/est/default.yaml**, update the **`eligible:`** section:

Old content

```
eligible:
            initial:
                value@: connector:scep.generic.connector.initial
               args: '[% context.cert_subject_parts.CN.0 %]'
               expect:
                   - Build
                   - New
```

New content

```
eligible:
            initial:
                value: 1
                # value@: connector:scep.generic.connector.initial
                # args: '[% context.cert_subject_parts.CN.0 %]'
                # expect:
                #    - Build
                #    - New
```

Notes:

- Review the space and indention in the script file.
- To approve certificates manually, comment **`value: 1`**, and then uncomment the other lines that are previously commented.

3. Save the file.
4. Start the OpenXPKI service using **`openxpkictl start`**.

Changing details to enable ca-certs download

1. Run the following command:

   `nano /usr/lib/cgi-bin/est.fcgi`

2. Replace **`my $mime = "application/pkcs7-mime; smime-type=certs-only";`** with **`my $mime = "application/pkcs7-mime";`**.
3. Start the OpenXPKI service using **`openxpkictl`**.

Creating a second realm

In OpenXPKI, you can configure multiple PKI structures in the same system. The following topics show how to create another realm for MVE named **democa-two**.

Copying and setting the directory

1. Create a directory, namely **democa2**, for the second realm inside **/etc/openxpki/config.d/realm**.
2. Copy the **/etc/openxpki/config.d/realm/ca-one** sample directory tree to a new directory (**cp -r /etc/openxpki/config.d/realm.tpl/*/etc/openxpki/config.d/realm/democa2**) within the realm directory.

3 In **/etc/openxpki/config.d/system/realms.yaml**, update the following section:

Old content

```
# This is the list of realms in this PKI
# You only need to enable the realms which are visible on the server

democa:
    label: Verbose name of this realm
    baseurl: https://pki.example.com/openxpki/

#democa2:
#    label: Verbose name of this realm
#    baseurl: https://pki.acme.org/openxpki/
```

New content

```
# This is the list of realms in this PKI
# You only need to enable the realms which are visible on the server

democa:
    label: Example.org Demo CA
    baseurl: https://pki.example.com/openxpki/

democa2:
    label: Example.org Demo CA2
    baseurl: https://pki.example.com/openxpki/
```

4 Save the file.

Configuring EST endpoint for multiple realms

You can configure the EST endpoint with a tuple composed of the authority portion of the URI and the optional label (for example, www.example.com:80 and arbitraryLabel1). In the following instructions, we use two PKI realms, **`democa`** and **`democa2`**.

1 Copy the default configuration file in **cp /etc/openxpki/est/default.conf /etc/openxpki/est/democa.conf**.

Note: Name the file as **`democa.conf`**.

2 In **nano /etc/openxpki/est/democa.conf**, change the realm value to **`realm=democa`**.

Note: According to your needs, you may need to uncomment the corresponding lines for the **simpleenroll**, **simplereenroll**, **csrattrs**, and **cacerts** sections. Keep the environment sections commented. Do the same for **default.conf**.

3 Create another configuration file in **cp /etc/openxpki/est/default.conf /etc/openxpki/est/democa2.conf**.

Note: Name the file as **`democa2.conf`**.

4 In **nano /etc/openxpki/est/democa2.conf**, change the realm value to **`realm=democa2`**.

Note: According to your needs, you may need to uncomment the corresponding lines for the **simpleenroll**, **simplereenroll**, **csrattrs**, and **cacerts** sections. Keep the environment sections commented.

5 Copy the **default.yaml** file in the following locations:

- **cp /etc/openxpki/config.d/realm/democa/est/default.yaml**
- **/etc/openxpki/config.d/realm/democa/est/democa.yaml**

Note: Name the file as **`democa.yaml`**.

6. Copy the **default.yaml** file in the following locations:
   - **cp /etc/openxpki/config.d/realm/democa2/est/default.yaml**
   - **/etc/openxpki/config.d/realm/democa2/est/democa2.yaml**

   Note: Name the file as **`democa2.yaml`**.

7. Restart the OpenXPKI service using **`openxpkictl restart`**.

Select the following URLs to open the EST server corresponding to a realm via a web browser:

- **`democa`—http://ipaddress/est/democa**
- **`democa2`—http://ipaddress/est/democa2**

If you want to differentiate between login credentials and default certificate templates for different PKI realms, then you may need advanced configuration.

Creating a signer certificate

The following instructions show how to generate a signer certificate in the second realm. You can use the same root and vault certificates as those in the first realm.

1. Create an OpenSSL configuration file in **nano /etc/certs/openxpki_democa2/openssl.conf**.

   Note: Change the certificate common name so that the user can easily distinguish between different certificates for different realms. The certificate files are created in the **/etc/certs/openxpki_democa2/** directory.

2. Go to the directory of the vault certificate in the first realm, and then import the certificate from the first realm.

3. Run the following code:

   ```
   openxpkiadm alias --realm democa2 --token datasafe --file vault.crt
   ```

Creating a password file for certificate keys

1. Run the following command:

   ```
   nano /etc/certs/openxpki_democa2/pd.pass
   ```

2. Type your password.

3. Create a signer certificate. For more information, see “Creating a signer certificate” on page 101.

4. Check whether the import is successful using **openxpkiadm alias --realm democa2**.

   Note: If you changed the key password of the certificate during certificate creation, update **nano /etc/openxpki/config.d/realm/democa2/crypto.yaml**.

5. Generate the CRLs for the second realm. For more information, see “Generating CRL information” on page 104.

   Note: Make sure that you use the correct CA certificate name according to the realm.

6. Publish the CRLs for this realm. For more information, see “Publishing CRL information” on page 122.

7. Restart the OpenXPKI service using **openxpkictl restart**.

Sample output

```
Stopping OpenXPKI
Stopping gracefully, 3 (sub)processes remaining...
```

```
DONE.
Starting OpenXPKI...
OpenXPKI Server is running and accepting requests.
DONE.
```

Enabling multiple active certificates with the same subject to be present at a time

By default, in OpenXPKI only one certificate with the same subject name can be active at a time. But when you are enforcing multiple Named Certificates, multiple active certificates with the same subject name must be present at a time.

1 In **/etc/openxpki/config.d/realm/REALM NAME/est/< REALM NAME >.yaml**, from the **`policy`** section, change the value of **`max_active_certs`** from **`1`** to **`0`**.

   Notes:

   - REALM NAME is the name of the realm. For example, **ca-one**.
   - Review the space and indentation in the script file.

2 Restart the OpenXPKI service using **`openxpkictl restart`**.

Setting the default port number for OpenXPKI CA

By default, Apache listens in port number 443 for https. Set the default port number for OpenXPKI CA to avoid conflicts.

1 In **/etc/apache2/ports.conf**, modify the 443 port to any other port. For example:

Old content

```
Listen 80

<IfModule ssl_module>
   Listen 443
</IfModule>

<IfModule mod_gnutls.c>
  Listen 443
</IfModule>
```

New content

```
Listen 80

<IfModule ssl_module>
   Listen 9443
</IfModule>

<IfModule mod_gnutls.c>
  Listen 9443
</IfModule>
```

2 In **/etc/apache2/sites-available/openxpki.conf**, add or modify the **`VirtualHost`** section to map a new port. For example, **`<VirtualHost *:443>`** to **`<VirtualHost *:9443>`**.

3 In **/etc/apache2/sites-available/default-ssl.conf**, add or modify the **`VirtualHost_default`** section to map a new port. For example, change **`<VirtualHost *:443>`** to **`<VirtualHost *:9443>`**.

4 Restart the Apache server using **`systemctl restart apache2`**.

Note: If it asks for the **SSL/TLS** passphrase, then type the password while adding the TLS web server certificate in the EST server.

5 In **tinddopenxpkiweb01.dhcp.dev.lexmark.com:9443 (RSA):**, enter the passphrase for the **SSL/TLS** keys.

To check the status, run **`netstat -tlpn| grep apache`**. The OpenXPKI SCEP URL is now **https://ipaddress**, and the web URL is **FQDN:9443/openxpki**.

Enabling basic authentication

1 Run the following command:

```
apt -y install apache2-utils
```

2 Create a user account that has access to the server. Enter the following details:

```
htpasswd -c /etc/apache2/.htpasswd <username>
                New password:
                Re-type new password:
                Adding password for user <username>
```

3 Go to directory **`cd /etc/apache2/sites-enabled/`**.

4 In **nano openxpki.conf**, add the following lines in **`<VirtualHost *: 443 block>`**:

```
#HTTPS BASIC AUTH FOR LABELS
Location /.well-known/est/*/simpleenroll
    AuthType Basic
    AuthName "estrealm"
    AuthUserFile /etc/apache2/.htpasswd
    require valid-user
    </Location>
    #HTTPS BASIC AUTH FOR NO LABEL
    <Location /.well-known/est/simpleenroll>
    AuthType Basic
    AuthName "estrealm"
    AuthUserFile /etc/apache2/.htpasswd
    require valid-user
    </Location>
```

5 Add **`ErrorDocument 401 %{unescape:%00}`** before **SSLEngine** in the same virtual Host block.

Example

```
ServerAlias *
DocumentRoot /var/www/
ErrorDocument 401 %{unescape:%00}
SSLEngine On
```

6 Restart the **apache2 service** using **service apache2 restart**.

Note: Basic authentication works using the above user name and password.

Enabling Client Certificate Authentication

1 Go to the following directory: **`cd /etc/apache2/sites-enabled/`**.

2 For the required host in **nano openxpki.conf**, add **SSLVerifyClient require**.

For example, if you are using port 443, modify the **VirtualHost** section to:

```
<VirtualHost *:443>
SSLVerifyClient require
</VirtualHost>
```

3 Remove the **SSLVerifyClient optional_no_ca** command.

4 Save the file, and then type **`quit`** to exit from MySQL.

5 Go to the following directory: **`cd /etc/openxpki/config.d/realm/democa/est`**.

6 Open **default.yaml** and **democa.yaml**.

Note: If the label is different, then change the YAML file.

7 Run the following command:

```
vi default.yaml
```

8 In the **authorized_signer** section, add the following:

```
authorized_signer:
rule2:
            subject: CN=,.
```

For example, if your client certificate subject name is **test123**, then add the following in the **`authorized_signer`** section:

```
authorized_signer:
rule1:
        # Full DN
        subject: CN=.+:pkiclient,.
rule2:
        subject: CN=test123,.*
```

9 Save the file, and then type **`quit`** to exit MySQL.

10 Restart the OpenXPKI service using **`openxpkictl restart`**.

11 Restart the Apache service using **`service apache2 restart`**.

What causes the SAN mismatch error that prevents the system from fetching the CRL?

The SAN mismatch error may occur when you are enabling the CRL information. This error indicates that the IP or host name does not match the value of the SAN in the web certificate. To avoid getting this error, use the FQDN in the path of the CRL instead of the IP. You can also configure the web certificate and use the FQDN of your system in the SAN field.

Why are the ca-signer-1 and vault-1 tokens offline?

If the System Status page shows that your ca-signer-1 and vault-1 tokens are offline, then do the following:

1 In **/etc/openxpki/config.d/realm/realm name/crypto.yaml**, change the corresponding key value.

2 Restart the OpenXPKI service.

Managing printer alerts

Overview

Alerts are triggered when a printer requires attention. Actions let you send customized e-mails or run scripts when an alert occurs. Events define which actions are executed when specific alerts are active. To register for alerts from a printer, create actions and then associate them with an event. Assign the event to the printers that you want to monitor.

Note: This feature is not applicable to secured printers.

Creating an action

An action is either an e-mail notification or an event viewer log. Actions assigned to events are triggered when a printer alert occurs.

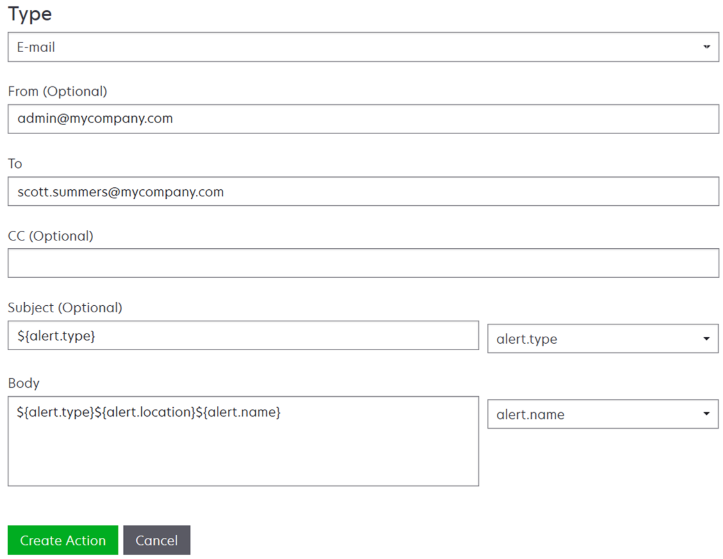
1. From the Printers menu, click **Events & Actions** > **Actions** > **Create**.
2. Type a unique name for the action and its description.
3. Select an action type.

E-mail

Note: Before you begin, make sure that the e-mail settings are configured. For more information, see "Configuring e-mail settings" on page 141.

a. In the Type menu, select **E-mail**.

b. Type the appropriate values in the fields. You can also use the available placeholders as the entire or part of the subject title, or as part of an e-mail message. For more information, see "Understanding action placeholders" on page 130.



Type: E-mail

From (Optional): admin@mycompany.com

To: scott.summers@mycompany.com

CC (Optional):

Subject (Optional): ${alert.type} — alert.type

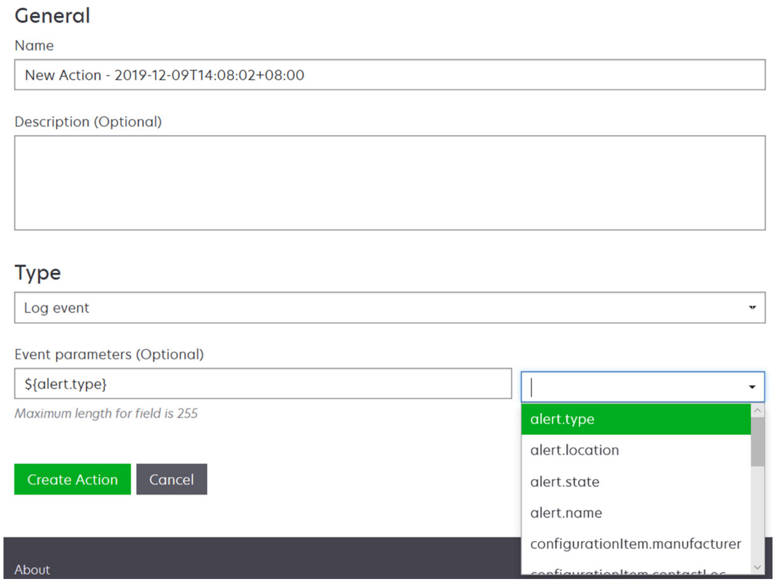
Body: ${alert.type}${alert.location}${alert.name} — alert.name

c. Click **Create Action**.

Log event

a In the Type menu, select **Log event**.

b Type the event parameters. You can also use the available placeholders in the drop-down menu. For more information, see "Understanding action placeholders" on page 130.



General

Name: New Action - 2019-12-09T14:08:02+08:00

Description (Optional)

Type: Log event

Event parameters (Optional): ${alert.type}

Maximum length for field is 255

c Click **Create Action**.

Understanding action placeholders

Use the available placeholders in the subject title or e-mail message. Placeholders represent variable elements, and are replaced with actual values when used.

- **${eventHandler.timestamp}**—The date and time that MVE processed the event. For example, **`Mar 14, 2017 1:42:24 PM`**.
- **${eventHandler.name}**—The name of the event.
- **${configurationItem.name}**—The system name of the printer that triggered the alert.
- **${configurationItem.address}**—The MAC address of the printer that triggered the alert.
- **${configurationItem.ipAddress}**—The IP address of the printer that triggered the alert.
- **${configurationItem.ipHostname}**—The host name of the printer that triggered the alert.
- **${configurationItem.model}**—The model name of the printer that triggered the alert.
- **${configurationItem.serialNumber}**—The serial number of the printer that triggered the alert.
- **${configurationItem.propertyTag}**—The property tag of the printer that triggered the alert.
- **${configurationItem.contactName}**—The contact name of the printer that triggered the alert.
- **${configurationItem.contactLocation}**—The contact location of the printer that triggered the alert.
- **${configurationItem.manufacturer}**—The manufacturer of the printer that triggered the alert.
- **${alert.name}**—The name of the alert that is triggered.
- **${alert.state}**—The state of the alert. It can be active or cleared.
- **${alert.location}**—The location within the printer where the triggered alert occurred.
- **${alert.type}**—The severity of the triggered alert, such as **`Warning`** or **`Intervention Required`**.

Managing actions

1 From the Printers menu, click **Events & Actions** > **Actions**.

2 Do any of the following:

Edit an action

a Select an action, and then click **Edit**.

b Configure the settings.

c Click **Save Changes**.

Delete actions

a Select one or more actions.

b Click **Delete**, and then confirm deletion.

Test an action

a Select an action, and then click **Test**.

b To verify the test results, see the tasks logs.

Notes:

- For more information, see "Viewing logs" on page 137.
- If you are testing an e-mail action, then verify if the e-mail was sent to the recipient.

Creating an event

You can monitor alerts in your printer fleet. Create an event, and then set an action to execute when the specified alerts occur. Events are not supported in secured printers.

1 From the Printers menu, click **Events & Actions** > **Events** > **Create**.

2 Type a unique name for the event and its description.

3 From the Alerts section, select one or more alerts. For more information, see "Understanding printer alerts" on page 132.

4 From the Actions section, select one or more actions to execute when the selected alerts are active.

Note: For more information, see "Creating an action" on page 129.

5 Enable the system to execute selected actions when alerts are cleared on the printer.

6 Set a grace period before executing any selected actions.

Note: If the alert is cleared during the grace period, then the action is not executed.

7 Click **Create Event**.

Understanding printer alerts

Alerts are triggered when a printer requires attention. The following alerts can be associated with an event in MVE:

- **Automatic Document Feeder (ADF) jam**—A paper is jammed in the ADF and must be physically removed.
  - Scanner ADF Exit Jam
  - Scanner ADF Feeder Jam
  - Scanner ADF Inverter Jam
  - Scanner ADF Paper Cleared
  - Scanner ADF Paper Missing
  - Scanner ADF PreRegistration Jam
  - Scanner ADF Registration Jam
  - Scanner Alert - Replace All Originals if Restarting Job
- **Door or cover open**—A door is open on the printer and must be closed.
  - Check Door/Cover - Mailbox
  - Door Open
  - Cover Alert
  - Cover Closed
  - Cover Open
  - Cover Open Or Cartridge Missing
  - Duplex Cover Open
  - Scanner ADF Cover Open
  - Scanner Jam Access Cover Open
- **Incorrect media size or type**—A job is printing and requires certain paper to be loaded in a tray.
  - Incorrect Envelope Size
  - Incorrect Manual Feed
  - Incorrect Media
  - Incorrect Media Size
  - Load Media
- **Memory full or error**—The printer is running low on memory and must apply changes.
  - Complex Page
  - Files Will Be Deleted
  - Insufficient Collation Memory
  - Insufficient Defrag Memory
  - Insufficient Fax Memory
  - Insufficient Memory
  - Insufficient Memory - Held Jobs May Be Lost
  - Insufficient Memory For Resource Save
  - Memory Full
  - PS Memory Shortage

  - Scanner Too Many Pages - Scan Job Canceled
  - Resolution Reduction
- **Option malfunction**—An option attached to the printer is in an error state. Options include input options, output options, font cards, user flash cards, disks, and finishers.
  - Check Alignment/Connection
  - Check Duplex Connection
  - Check Finisher/Mailbox Installation
  - Check Power
  - Corrupted Option
  - Defective Option
  - Detach Device
  - Duplex Alert
  - Duplex Tray Missing
  - External Network Adapter Lost
  - Finisher Alert
  - Finisher Door Or Interlock Open
  - Finisher Paper Wall Open
  - Incompatible Duplex Device
  - Incompatible Input Device
  - Incompatible Output Device
  - Incompatible Unknown Device
  - Incorrect Option Installation
  - Input Alert
  - Input Configuration Error
  - Option Alert
  - Output Bin Full
  - Output Bin Nearly Full
  - Output Configuration Error
  - Option Full
  - Option Missing
  - Paper Feed Mechanism Missing
  - Print Jobs On Option
  - Reattach Device
  - Reattach Output Device
  - Too Many Inputs Installed
  - Too Many Options Installed
  - Too Many Outputs Installed
  - Tray Missing
  - Tray Missing During Power On
  - Tray Sensing Error
  - Uncalibrated Input

  - Unformatted Option
  - Unsupported Option
  - Reattach Input Device
- **Paper jam**—A paper is jammed in the printer and must be physically removed.
  - Internal Paper Jam
  - Jam Alert
  - Paper Jam
- **Scanner error**—The scanner has a problem.
  - Scanner Back Cable Unplugged
  - Scanner Carriage Locked
  - Scanner Clean Flatbed Glass/Backing Strip
  - Scanner Disabled
  - Scanner Flatbed Cover Open
  - Scanner Front Cable Unplugged
  - Scanner Invalid Scanner Registration
- **Supplies error**—A printer supply has a problem.
  - Abnormal Supply
  - Cartridge Region Mismatch
  - Defective Supply
  - Fuser Unit Or Coating Roller Missing
  - Invalid Or Missing Left Cartridge
  - Invalid Or Missing Right Cartridge
  - Invalid Supply
  - Priming Failure
  - Supply Alert
  - Supply Jam
  - Supply Missing
  - Toner Cartridge Eject Handle Pulled
  - Toner Cartridge Not Installed Correctly
  - Uncalibrated Supply
  - Unlicensed Supply
  - Unsupported Supply
- **Supplies or consumable empty**—A printer supply must be replaced.
  - Input Empty
  - Life Exhausted
  - Printer Ready for Maintenance
  - Scheduled Maintenance
  - Supply Empty
  - Supply Full
  - Supply Full or Missing

Note: The printer sends the alert as an error and a warning. If one of these alerts is triggered, then its associated action occurs twice.

- **Supplies or consumable low**—A printer supply is running low.
  - Early Warning
  - First Low
  - Input Low
  - Life Warning
  - Nearly Empty
  - Nearly Low
  - Supply Low
  - Supply Nearly Full
- **Uncategorized alert or condition**
  - Color Calibration Failure
  - Data Transmission Error
  - Engine CRC Failure
  - External Alert
  - Fax Connection Lost
  - Fan Stall
  - Hex Active
  - Insert Duplex Page and Press Go
  - Internal Alert
  - Internal Network Adapter Needs Service
  - Logical Unit Alert
  - Offline
  - Offline for Warning Prompt
  - Operation Failed
  - Operator Intervention Alert
  - Page Error
  - Port Alert
  - Port Communication Failure
  - Port Disabled
  - Power Saver
  - Powering Off
  - PS Job Timeout
  - PS Manual Timeout
  - Setup Required
  - SIMM Checksum Error
  - Supply Calibrating
  - Toner Patch Sensing Failed
  - Unknown Alert Condition
  - Unknown Configuration

  - Unknown Scanner Alert Condition
  - User(s) Locked Out
  - Warning Alert

Managing events

1. From the Printers menu, click **Events & Actions** > **Events**.
2. Do either of the following:

Edit an event

a. Select an event, and then click **Edit**.
b. Configure the settings.
c. Click **Save Changes**.

Delete events

a. Select one or more events.
b. Click **Delete**, and then confirm deletion.

Viewing task status and history

Overview

Tasks are any printer management activities performed in MVE, such as printer discovery, audit, and configurations enforcement. The Status page shows the status of all currently running tasks and the tasks run in the last 72 hours. Information on the currently running tasks is entered into the log. Tasks older than 72 hours can be viewed only as individual log entries in the Log page, and can be searched using the task IDs.

Viewing the task status

From the Tasks menu, click **Status**.

Note: The task status is updated in real time.

Stopping tasks

1. From the Tasks menu, click **Status**.
2. From the Currently Running Tasks section, select one or more tasks.
3. Click **Stop**.

Viewing logs

1. From the Tasks menu, click **Logs**.
2. Select task categories, task types, or a time period.

   Notes:

   - Use the search field to search for multiple Task IDs. Use commas to separate multiple Task IDs or a hyphen to indicate a range. For example, `11, 23, 30-35`.
   - To export the search results, click **Export to CSV**.

Clearing logs

1. From the Tasks menu, click **Log**.
2. Click **Clear Log**, and then select a date.
3. Click **Clear Log**.

Exporting logs

1. From the Tasks menu, click **Log**.
2. Select task categories, task types, or a time period.

3 Click **Export to CSV**.

Scheduling tasks

Creating a schedule

1. From the Tasks menu, click **Schedule** > **Create**.
2. From the General section, type a unique name for the scheduled tasks and its description.
3. From the Task section, do one of the following:

Schedule an audit

a. Select **Audit**.

b. Select a saved search.

Schedule a conformance check

a. Select **Conformance**.

b. Select a saved search.

Schedule a printer status check

a. Select **Current Status**.

b. Select a saved search.

c. Select an action.

Schedule a configuration deployment

a. Select **Deploy File**.

b. Select a saved search.

c. Browse to the file, and then select the file type.

d. If necessary, select a deployment method or protocol.

Schedule a discovery

a. Select **Discovery**.

b. Select a discovery profile.

Schedule a configuration enforcement

a. Select **Enforcement**.

b. Select a saved search.

Schedule a certificate validation

Select **Validate Certificate**.

Note: During validation, MVE communicates with the CA server to download the certificate chain and the Certificate Revocation List (CRL). The enrolment agent certificate is also generated. This certificate enables the CA server to trust MVE.

Schedule a view export

a Select **View Export**.

b Select a saved search.

c Select a view template.

d Type the list of e-mail addresses where the exported files are sent.

4 From the Schedule section, set the date, time, and frequency of the task.

5 Click **Create Scheduled Task**.

Managing scheduled tasks

1 From the Tasks menu, click **Schedule**.

2 Do either of the following:

Edit a scheduled task

a Select a task, and then click **Edit**.

b Configure the settings.

c Click **Edit Scheduled Task**.

Note: The Last Run information is removed when a scheduled task is edited.

Delete a scheduled task

a Select a task, and then click **Delete**.

b Click **Delete Scheduled Task**.

Performing other administrative tasks

Configuring general settings

1. Click ⚙ on the upper-right corner of the page.
2. Click **General**, and then select a host name source.
   - **Printer**—The system retrieves the host name from the printer.
   - **Reverse DNS Lookup**—The system retrieves the host name from the DNS table using the IP address.
3. Set the alert reregistration frequency.

   Note: Printers may lose the alert registration state when changes are made, such as rebooting or updating the firmware. MVE attempts to recover the state automatically on the next interval set in the alert reregistration frequency.
4. Click **Save Changes**.

Configuring e-mail settings

Enable SMTP configuration to let MVE send data export files and event notifications through e-mail.

1. Click ⚙ on the upper-right corner of the page.
2. Click **E-mail**, and then select **Enable E-mail SMTP configuration**.
3. Type the SMTP mail server and port.
4. Select the proper encryption.

   Notes:

   - For SSL encryption, select port 465.
   - For TLS/STARTTLS encryption, select port 587.
5. Type the e-mail address of the sender.
6. If a user must log in before e-mailing, then select **Login required**, and then type the user credentials.
7. Click **Save Changes**.

Adding a login disclaimer

You can configure a login disclaimer to be shown when users log in with a new session. Users must accept the disclaimer before they can access MVE.

1. Click ⚙ on the upper-right corner of the page.
2. Click **Disclaimer**, and then select **Enable disclaimer prior to login**.
3. Type the disclaimer text.
4. Click **Save Changes**.

Signing the MVE certificate

Secure Socket Layer (SSL) or Transport Layer Security (TLS) is a security protocol that uses data encryption and certificate authentication to protect server-client communication. In MVE, TLS is used to protect the sensitive information shared between the MVE server and the web browser. The protected information can be printer passwords, security policies, MVE user credentials, or printer authentication information, such as LDAP or Kerberos.

TLS enables the MVE server and the web browser to encrypt the data before sending it, and then decrypt it after it is received. SSL also requires the server to present the web browser with a certificate that proves that the server is who it claims to be. This certificate is either self-signed or signed using a trusted third-party CA. By default, MVE is configured to use a self-signed certificate.

1 Download the certificate signing request.

  a Click ⚙ on the upper-right corner of the page.

  b Click **TLS** > **Download**.

  c Select **Certificate signing request**.

  Note: The certificate signing request includes Subject Alternative Names (SANs).

2 Use a trusted CA to sign the certificate signing request.

3 Install the CA-signed certificate.

  a Click ⚙ on the upper-right corner of the page.

  b Click **TLS** > **Install Signed Certificate**.

  c Upload the CA-signed certificate, and then click **Install Certificate**.

  d Click **Restart MVE Service**.

  Note: Restarting the MVE service reboots the system, and the server may be unavailable for the next few minutes. Before restarting the service, make sure that no tasks are currently running.

Removing user information and references

MVE is compliant with the data protection rules under General Data Protection Regulation (GDPR). MVE can be configured to apply the right to be forgotten and remove private user information from the system.

Removing users

1 Click ⚙ on the upper-right corner of the page.

2 Click **User**, and then select one or more users.

3 Click **Delete** > **Delete Users**.

Removing user references in LDAP

1 Click ⚙ on the upper-right corner of the page.

2 Click **LDAP**.

3 Remove any user-related information in the search filters and binding settings.

Removing user references in the e-mail server

1. Click ⚙ on the upper-right corner of the page.
2. Click **E-mail**.
3. Remove any user-related information, such as user credentials used for authenticating with the e-mail server.

Removing user references in the task logs

For more information, see "Clearing logs" on page 137.

Removing user references in a configuration

1. From the Configurations menu, click **All Configurations**.
2. Click the configuration name.
3. From the Basic tab, remove any user-related values from the printer settings, such as contact name and contact location.

Removing user references in an advanced security component

1. From the Configurations menu, click **All Advanced Security Components**.
2. Click the component name.
3. From the Advanced Security Settings section, remove any user-related values.

Removing user references in saved searches

1. From the Printers menu, click **Saved Searches**.
2. Click a saved search.
3. Remove any search rule that uses any user-related values, such as contact name and contact location.

Removing user references in keywords

1. From the Printers menu, click **Printer Listing**.
2. Unassign user-related keywords from the printers.
3. From the Printers menu, click **Keywords**.
4. Remove any keyword that uses user-related information.

Removing user references in events and actions

1. From the Printers menu, click **Events & Actions**.
2. Remove any actions that contain e-mail references to users.

Frequently asked questions

Markvision Enterprise FAQ

Why can I not choose multiple printers in the supported models list when creating a configuration?

Configuration settings and commands differ between printer models.

Can other users access my saved searches?

Yes. All users can access saved searches.

Where can I find the log files?

You can find the installation log files in the hidden directory of the user installing MVE. For example, **`C:\Users\Administrator\AppData\Local\Temp\mveLexmark-install.log`**.

You can find the ***.log** application log files in the ***`installation_dir`*`\Lexmark\Markvision Enterprise\tomcat\logs`** folder, where ***`installation_dir`*** is the installation folder of MVE.

What is the difference between host name and reverse DNS lookup?

A host name is a unique name assigned to a printer on a network. Each host name corresponds to an IP address. Reverse DNS lookup is used to determine the designated host name and domain name of a given IP address.

Where can I find reverse DNS lookup in MVE?

Reverse DNS lookup can be found in the general settings. For more information, see "Configuring general settings" on page 141.

How do I manually add rules to the Windows firewall?

Run the command prompt as an administrator, and then type the following:

```
firewall add allowedprogram "installation_dir/Lexmark/Markvision
Enterprise/tomcat/bin/tomcat9.exe" "Markvision Enterprise Tomcat"
firewall add portopening UDP 9187 "Markvision Enterprise NPA UDP"
firewall add portopening UDP 6100 "Markvision Enterprise LST UDP"
```

Where ***`installation_dir`*** is the installation folder of MVE.

How do I set up MVE to use a different port than port 443?

1 Stop the Markvision Enterprise service.

   a Open the Run dialog box, and then type **`services.msc`**.

   b Right-click **Markvision Enterprise**, and then click **Stop**.

2 Open the ***installation_dir*\Lexmark\Markvision Enterprise\tomcat\conf\server.xml** file.

Where ***installation_dir*** is the installation folder of MVE.

3 Change the **Connector port** value to another unused port.

```
<Connector port="443" protocol="org.apache.coyote.http11.Http11NioProtocol"
sslImplementationName="org.apache.tomcat.util.net.jsse.JSSEImplementation"
SSLEnabled="true" scheme="https" secure="true" clientAuth="false"
compression="on" compressableMimeType="text/html,text/xml,text/plain,text/css,
text/javascript,application/javascript,application/json" maxThreads="150"
maxHttpHeaderSize="16384" minSpareThreads="25" enableLookups="false"
acceptCount="100" connectionTimeout="120000" disableUploadTimeout="true"
URIEncoding="UTF-8" server="Apache" sslEnabledProtocols="TLSv1,TLSv1.1,TLSv1.2"
sslProtocol="TLS" keystoreFile="C:/Program Files/Lexmark/Markvision Enterprise/
../mve_truststore.p12" keystorePass="markvision" keyAlias="mve" keyPass="markvision"
keystoreType="PKCS12" ciphers="TLS_ECDHE_RSA_WITH_AES_128_CBC_SHA256,
TLS_ECDHE_RSA_WITH_AES_128_CBC_SHA,TLS_RSA_WITH_AES_128_CBC_SHA256,
TLS_RSA_WITH_AES_128_CBC_SHA"/>
```

4 Change the **redirectPort** value to the same port number used as the connector port.

```
<Connector port="9788" maxHttpHeaderSize="16384" maxThreads="150" minSpareThreads="25"
enableLookups="false" redirectPort="443" acceptCount="100" connectionTimeout="120000"
disableUploadTimeout="true" compression="on" compressableMimeType="text/html,text/xml,
text/plain,text/css,text/javascript,application/javascript,application/json"
URIEncoding="UTF-8" server="Apache"/>
```

5 Restart the Markvision Enterprise service.

a Open the Run dialog box, and then type **services.msc**.

b Right-click **Markvision Enterprise**, and then click **Restart**.

6 Access MVE using the new port.

For example, open a web browser, and then type **https://*MVE_SERVER*:*port*/mve**.

Where ***MVE_SERVER*** is the host name or IP address of the server hosting MVE, and ***port*** is the connector port number.

How do I customize the ciphers and TLS versions that MVE uses?

1 Stop the Markvision Enterprise service.

a Open the Run dialog box, and then type **services.msc**.

b Right-click **Markvision Enterprise**, and then click **Stop**.

2 Open the ***installation_dir*\Lexmark\Markvision Enterprise\tomcat\conf\server.xml** file.

Where ***installation_dir*** is the installation folder of MVE.

3 Configure the ciphers and TLS versions.

For more information on the configuration, see the **Apache Tomcat SSL/TLS configuration instructions**.

For more information on the protocols and cipher values, see the **Apache Tomcat SSL support information documentation**.

4 Restart the Markvision Enterprise service.

a Open the Run dialog box, and then type **services.msc**.

b Right-click **Markvision Enterprise**, and then click **Restart**.

How do I manage CRL files when using Microsoft CA Enterprise?

1. Obtain the CRL file from the CA server.

   Notes:

   - For Microsoft CA Enterprise, the CRL is not automatically downloaded through SCEP.
   - For more information, see the *Microsoft Certificate Authority Configuration Guide*.

2. Save the CRL file in the ***installation_dir*\Lexmark\Markvision Enterprise\apps\library\crl** folder, where ***installation_dir*** is the installation folder of MVE.

3. Configure the certificate authority in MVE.

Note: This process is only applicable SCEP protocol is used.

Troubleshooting

User has forgotten the password

Reset the user password

You need administrative rights to reset the password.

1. Click ⚙ on the upper-right corner of the page.
2. Click **User**, and then select a user.
3. Click **Edit**, and then change the password.
4. Click **Save Changes**.

If you have forgotten your own password, then do either of the following:

- Contact another Admin user to reset your password.
- Contact Lexmark Customer Support Center.

Admin user has forgotten the password

Create another Admin user, and then delete the previous account

You can use the Markvision Enterprise Password Utility to create another Admin user.

1. Browse to the folder where Markvision Enterprise is installed.

   For example, **`C:\Program Files\`**
2. Launch the **mvepwdutility-windows.exe** file in the Lexmark\Markvision Enterprise\ directory.
3. Select a language, and then click **OK** > **Next**.
4. Select **Add User Account** > **Next**.
5. Enter the user credentials.
6. Click **Next**.
7. Access MVE, and then delete the previous Admin user.

   Note: For more information, see “Managing users” on page 29.

Page does not load

This problem may occur if you have closed the web browser without logging out.

Try one or more of the following:

Clear the cache, and delete the cookies in your web browser

Access the MVE login page, and then log in using your credentials

Open a web browser, and then type **`https://`*`MVE_SERVER`*`/mve/login`**, where ***`MVE_SERVER`*** is the host name or IP address of the server hosting MVE.

Cannot discover a network printer

Try one or more of the following:

Make sure that the printer is turned on

Make sure that the power cord is securely plugged into the printer and into a properly grounded electrical outlet

Make sure that the printer is connected to the network

Restart the printer

Make sure that TCP/IP is enabled on the printer

Make sure that the ports used by MVE are open, and SNMP and mDNS are enabled

For more information, see “Understanding ports and protocols” on page 153.

Contact your Lexmark representative

Incorrect printer information

Perform an audit

For more information, see “Auditing printers” on page 60.

MVE does not recognize a printer as a secured printer

Make sure that the printer is secured

For more information on securing printers, see the *Markvision Enterprise And Printer Security* document.

Make sure that mDNS is turned on and is not blocked

Delete the printer, and then rerun the printer discovery

For more information, see “Discovering printers” on page 33.

Enforcement of configurations with multiple applications fails in the first attempt but succeeds in the subsequent attempts

Increase the timeouts

1. Browse to the folder where Markvision Enterprise is installed.

   For example, `C:\Program Files\`

2. Navigate to the Lexmark\Markvision Enterprise\apps\dm-mve\WEB-INF\classes folder.
3. Using a text editor, open the *platform.properties* file.
4. Edit the `cdcl.ws.readTimeout` value.

   Note: The value is in milliseconds. For example, 90000 milliseconds is equal to 90 seconds.

5. Using a text editor, open the *devCom.properties* file.
6. Edit the `lst.responseTimeoutsRetries` values.

   Note: The value is in milliseconds. For example, 10000 milliseconds is equal to 10 seconds.

   For example, `lst.responseTimeoutsRetries=10000 15000 20000`. The first connection retry is after 10 seconds, the second connection retry is after 15 seconds, and the third connection retry is after 20 seconds.

7. If necessary, when you are using LDAP GSSAPI, then create a *parameters.properties* file.

   Add the following setting: `lst.negotiation.timeout=400`

   Note: The value is in seconds.

8. Save the changes.

Enforcement of configurations with printer certificate fails

Sometimes, no new certificate is issued during enforcement.

Increase the number of enrolment retries

Add the following key in the **platform.properties** file:

```
enrol.maxEnrolmentRetry=10
```

The retry value must be greater than five.

OpenXPKI Certificate Authority

Certificate issuance failed using the OpenXPKI CA server

Make sure that the “signer on behalf” key in MVE matches the authorized signer key in the CA server

For example:

If the following is the **ca.onBehalf.cn** key in the **platform.properties** file in MVE,

```
ca.onBehalf.cn=Markvision_SQA-2012-23AB.lrdc.lexmark.ds
```

then the following must be the **authorized_signer** key in the **generic.yaml** file in the CA server.

```
rule1:
            # Full DN
                    Subject: CN=Markvision_SQA-2012-23AB.lrdc.lexmark.ds
```

For more information on configuring the OpenXPKI CA server, see the *OpenXPKI Certificate Authority Configuration Guide*.

An internal server error occurs

Install the en_US.utf8 locale

1. Run the **`dpkg-reconfigure locales`** command.
2. Install the **en_US.utf8** (locale -a | grep en_US) locale.

The login prompt does not appear

When accessing **http://yourhost/openxpki/**, you get only the Open Source Trustcenter banner, without a login prompt.

Enable `fcgid`

Run the following commands:

1. `a2enmod fcgid`
2. `service apache2 restart`

A nested connector without class error occurs

An **`EXCEPTION: Nested connector without class (scep.scep-server-1.connector.initial)`** error at /usr/share/perl5/Connector/Multi.pm line 201 appears.

Update `scep.scep-server-1`

In **/etc/openxpki/config.d/realm/REALM/scep/generic.yaml**, replace **`scep.scep-server-1`** with **`scep.generic`**.

Note: Replace **`REALM`** with the name of your realm. For example, when using the default realm, use **`ca-one`**.

```
eligible:
     initial:
            value@: connector:scep.generic.connector.initial
```

Cannot manually approve certificates

The Manual Approve button does not appear when approving certificates manually.

Update `scep.scep-server-1`

In **/etc/openxpki/config.d/realm/REALM/scep/generic.yaml**, replace **`scep.scep-server-1`** with **`scep.generic`**.

Note: Replace **`REALM`** with the name of your realm. For example, when using the default realm, use **`ca-one`**.

```
eligible:
     initial:
            value@: connector:scep.generic.connector.initial
```

A Perl error occurs when approving enrollment requests

Update `scep.scep-server-1`

In **/etc/openxpki/config.d/realm/REALM/scep/generic.yaml**, replace **`scep.scep-server-1`** with **`scep.generic`**.

Note: Replace **`REALM`** with the name of your realm. For example, when using the default realm, use **`ca-one`**.

```
eligible:
     initial:
            value@: connector:scep.generic.connector.initial
```

The `ca-signer-1` and `vault-1` tokens are offline

The System Status page shows that the **`ca-signer-1`** and **`vault-1`** tokens are offline.

Try one or more of the following:

Change the certificate key password

In **/etc/openxpki/config.d/realm/ca-one/crypto.yaml**, change the certificate key password.

Create correct symlinks and copy the key file

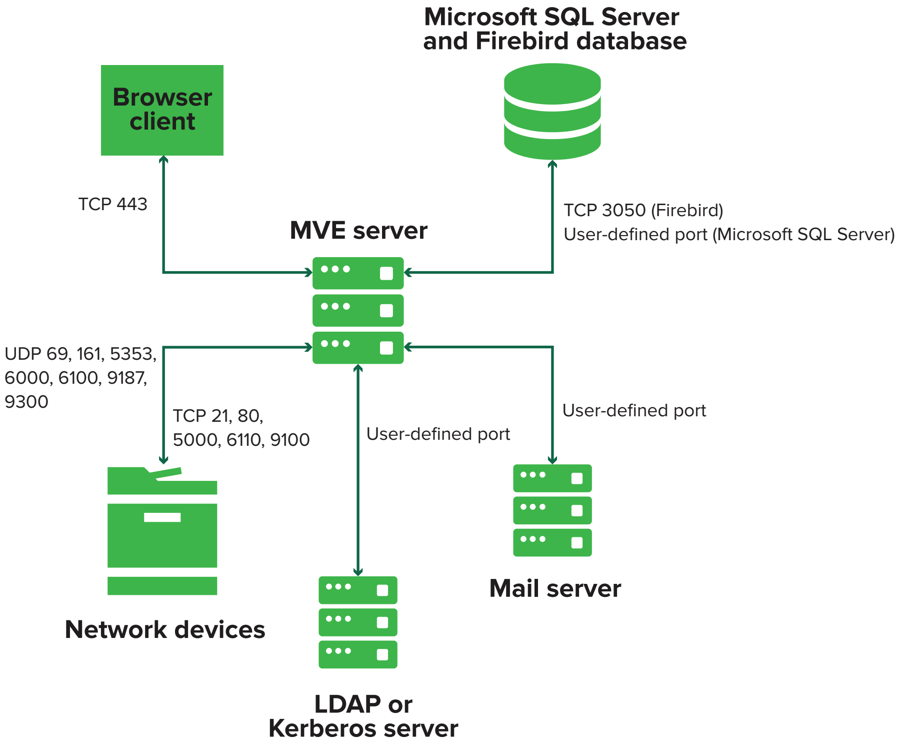
For more information, see “Copying the key file and creating a symlink” on page 102.

Make sure that the key file is readable by OpenXPKI

Appendix

Understanding ports and protocols

MVE uses different ports and protocols for several types of network communication, as shown in the following diagram:


Microsoft SQL Server and Firebird database
Browser client
TCP 443
MVE server
TCP 3050 (Firebird)
User-defined port (Microsoft SQL Server)
UDP 69, 161, 5353, 6000, 6100, 9187, 9300
TCP 21, 80, 5000, 6110, 9100
User-defined port
User-defined port
Network devices
Mail server
LDAP or Kerberos server

Notes:

- The ports are bidirectional and must be open or active for MVE to function properly. Make sure that all the printer ports are enabled.
- Some communications require an ephemeral port, which is an allocated range of available ports on the server. When a client requests a temporary communication session, the server assigns a dynamic port to the client. The port is valid only for a short duration and can become available for reuse when the previous session expires.

Server-to-printer communication

Ports and protocols used during communication from the MVE server to network printers

Protocol	MVE server	Printer	Used for
Network Printing Alliance Protocol (NPAP)	UDP 9187	UDP 9300	Communicating with Lexmark network printers.
XML Network Transport (XMLNT)	UDP 9187	UDP 6000	Communicating with some Lexmark network printers.

Protocol	MVE server	Printer	Used for
Lexmark Secure Transport (LST)	UDP 6100 Ephemeral Transmission Control Protocol (TCP) port (handshaking)	UDP 6100 TCP 6110 (handshaking)	Communicating securely with some Lexmark network printers.
Multicast Domain Name System (mDNS)	Ephemeral User Datagram Protocol (UDP) port	UDP 5353	Discovering Lexmark network printers and determining the security capabilities of printers. **Note:** This port is required to allow MVE to communicate with secured printers.
Simple Network Management Protocol (SNMP)	Ephemeral UDP port	UDP 161	Discovering and communicating with Lexmark and third-party network printers.
File Transfer Protocol (FTP)	Ephemeral TCP port	TCP 21 TCP 20	Deploying files.
Hypertext Transfer Protocol (HTTP)	Ephemeral TCP port	TCP 80	Deploying files or enforcing configurations.
		TCP 443	Deploying files or enforcing configurations.
Hypertext Transfer Protocol over SSL (HTTPS)	Ephemeral TCP port	TCP 161 TCP 443	Deploying files or enforcing configurations.
RAW	Ephemeral TCP port	TCP 9100	Deploying files or enforcing configurations.

Printer-to-server communication

Port and protocol used during communication from network printers to the MVE server

Protocol	Printer	MVE server	Used for
NPAP	UDP 9300	UDP 9187	Generating and receiving alerts

Server-to-database communication

Ports used during communication from the MVE server to databases

MVE server	Database	Used for
Ephemeral TCP port	User-defined port. The default port is TCP 1433.	Communicating with an SQL Server database.
Ephemeral TCP port	TCP 3050	Communicating with a Firebird database.

Client-to-server communication

Port and protocol used during communication from the browser client to the MVE server

Protocol	Browser Client	MVE server
Hypertext Transfer Protocol over SSL (HTTPs)	TCP port	TCP 443

Server-to-mail-server communication

Port and protocol used during communication from the MVE server to a mail server

Protocol	MVE server	SMTP server	Used for
Simple Mail Transfer Protocol (SMTP)	Ephemeral TCP port	User-defined port. The default port is TCP 25.	Providing the e-mail functionality used to receive alerts from printers.

Server-to-LDAP-server communication

Ports and protocols used during communication from the MVE server to an LDAP server involving user groups and authentication functionality

Protocol	MVE server	LDAP server	Used for
Lightweight Directory Access Protocol (LDAP)	Ephemeral TCP port	User-defined port. The default port is TCP 389.	Authenticating MVE users using an LDAP server.
Lightweight Directory Access Protocol over TLS (LDAPS)	Ephemeral TCP port	User-defined port. The default port is TCP 636.	Authenticating MVE users using an LDAP server over TLS.
Kerberos	Ephemeral UDP port	User-defined port. The default port is UDP 88.	Authenticating MVE users using Kerberos.

Enabling automatic approval of certificate requests in Microsoft CA

By default, all CA servers are in pending mode and you must manually approve each signed certificate request. Since this method is not feasible for bulk requests, enable the automatic approval of signed certificates.

1. From Server Manager, click **Tools** > **Certification Authority**.
2. From the left panel, right-click the CA, and then click **Properties** > **Policy Module**.
3. From the Request Handling tab, click **Follow the settings in the certificate template if applicable**, and then click **OK**.

   Note: If **Set the certificate request status to pending** is selected, then you must manually approve the certificate.
4. Restart the CA service.

Revoking certificates

Note: Before you begin, make sure that the CA server is configured for CRLs and that they are available.

1. From the CA server, open **Certification Authority**.
2. From the left panel, expand the CA, and then click **Issued Certificates**.
3. Right-click a certificate to revoke, and then click **All Tasks** > **Revoke Certificate**.
4. Select a reason code and the date and time for revocation, and then click **Yes**.
5. From the left panel, right-click **Revoked Certificates**, and then click **All Tasks** > **Publish**.

   Note: Make sure that the certificate that you revoked is in Revoked Certificates.

You can see the revoked certificate serial number in the CRL.

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** JmDNS

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Glossary

action
An e-mail notification or a command-line operation. Actions assigned to events are triggered when a printer alert occurs.

audit
The task of collecting printer data such as printer status, supplies, and capabilities.

configuration
A collection of settings that can be assigned and enforced to a printer or a group of printer models. Within a configuration, you can modify printer settings and deploy applications, licenses, firmware, and CA certificates to the printers.

discovery profile
A profile that contains a set of parameters used to find printers on a network. It may also contain predefined configurations that can be assigned and enforced to printers automatically during the discovery.

event
Defines which actions are executed when specific alerts are active.

keyword
A custom text assigned to printers that you can use to search for those printers within the system. When you filter a search using a keyword, only printers that are tagged with the keyword are shown.

secured printer
A printer that is configured to communicate through an encrypted channel, and requires authentication to access its functions or applications.

token
An identifier that represents printer data values for variable settings in a configuration.

variable settings
A set of printer settings containing dynamic values that can be integrated into a configuration.

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