



Centralized License Manager

Release 20.6

CLM User Guide

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About this document

Purpose

The *CLM User Guide* describes how to configure and use the Centralized License Manager.

Safety information

For your safety, this document contains safety statements. Safety statements are given at points where risks of damage to personnel, equipment, and operation may exist. Failure to follow the directions in a safety statement may result in serious consequences.

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1 Getting Started

1.1 List of abbreviations

Abbreviation	Definition
ASL	Application Specific License
CBAM	CloudBand Application Manager
CLM	Centralized License Manager
CLR	Customer License Repository
CMG	Cloud Mobile Gateway
CPM	Control Plane Module
CSR	Certificate Signing Request
PSS	Photonic Service Switch
UID	Unique ID
UUID	Universally Unique Identifier
VM	Virtual Machine
VNF	Virtual Network Function
VSR-I	Virtualized Service Router Integrated

1.2 Overview

The Centralized License Manager (CLM) provides simplification of network function license management. Using the CLM, operators can flexibly control license entitlement and monitor license usage for their managed network functions. The CLM server communicates with the managed network as well as the license key repository that is used to store the license keys for network functions.



CAUTION

Service Disruption

A CLM instance is node-locked to the server where it is installed.

Network Pool Keys issued by Nokia are tied to a specific CLM instance by its UUID.

Resource and network parameters associated with the CLM server shall not be altered after Network Pool Keys are received for a specific CLM instance.

An operator may migrate a CLM instance within a VM environment only if the server resource and network characteristics remain constant.

i **Note:** The user profile of the user entered in the connection properties of the network function must be configured to use classic CLI

i **Note:** There are three types of CLM users defined by a system administrator during CLM installation:

- system administrators, who automatically have read/write access to CLM
- users with read/write access to CLM, as defined by the user access control function of the User Manager application
- users with read-only access to CLM, as defined by the user access control function of the User Manager application

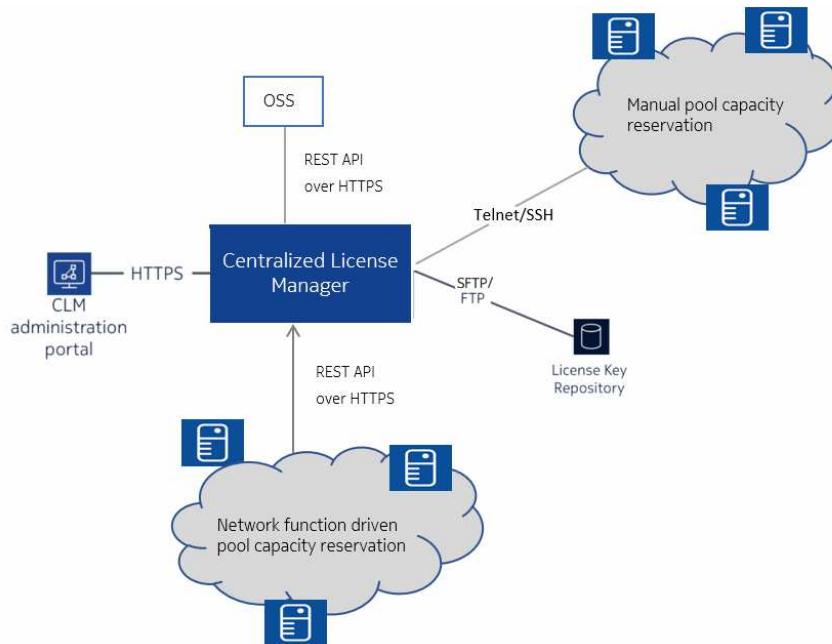
1.3 Architecture

There are two deployment modes of CLM:

- Standalone - CLM is deployed on a single bare metal server or virtual machine (VM).
- Redundant - CLM is deployed on two bare metal servers or VMs. There is an active and a standby instance of the CLM in this deployment mode.

The following Figure shows the architecture of CLM.

Figure 1-1 CLM architecture



CLM comprises of an administration portal and a server. The CLM administration portal is a GUI that allows an operator to perform administrative functions such as uploading licenses and viewing notifications.

The CLM server has the business logic for license management. The network license pool is maintained here for each network function type, as defined by the network pool key. A network pool key is a file that defines the quantity or pool of ASLs for a specific network function.

i **Note:** The operator must acquire the network pool key for the specific network function type and version from the Nokia Supply Chain.

License entitlement for a network function involves license pool capacity reservation. The CLM reserves pool capacity per network function using the following methods:

- Manual pool capacity reservation
- Network function driven pool capacity reservation

1.3.1 Manual pool capacity reservation

The CLM server communicates with the managed network functions as well as the license key repository that is used to store the license keys used by the network functions. The CLM application allows an operator to configure, manage, and monitor the license key deployment.

Examples of network functions that use manual pool capacity reservation include Virtual Service Router Integrated (VSR-I), 7x50 Service Router/Extensible Routing System (7x50 SR/XRS), and Cloud Mobile Gateway (CMG).

1.3.2 Network function driven pool capacity reservation

The CLM supports license pool reservation that is initiated by the network function via REST API. In this mode of operation, the operator reserves entitlements through their actions and the configuration of the individual network functions. The CLM application allows an operator to monitor the usage of all network functions of a given product, or individual network functions.

The 1830 Photonic Service Switch (1830 PSS), Release 12 and later, is an example of a network function that uses network function driven pool capacity reservation.

1.4 How do I start the CLM application?

The browser-based NSP Launchpad is the graphical operator interface that provides access to CLM and NSP applications.


- 1 _____
Navigate to the NSP Launchpad:
server/login
where *server* is the IP address of the CLM server
- 2 _____
Enter your login credentials and click **SIGN IN**.

3

Click the Centralized License Manager application icon. The CLM application launches.

END OF STEPS

1.5 How do I access the CLM application help?

The CLM has application help to guide operators in the use of the interface. Application help is delivered in the NSP Help Center, which can be opened by clicking **Open Help Center**  on the NSP Launchpad or the CLM application banner bar.

1.6 Workflow for typical CLM operator configuration

1.6.1 Manual pool capacity reservation

1

Obtain your network pool key(s) from the Nokia Supply Chain; see [2.1 “How do I obtain a network pool key?” \(p. 13\)](#).

2

Upload your network pool key(s); see [2.2 “How do I upload a network pool key?” \(p. 13\)](#).

3

Configure your customer license repositories; see [3.3 “How do I configure a license repository?” \(p. 17\)](#).

4

Define your network functions; see [4.2 “How do I define a network function?” \(p. 21\)](#).

5

Generate and deploy license keys; see [4.10 “How do I manually generate and deploy a license key?” \(p. 30\)](#) or [4.12 “How do I enable license key auto-renewal?” \(p. 33\)](#).

6

Optional for CMGs managed by CBAM only, enable dynamic licensing; see [4.15 “How do I configure dynamic license management for CMG?” \(p. 36\)](#).

END OF STEPS

1.6.2 Network function driven pool capacity reservation

1

Obtain your network pool key(s) from the Nokia Supply Chain; see [2.1 “How do I obtain a network pool key?” \(p. 13\)](#).

2 Upload your network pool key(s); see [2.2 “How do I upload a network pool key?”](#) (p. 13).

3 License pool management for the network function is done on CLM.
Pool capacity reservation of ASLs from the license pool and license grant via secure REST API based on network function request.


4 Follow the node specific instructions to configure your network function for use with CLM; see the appropriate node documentation.


END OF STEPS

2 Network Pool Keys

2.1 How do I obtain a network pool key?

Before entitlements can be associated with a network function, you need to first obtain a network pool key from Nokia. A network pool key is a file that contains details about the quantities and entitlements assigned to a specific release of a network function; for example, VSR-I Release 16.0. A network pool key contains an expiry date, after which time the ability to generate license keys for network functions is unavailable. The CLM provides a notification if the network pool key is nearing its expiry date. Network pool keys are digitally signed and the CLM rejects keys that have been tampered with.

 **Note:** A network pool key is locked to a specific CLM installation.

- 1 _____
Sign in as a user with read/write access to CLM and launch the CLM application.
- 2 _____
Click the **CONFIGURATION** tab and then click System Information.
- 3 _____
Click **Download**  next to the System Certificate Signing Request (CSR) label.
- 4 _____
Send the downloaded file (zip archive) to your Nokia representative.

END OF STEPS

When Nokia receives the zip file containing the downloaded CSR and UUID information (and the secondary UUID if required), a network pool key is provided back to you which can be uploaded on CLM.

2.2 How do I upload a network pool key?

To generate license keys for network functions, you must first upload your network pool key(s) into the CLM. Your network pool key may come to you as a zip archive file from Nokia. You can upload the network pool keys you have received from Nokia, there is no need to unzip the file.

If you have already uploaded a network pool key for the same product and license type, you will replace the currently uploaded network pool key with the new one.

- 1 _____
Sign in as a user with read/write access to CLM and launch the CLM application.

2

Click the **NETWORK POOL KEYS** tab and click **+ ADD POOL KEY**.

3

Choose a file and click **UPLOAD**. A message appears confirming the upload was successful and a network pool key tile appears as a visual representation.

If an error message appears instead, see [2.3 “What does this network pool key upload error mean?”](#) (p. 13).

END OF STEPS

2.3 What does this network pool key upload error mean?

When you upload a network pool key, there are a number of errors that can occur. Contact Nokia to resolve any problems.

Common errors include:

Error	Cause
Invalid UUID	The UUID specified in the network pool key does not match the UUID of your CLM.
Invalid field: expiry date	The network pool key has expired and cannot be used.
Zip archive processing error	The zip file is corrupt.
Invalid signature	The network pool key has an invalid signature and might have been tampered with.
Parsing error	There was a problem parsing the network pool key.
Invalid pool key certificate	The network pool key was generated using a CSR from another CLM. This could happen if a user sends an older CSR after they have re-installed CLM.

2.4 How do I remove a network pool key?

After a pool key is no longer required, for example it has expired, you can remove the pool key from the CLM.

i **Note:** You receive an error message if you attempt to remove a network pool key that has associated network functions. You must delete all network functions that reference the network pool key first.

1

Sign in as a user with read/write access to CLM and launch the CLM application.

2 _____

Click the **NETWORK POOL KEYS** tab.

3 _____

On the network pool key tile, click **More**  , **Remove**. A confirmation pop-up opens.

4 _____

Click **REMOVE**. The network pool key is removed from the CLM.

END OF STEPS _____

2.5 How do I view details of a network pool key?

Uploaded network pool keys are displayed as tiles on the Network Pool Keys page. The tile provides the product, release, license type, and expiry date of the network pool key. The network pool key tile displays a warning icon if the network pool key is nearing its expiry date, or if the amount of allocated entitlements has exceeded one of the thresholds.

You can view more information about your network pool keys, such as common properties (for example, product, license type, and activation date), as well as the entitlements that the product-specific network pool key provides.

1 _____

Sign in and launch the CLM application.

2 _____

Click the **NETWORK POOL KEYS** tab.

3 _____

On the network pool key tile, click **More**  , **View Information**.

END OF STEPS _____

2.6 How do I view allocated entitlements for a selected network pool key?

1 _____

Sign in and launch the CLM application.

2 _____

Click the **NETWORK POOL KEYS** tab.

3 _____

Click on a network pool key tile. A list of entitlements displays.

-
- The Release column displays release specific information for entitlements of network functions that have been upgraded. If no value is listed, the entitlement supports the original release of the network function. A range [x-y] specifies the release range that an entitlement is valid for. A [x+] value specifies the release an entitlement was introduced in.
 - The Allocated column displays how much of the entitlement has been allocated to your various network functions.
 - The Available column shows how much of the entitlement remains for future use.
 - The Allocatable column displays a count of the total amount of the entitlement that is provided by the network pool key.
 - A notification icon appears when an entitlement has approached or exceeded the set thresholds.

END OF STEPS

2.7 How do I download a usage report for a network pool key?

You can download a report in CSV or Text format on the current usage of a network pool key. A report can be generated for one network pool key at a time. The report contains the following information:

- Report generation date/time
- Activation Date
- Expiration Date
- Number of network functions
- For each entitlement in the network pool key, numbers for: allocated, available and allocatable

1

Sign in and launch the CLM application.

2

Click the **NETWORK POOL KEYS** tab.

3

On the network pool key tile, click **More**  and choose one of the following:

- **Download Usage Report (CSV)**
- **Download Usage Report (TEXT)**

END OF STEPS

3 License Repositories

3.1 Introduction

This chapter only applies to SFTP/FTP based license repositories for manual pool capacity reservation. Examples of network functions that use manual pool capacity reservation include VSR-I, 7x50 SR/XRS, and CMG.

3.2 What is a license repository?

A license repository contains information about the SFTP/FTP server that is used by your network functions (for example, VSR-I) to obtain their license key files. This information is used by the CLM to connect, log in, and manage license key files that the CLM generates and are referenced by the network functions. Once a license repository has been created in CLM, it can be assigned to network functions. When you generate and deploy a license key for a specific network function, the information defined in the license repository assigned to the network function is used for license key management.

For an SR network function, the preferred method of license key storage is local storage. See [4.2 “How do I define a network function?” \(p. 21\)](#) for information about setting local storage as the license repository.

3.3 How do I configure a license repository?


i **Note:** Create one license repository for each unique location that you want to store license keys. A location is unique if its server IP address and Full Directory Path are different than another license repository.

- 1 _____
Sign in as a user with read/write access to CLM and launch the CLM application.
- 2 _____
Click the **CONFIGURATION** tab and then click License Repositories.
- 3 _____
Click **+ ADD**. The Add License Repository form opens.
- 4 _____
Configure the required parameters, ensuring that:
 - The **Name** is unique.
 - The login credentials are correct.
 - The repository type is correct.

-
- The directory specified by **Full Directory Path** exists and the user specified in the connection properties has read/write permissions to the directory.
 - The directory is specified relative to root of the file system.

5

Click **SAVE**.

 **Note:** After you create a license repository, wait for a few minutes as the CLM automatically validates the connection.

END OF STEPS

3.4 How do I edit a license repository?


1

Sign in as a user with read/write access to CLM and launch the CLM application.

2

Click the **CONFIGURATION** tab and then click License Repositories.

3

Click **Edit**  for the License Repository you want to edit. The Edit License Repository form opens.


4

Edit the parameters.

- The **Name** must be unique.
- You cannot change the **Full Directory Path** after you have associated network functions to the license repository.


5


Click **SAVE**.

 **Note:** After you edit a license repository, wait for a few minutes as the CLM automatically validates the connection.

END OF STEPS

3.5 How do I delete a license repository?

 **Note:** You will receive an error message if you attempt to delete a license repository that has been assigned to one or more network functions.

-
- 1 _____
Sign in as a user with read/write access to CLM and launch the CLM application.
 - 2 _____
Un-assign the license repository from any network functions that are referencing it. Do this by editing a network function and setting the **License Repository** property to 'None'.
 - 3 _____
Click the **CONFIGURATION** tab and then click License Repositories.
 - 4 _____
Click **Delete**  for the License Repository you want to delete. A delete confirmation pop-up opens.
 - 5 _____
Click **DELETE**.

END OF STEPS _____

4 Manual pool capacity network functions

4.1 Introduction

This chapter only applies to network functions that use manual pool capacity reservation such as VSR-I, 7x50 SR/XRS, and CMG.

NOTICE


Network function requirements

Network functions that use manual pool capacity reservation have the following requirements:

- The UID must be the OAM IP or the Inband IP through which the network function is reachable. IPv4 and IPv6 addresses are supported.
- A network function must have a unique name.
- A network function for a given product type must have a unique UID within that product type.
- The user profile of the user entered in the connection properties of the network function must be configured to use classic CLI.
- For an SR network function, you must ensure the SR user profile has privileges to the “admin” and “bof” subtrees.
- When using dynamic licensing, the name of a CMG should only consist of ASCII characters and not contain the following characters: quote("), forward-slash(/), back-slash(\), asterix(*), question mark(?).

4.2 How do I define a network function?

The CLM application allows you to assign entitlements to your network functions to enable specific features of the network function. An entitlement is a definition of the application specific licenses for a specific network function.

- 1 _____
Sign in as a user with read/write access to CLM and launch the CLM application.
- 2 _____
Click the **NETWORK POOL KEYS** tab.
- 3 _____
On the network pool key tile, click **More**  , **Define Network Function**. The Define Network Function form opens.

4

If the network pool key supports more than one release of a network function, the **Select Product Release** parameter is displayed. Choose the matching major release of the software running on the network function you are defining.

5

Configure the required parameters. The panel on the left side of the form lists the Properties of the network function as well as the groups of entitlements that can be assigned to the network function. The panel indicates which groups contain mandatory fields with a yellow dot icon next to the label.

After you populate the **UID**, **Name**, **Connection Username** and **Connection Password** parameters, the **FETCH UUID** button is enabled. Fetching the UUID, which auto-populates the UUID parameter(s), is only required if you are generating and downloading license keys. If you close the Define Network Function form when the CLM is retrieving the UUID(s), the process is cancelled.

For an SR network function, the preferred setting for the **License Repository** parameter is Local Storage.



Note: If you populate the UUID parameter(s) for a network function and if any one or both UUIDs do not match the network function, deployment will fail.

6

Apply one or more product standard templates, as required.

Certain network functions (for example, VSR-I) support standard sets of functionality that can be applied when creating or editing a network function. If a product supports the product standard templates, the **APPLY TEMPLATES** button is enabled.

- Click **APPLY TEMPLATES**.
- Select one or more product templates to apply.
- Select “Replace all existing entitlements” before applying the template(s).
- Click **APPLY**.

7

Filter the entitlements, as required.

Certain network functions allow you to filter displayed entitlements based on a set of criteria. Filtering allows you to hide the entitlements that are not applicable to the network function you are creating or editing.

If a product supports entitlement filtering, when you click on an entitlement group in the left-side panel, an **ADD FILTER** control appears in the right-side panel.

- Click on the **ADD FILTER** control to select the filter(s) to apply.
- Remove the specified filter(s) to clear the associated filter(s).

8

Select the various entitlements that you want to allocate to the network function. The **DEFINE** button becomes active when all mandatory fields have been populated.



Note: Creating the network function may result in an over-allocation of one or more entitlements. If the over-allocation of any single entitlement exceeds the amount configured in your network pool key, you will receive an error message and the network function is not created. You must either free up the listed entitlements from another network function, or order additional resources from Nokia.

9

Click **DEFINE**.

END OF STEPS

4.3 How do I copy an existing network function?

You can define a network function based on an existing defined network function. All properties and entitlement allocations of the original network function are copied except for: **Name**, **UID** and the **UUID(s)**. Changes made to an entitlement allocation in the original network function after you complete the following procedure are not copied.


1

Sign in as a user with read/write access to CLM and launch the CLM application.

2

Click the **NETWORK FUNCTIONS** tab.

3

Click on a network function from the list that you want to copy and click **Copy** . The Define Network Function form opens and it is pre-populated with the information from the original network function.

4

Edit the properties and entitlement allocations, as required, and click **DEFINE**.

END OF STEPS

4.4 How do I bulk copy network functions?

Use this procedure to bulk copy multiple network functions based on an existing reference network function.

1 _____
Create a reference network function that allocates the common entitlements that you want to bulk copy to new network functions. See [4.2 "How do I define a network function?" \(p. 21\)](#).

2 _____
Create a CSV text file that contains a list of network functions with the following information:

- UID
- Name
- CLI credentials (only if different from the referenced network function)

The CSV must have a format of:

```
Name, UID, Username, Password\n
```

```
<Name>, <UID>, [Username1], [Password1]\n
```

```
...
```


```
<Name>, <UIDN>, [UsernameN], [PasswordN]\n
```

The lines can be terminated with \n or \r\n.

The Username and Password fields are optional. If they are not present, the values from the referenced network function are used. If an optional field is not present, it can be left empty (,,) or with white space (, ,). If there are no optional fields, then they can be omitted. For example, the following is a valid line.

```
Name,UID\n
```

3 _____
Click the **NETWORK FUNCTIONS** tab.

4 _____
Click on a network function from the list and then click **View Details** .

5 _____
Click **+ BULK COPY**.

6 _____
Click **Choose File** and upload the CSV file.

7 _____
Choose one of the following options:

- None - no license keys will be generated
- Deploy License Keys - a new license key will be deployed for each new network function.

-
- Enable Auto-Renewal License Keys - all of the new copied network functions will be auto-renew enabled as they are created.

8

Click **UPLOAD**. A confirmation dialog appears for you to confirm this action.

CLM parses the list, and if successful, creates a new network function for each line in the file.

If an error is returned, no network functions are created. Troubleshoot the error and try again.

Some possible errors include:

- INVALID_FILE_FORMAT - the format is incorrect
- OBJ_NOT_FOUND - the referenced network function doesn't exist in the system
- DUPLICATE_RECORDS_FOUND - duplicate Names or UIDs were used in the file
- DUPLICATE_UNIQUE_FIELD- the set of Names and/or UIDs in the file were not unique in the system
- INVALID_ENTITLEMENT_ALLOCATION - OVER_ALLOCATION - there are insufficient entitlement resources available to create the network functions

END OF STEPS

4.4.1 Bulk Copy example in CSV format

Name,UID, Username, Password

Name1,UID1

Name2,UID2, user, password

Name 3,UID3

4.5 How do I view network functions?

1

Sign in and launch the CLM application.

2

Click the **NETWORK FUNCTIONS** tab. A list of network functions displays.

Use the column headings to sort the network functions, or the column fields to search for a specific network function.

The Auto-renewal Status column indicates if the CLM is automatically generating and deploying new license keys to the network function at periodic intervals.

The Deployed Status column identifies if network functions have deployed license keys on their referenced license repository. However, the network function may not actually be using the deployed key. If there are notifications, this may indicate that the network function did not accept the license key.

The License Expiry column identifies the number of days before the license key will expire. The column will indicate Today or Expired as well.

The Highest Severity column denotes the highest severity notification associated with the network function.

Notifications can be raised on network functions if:


- CLM cannot connect to the network function
- CLM fails to deploy a license key for a network function


3

To view the entitlements that have been associated with the network function, click on a network function from the list and then click **View Details**  .

END OF STEPS

4.6 How do I edit a network function?

 **Note:** Editing a network function may result in an over-allocation of one or more entitlements. If the over-allocation of any single entitlement exceeds the amount configured in your network pool key, you receive an error message and the network function changes will not be saved. You must either free up the listed entitlements from another network function, or order additional resources from Nokia.

 **Note:** You cannot edit a network function while a license key is being deployed or revoked. You will receive an error message stating that the object is busy and that you should re-try the operation.


1

Sign in as a user with read/write access to CLM and launch the CLM application.

2

Click the **NETWORK FUNCTIONS** tab.

3

Click on a network function from the list that you want to modify and click **Edit**  . The Edit Network Function form opens.

4

To change the release of the network function that you want to edit, click **CHANGE RELEASE**. The Change Release pop-up opens. Select a release and click **APPLY**. The pop-up closes.

5

Modify the parameters, as required.

Fetching the UUID, which auto-populates the UUID parameter(s), is only required if you are generating and downloading license keys. If you close the Edit Network Function form when the CLM is retrieving the UUID(s), the process is cancelled.

i **Note:** If you populate the UUID parameter(s) for a network function and if any one or both UUIDs do not match the network function, deployment will fail.

i **Note:** If a network function has a deployed license key, one of the following occurs:

- If you changed the UUID(s) of the network function, the existing license key is revoked.
- If you changed which license repository the network function references, the license key is removed from the original license repository and a new license key is deployed to the new license repository.
- If you set the referenced license repository to 'none' the CLM revokes the license key from the original license repository.

6

Apply one or more product standard templates, as required.

Certain network functions (for example, VSR-I) support standard sets of functionality that can be applied when creating or editing a network function. If a product supports the product standard templates, the **APPLY TEMPLATES** button is enabled.

- Click **APPLY TEMPLATES**.
- Select one or more product templates to apply.
- Select "Replace all existing entitlements" before applying the template(s).
- Click **APPLY**.

7

Filter the entitlements, as required.

Certain network functions allow you to filter displayed entitlements based on a set of criteria. Filtering allows you to hide the entitlements that are not applicable to the network function you are creating or editing.

If a product supports entitlement filtering, when you click on an entitlement group in the left-side panel, an **ADD FILTER** control appears in the right-side panel.

- Click **ADD FILTER** to select the filter(s) to apply.
- Remove the specified filter(s) to clear the associated filter(s).

8

Edit or assign new entitlements to the network function. If you remove or reduce an existing entitlement from a network function, you will receive a warning next to the entitlement stating that you are removing or reducing functionality from the network function.

WARNING: Certain network functions require that you apply configuration changes to them before deploying a new license key that reduces functionality. Consult the network functions operator guide. The edit form panel displays a coloured warning icon next to the group label to indicate which entitlement groups contain entitlements that you have removed or reduced.

9

Click **SAVE** to save your changes to the network function, or cancel the operation by clicking **Close X** in the upper right-hand corner of the edit form.

Changing the functionality of a network function may require a network function reboot for the new functionality to become active. The warning message returned by CLM will indicate if a reboot of the network function is required.

END OF STEPS

4.7 How do I upgrade a network function to a new major release?

When you want to upgrade a network function to a new major release with new features, and ensure seamless operation of the network function, you must first update the network function in CLM prior to the software upgrade.

1

To upgrade an existing network function to a new major software release, you must first obtain and upload a new network pool key from the Nokia Supply Chain that supports the product release into your CLM.

See [2.1 “How do I obtain a network pool key?” \(p. 13\)](#) and [2.2 “How do I upload a network pool key?” \(p. 13\)](#).

2

Change the release of the network function and edit or assign new entitlements. The displayed entitlements are valid for the new release.

See [4.6 “How do I edit a network function?” \(p. 26\)](#).

3

Deploy a new license key file. The file will contain license keys for the network function releases supported by the network pool key.

See [4.10 “How do I manually generate and deploy a license key?” \(p. 30\)](#).

4

Upgrade the network function software to the new release.

See the appropriate node documentation.

END OF STEPS

4.8 How do I upgrade a network function to a new minor release?

When a new minor release of the network function software contains new entitlements that you want to use, perform this procedure to enable CLM to generate a license key that contains the new entitlements.


-
- 1
To upgrade an existing network function to a new minor software release, you may be required to first obtain and upload a new network pool key from the Nokia Supply Chain that supports the product release into your CLM.
See [2.1 “How do I obtain a network pool key?” \(p. 13\)](#) and [2.2 “How do I upload a network pool key?” \(p. 13\)](#).
 - 2
Upgrade the network function software to the new minor release. The new network function minor release is able to operate with the existing network function license key.
See the appropriate node documentation.
 - 3
Edit the network function and enable any of the new entitlements added in the minor release.
See [4.6 “How do I edit a network function?” \(p. 26\)](#).
 - 4
Deploy the new license key file.
See [4.10 “How do I manually generate and deploy a license key?” \(p. 30\)](#).

END OF STEPS

4.9 How do I delete a network function?

You can delete a network function when it is no longer needed. Deleting a network function releases any entitlements assigned to it back to the pool of available entitlements.

If the network function you are deleting has a deployed license key, the CLM revokes the key from the license repository referenced by the network function.

- 1
Sign in as a user with read/write access to CLM and launch the CLM application.
- 2
Click the **NETWORK FUNCTIONS** tab.
- 3
Click on a network function from the list that you want to delete and click **More**  , **Delete**. A confirmation pop-up opens.
- 4
Click **DELETE**.

END OF STEPS

4.10 How do I manually generate and deploy a license key?

4.10.1 Pre-requisite

- “Perform automated license key deployment?” is set to true in the network pool key details.

The duration of any license manually generated and deployed is given by the “Manual License Key Duration in Days” of the network pool key details.

i **Note:** Changing the functionality of a network function may require a network function reboot for the new functionality to become active. The CLM does not automatically reboot the network function.

4.10.2 Deployment steps for VSR-I/7x50 SR

Deploying a license key to the VSR-I/7x50 network functions consists of the following steps.

Step	Description
Validate connection	CLM will validate that it can connect to the network function using the UID and CLI credentials.
Check UUID	CLM will validate that all UUIDs of the network function match those as reported by the network function. If the network function UUID is not filled in, CLM will attempt to connect to the network function and populate the UUID field with the correct value from the network function. Otherwise, you can use CLI to look up the corresponding value on the network function. See the appropriate node documentation. NOTE: The UUID field corresponds to the Chassis Serial # for 7x50 SR.
Generate license key	CLM generates a unique license key file for the selected network function.
Upload license key to CLR	CLM places the license key file onto the license repository referenced by the network function. NOTE: For 7x50 SR network functions, the preferred method of license key storage is local storage on the 7x50 SR.
Activate license	CLM sets the network function to reference the license key file. For example, for a VSR-I, the BOF is set to reference the location of the license key file on the license repository



4.10.3 Deployment steps for CMG

Deploying a license key to CMG network functions consists of the following steps.

Step	Description
Validate connection	CLM will validate that it can connect to the network function using the UID and CLI credentials.
Ensure redundancy ready	CLM only supports deploying keys to redundant CMGs.
Check UUID	CLM will validate that all UUIDs of the network function match those as reported by the network function. If the network function UUIDs are not filled in, CLM will attempt to connect to the network function and populate the UUID field with the correct value from the network function. Otherwise, you can use CLI to look up the corresponding value on the network function. See the appropriate node documentation.
Generate license key	CLM generates a unique license key file for the selected network function.
Upload license key to CLR	CLM places the license key file onto the license repository referenced by the network function.
Update BOF	CLM updates the CMG BOF license file location. Some reasons why this command could fail: <ul style="list-style-type: none">• the network function cannot connect to the file location• a license file that contains a license key record that matches the TiMOS version of the network function could not be found
Synchronize boot environment	With distributed network functions like CMG, the BOF changes need to be synchronized.
Reboot standby	CLM must reboot the standby CPM for the standby CPM of the CMG to use the new license key.

Step	Description
Wait for standby reboot	CLM will then wait for the standby CPM to reboot for a specific amount of time. NOTE: If the license key file has removed features from the CMG, the deploy process will fail. The standby CPM will not start and the operator must perform a service affecting reboot of the CMG.
Ensure standby valid	The CLM will check that the Standby CPM is reporting a license status as valid.
Force switch over	CLM needs to perform a switch over so that the standby CPM with the new license is now the active CPM. As part of the switch over, the former active CPM (which is now the standby CPM) will be rebooted.
Reconnect	The CLM will attempt to reconnect to the CMG.
Ensure active and standby valid	Once CLM has reconnected to the CMG, it will poll the CMG until both active and standby CPMs are running and they both have valid licenses.

4.10.4 Procedure

- 1 _____
 Sign in as a user with read/write access to CLM and launch the CLM application.
- 2 _____
 Click the **NETWORK FUNCTIONS** tab.
- 3 _____
 Click on a network function for which you want to deploy a license key and click **More** , **Deploy License Key**.
- 4 _____
 Click **DEPLOY**.
 The deploy license key operation is asynchronous and may take a few minutes depending on your network performance. Clicking **Refresh List**  updates the data in the network function grid.
 The Deployed Status column of the network function grid indicates that the license key file has been deployed to the license repository. After deploying a license key:

- If the network function is not marked as Deployed, there will be notifications raised about problems communicating with the referenced license repository.
- If the network function is marked as Deployed, but there are notifications raised against it, the network function is not configured to use the new license key.

If a deploy operation fails, CLM raises a notification with the step, the CLI command CLM sent, and the CLI response received. You must address the problem indicated in the notification, and then choose the deploy license key operation again.

END OF STEPS

4.11 How do I revoke a license key?

Revoking license keys is the process of removing the current license key for the network function from the license repository.

i **Note:** When the CLM revokes a license key, it only removes the license key file from the FTP server or network function local storage. It does not remove the reference to the license key from the BOF of the network function. This is done to ensure the network function remains functional for as long as the previous license was valid for, or until the network function is rebooted.


1

Sign in as a user with read/write access to CLM and launch the CLM application.

2

Click the **NETWORK FUNCTIONS** tab.

3

Click on a network function for which you want to revoke a license key and click **More**  , **Revoke License Key**.

4

Click **REVOKE**.

END OF STEPS

4.12 How do I enable license key auto-renewal?

By enabling license key auto-renewal for a network function, the CLM will automatically generate and deploy license keys to the network function.

i **Note:** This functionality is not required for 7x50 SR network functions.

i **Note:** If you change the entitlements for a network function that has auto-renewal enabled, a new license key is not automatically generated when you save your edits. You must manually

deploy a new license key, and potentially restart the network function for the changed entitlements to take effect. If you do not perform this process, the network function may never apply your changes.

4.12.1 Pre-requisite


- “Perform automated license key deployment?” is set to true in the network pool key details.

The duration of an auto-renewal key is displayed by the “Auto-renewal License Key Duration in Days” of the network pool key details.

4.12.2 Procedure

1 _____
Sign in as a user with read/write access to CLM and launch the CLM application.

2 _____
Click the **NETWORK FUNCTIONS** tab.


3 _____
Click on a network function for which you want to configure automated license key deployment and click **More**  , **Enable License Key Renewal** then click **ENABLE**. The Auto-renewal Status column displays the new Managed state.
The CLM attempts to generate a license key, deploy the license key to the appropriate license repository, and then set the BOF of the network function to use the new license key.

4 _____
When a network function is first set to the auto-renewal Managed state, you may be required to reboot the network function before it will use the new license key.
When subsequent license keys are automatically generated by the auto-renewal process, the network function does not need to be rebooted on installation of the new license key as long as you have not changed any entitlements (see Note above).

After enabling license key renewals:

- If errors are encountered during the deployment, notifications are raised.
- If an auto-renewal network function has notifications, at periodic intervals the CLM still attempts to generate and deploy a new license key to the network function to ensure the network function always has a valid license key. Once the problems that are causing the notification are resolved, the CLM will successfully deploy a new license key.

See [4.10 “How do I manually generate and deploy a license key?” \(p. 30\)](#) for information about the deployment steps and possible failure reasons.

 **Note:** If the CLM is reporting the ‘LICENSE_KEY_NOT_SET_ON_SR’ notification for an auto-renewal network function, it means the BOF of the SR network function is not pointing to the license key file CLM thinks it should, which could be caused by such things as:

- Rejected deploy due to Version mismatch

-
- An operator changing the BOF
If you encounter this notification for a network function:
 - Determine the cause of the problem and rectify it.
 - Select the 'Deploy License Key' option for the network function you had the original problem with.
These actions will cause the CLM to immediately generate and deploy a new license key to the network function. If the network function accepts the new license key, the notifications will disappear and the normal CLM auto-renewal process will resume.

END OF STEPS

4.13 How do I disable license key auto-renewal?


1 _____

Sign in as a user with read/write access to CLM and launch the CLM application.

2 _____

Click the **NETWORK FUNCTIONS** tab.

3 _____

Click on a network function for which you want to disable automated license key deployment and click **More**  , **Disable License Key Renewal**.

4 _____


Click **DISABLE**. The Auto-renewal Status column no longer displays the network function as having auto-renewal enabled.

The CLM no longer auto-generates license keys for the network function. When a network function has auto-renewal disabled, the CLM leaves the existing license key on the license repository and set in the BOF of the network function.


END OF STEPS

4.14 How do I generate and download license keys?

The pool key associated with the network function may have permission to enable you to generate and download a license key file for a network function. If these permissions are present, the "Perform license key generation and download?" value of the pool key details will be set to 'true'. By default, this functionality is disabled. Contact your Nokia representative about how to enable this functionality.

 **Note:** The pool key would allow license download if specified during the network pool key acquisition process. Contact your Nokia representative to request a network pool key with permission to generate license key and download it.

When generating and downloading license keys, you must supply UUID(s) for the network function. Fetching the UUID auto-populates the UUID parameter(s).

-
- 1 _____
Sign in as a user with read/write access to CLM and launch the CLM application.
 - 2 _____
Click the **NETWORK FUNCTIONS** tab.
 - 3 _____
Click on a network function for which you want to generate and download a license key and click **More**  , **Generate and Download License Key**.
Your browser downloads the license key file, or an error dialog appears.

END OF STEPS _____

4.15 How do I configure dynamic license management for CMG?

 **Note:** Dynamic license management only applies to CMG VNFs that are managed by CBAM.

When you create and deploy a license key in CLM, this key is node locked to the VNF. CMG VNFs that are managed by CBAM can have their UUIDs changed during lifecycle management operations, such as CMG software upgrade or healing operation in OAM-VMs. When a CMG changes its UUID, the license key that was previously generated by CLM is no longer valid. CBAM instructs CLM to generate and deploy a new node locked license key to the CMG. CBAM also instructs CLM to update the IP address (the UID) of the CMG if applicable.

The process of installing new licenses or updating a license is performed in two steps during CMG deployment, CMG software upgrade, and OAM-VM healing operation. The first step involves the installation of temporary license keys and the second step involves the creation and installation of the final and CMG-specific (UUID) license keys

CLM generates a unique temporary license key for every CMG you have defined in CLM. Temporary keys expire 4 hours after they are created and are auto-generated every two hours.

See the CMG and CBAM documentation for more information about CMG and CBAM requirements for dynamic licensing management.

4.15.1 Pre-requisites

- “Can enable automatic temporary license key file generation?” is set to true in the network pool key details.
- The VNF must already be defined in CLM and have the correct entitlements that match the configuration of the network function already defined.

4.15.2 How do I generate a temporary license key file?

-
- 1 _____
Sign in as a user with read/write access to CLM and launch the CLM application.

-
- 2 _____
Click the **CONFIGURATION** tab and then click VNF Temporary License Generation.
The products that are configured to support temporary license key file generation are listed.
 - 3 _____
Select which pool key is to be used to generate the temporary license key.
 - 4 _____
Select which license repository to which the temporary license key file should be written.
 - 5 _____
Click on the checkbox beside the product for which you want to generate a temporary license key.
 - 6 _____
Click **SAVE**.
The CLM generates and transfers the temporary license key to the license repository.

END OF STEPS _____

4.15.3 How do I regenerate temporary license keys?

After you edit a CMG, change the entitlements allocated to it, and deploy a new license key, you need to regenerate the temporary license key to ensure that the features in the temporary key match the features in the license key. You can also regenerate temporary keys if there was a problem during the key generation and transfer process, for example if the destination license repository was unavailable.

- 1 _____
Sign in as a user with read/write access to CLM and launch the CLM application.
- 2 _____
Click the **CONFIGURATION** tab and then click VNF Temporary License Generation.
The products that are configured to support temporary license key file generation are listed.
- 3 _____
Disable the CMG temporary key generation by de-selecting the checkbox beside the CMG product.
- 4 _____
Click **SAVE**. A warning statement displays

5 _____

Click **CONTINUE**.

6 _____

Enable the CMG temporary key generation by clicking on the checkbox beside the CMG product.

7 _____

Click **SAVE**.

The CLM regenerates and transfers all temporary license keys for all CMGs to the license repository.

END OF STEPS _____

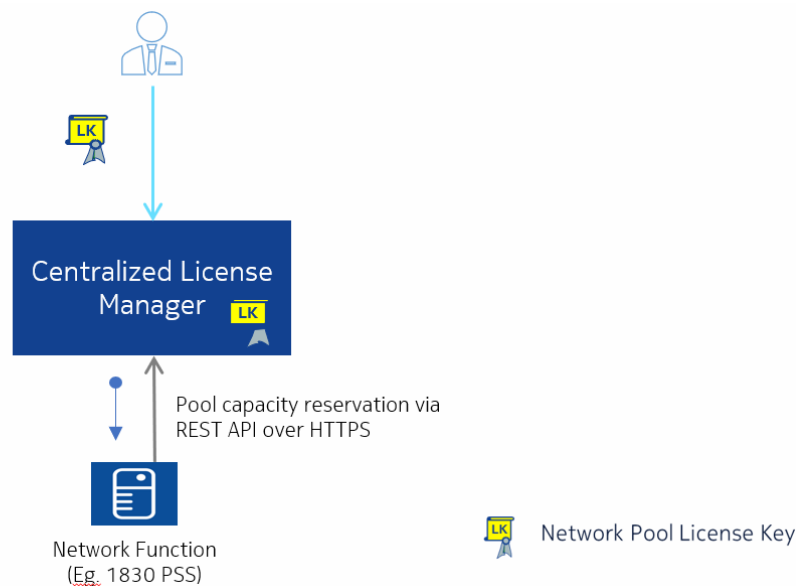
5 Network function driven pool capacity reservation

5.1 Overview

Network function driven pool capacity reservation is a dynamic mode of pool capacity reservation and ASL allocation. In this mode, the network function communicates with CLM over an HTTPS channel using REST API. After the CLM receives the pool capacity reservation request it checks whether there are enough ASLs in the network pool. If there are enough ASLs, CLM reserves the requested number of ASLs in the pool (i.e. pool capacity reservation) and sends an acknowledgement to the network function over an HTTPS channel using REST API. When the network function receives the acknowledgement, it enables the feature or functionality. If there are not enough requested ASLs in the network pool, a rejection is sent to the requesting network function.

The 1830 PSS, Release 12 and later, utilizes this mechanism of pool capacity reservation and licensing. See the appropriate 1830 PSS documentation for network element configuration information.

Figure 5-1 Network function driven pool capacity reservation




See [1.6 “Workflow for typical CLM operator configuration”](#) (p. 10) for network function driven pool capacity reservation workflow.

5.2 How do I view network functions?

1 _____
Sign in and launch the CLM application.

2 _____
Click the **NETWORK FUNCTIONS** tab. A list of network functions displays.
Use the column headings to sort the network functions, or the column fields to search for a specific network function.
The Name and UID specify the unique identifier of the network function, as specified by the network function. See the appropriate node documentation for more information.
The Auto-renewal Status, Deployed Status, and License Expiry columns are always empty.

3 _____
To view the entitlements that have been associated with the network function, click on a network function from the list and then click **View Details**  .

END OF STEPS _____

6 Notifications and Events

6.1 Overview

Notifications alert an operator of configuration error of license repository, failed license deployment, or expiration of the pool key. Notifications are generated automatically by the CLM, and they are cleared when the condition has cleared.

You can configure the CLM to forward notifications to the NSP Fault Management application.

6.2 How do I view notifications in CLM?

- 1 _____
Sign in and launch the CLM application.
- 2 _____
Click the **NOTIFICATIONS** tab. A list of notifications displays.
Use the column headings to sort the notifications, or use the Type field to search for a specific type of notification.
- 3 _____
To sort or filter the notifications, use the column headings.
 - Click on the column heading. An up or down arrow appears, and the list of events is sorted by that column.
 - Enter text in Type filter text box and click Enter. Only events that match the text in the filter text box are shown in the list.
 - Enter text in the Message column to filter the messages. This is useful for finding all notifications for a network function with the specific name for example.
 - Clear filters by removing the text from the Type filter text box and clicking Enter.
- 4 _____
You can also see notification icons on the Network Pool Key summary view list when thresholds are close to, or exceeding, thresholds.

END OF STEPS _____

6.3 What does this CLM notification mean?

Notification	Description
ALARM_FORWARDING_ERROR	<p>CLM cannot forward alarms to the configured NSP Fault Management instance(s). Check that the configuration is correct and restart CLM.</p> <p>This notification is not published to the Fault Management application when CLM notification forwarding is enabled.</p>
POOL_KEY_NEAR_EXPIRY	<p>The network pool license key is nearing expiry. Obtain a new network pool license key from Nokia.</p>
POOL_KEY_EXPIRED	<p>The network pool license key expiry date has passed. The pool key is no longer valid and you can no longer define new network functions or generate license keys. In addition, CLM will not grant any resources to network functions that use network function driven pool capacity reservation (e.g. 1830 PSS). Obtain a new network pool license key from Nokia.</p>
POOL_KEY_INVALID_UUID	<p>The UUID in the network pool license key does not match the UUID of this CLM instance. Obtain a new network pool license key from Nokia.</p>
POOL_KEY_REDUNDANT_UUID_MISSING	<p>When CLM is installed in a geo-redundant configuration, the network pool license key you obtain from Nokia requires two UUIDs. This alarm indicates the network pool license key only has one. Obtain a new network pool license key from Nokia.</p>
POOL_KEY_REQUIRES_APP_UPDATE	<p>The network pool license key supports a network function version that is not supported by the version of your CLM instance. You can still use the network pool license key, but you will not be able to define network functions for the unsupported versions. Upgrade your CLM installation if you need to use the newer network function versions.</p>

Notification	Description
ENTITLEMENT_RESOURCE_ALERT	A specific entitlement is nearing, or has exceeded, its available allotment. When the allocation for an entitlement has been exceeded, CLM will not grant any more of the entitlement.
FAILED_CREATION_OF_NF_TEMP_LICENSE	CLM could not generate the temporary license key for a specific network function. The network function details are in the message. Try to manually regenerate a license key for the network function to troubleshoot why CLM cannot deploy a license key to the network function.
FAILED_DEPLOY_OF_NF_TEMP_LICENSE	CLM could not transfer the temporary license key for a specific network function to the license repository. The network function details and name of the repository are in the message. This is raised if there is a problem with the license repository (e.g. no connection) and there will be a corresponding LICENSE_REPO notification.
LICENSE_REPO_PROBLEM	There was a problem when communicating with the specific license repository. The parameters describe the cause of the error (i.e. TIMEOUT, AUTHENTICATION, etc.)
LICENSE_REPO_PATH_ERROR	There was an error accessing or creating the specific initial directory for the given license repository. Check that the directory is valid and that the specified user has permissions to read, write, and create directories on the license repository.
LICENSE_KEY_NOT_SET_ON_SR	The CLM found that the actual BOF license string on the SR does not match the license file that the CLM has set. This can be caused by another system/operator changing the SR BOF after the CLM has deployed a license key. To clear this error, you can manually deploy a new license key to the SR.
LICENSE_KEY_DEPLOY_FAILURE	The CLM failed to deploy a license key to the given network function during the given deployment step.

Notification	Description
LICENSE_KEY_NOT_ON_CLR	The CLM detected that a deployed license key that is in use by a network function is missing from the CLR. In the case of an SR, if the SR reboots it will not find its license file. This is usually due to the accidental deletion of the file by another system. To rectify, you can manually deploy a new license key to the network function.
NF_COMMUNICATIONS_ERROR	The CLM is not able to communicate with the specific network function. The reason for the error is included in the notification (e.g TIMEOUT, AUTHENTICATION, etc.).
NF_CONFIGURATION_ERROR	The specified network function has an invalid configuration defined in the CLM which is preventing the CLM from deploying a license key. This is usually caused by the network function having a UUID defined in the CLM that is different from the actual UUID.
NF_REDUNDANCY_NOT_SET	The CLM detected that for a 7x50 SR/XRS node, standby is enabled but boot config redundancy is not set. To rectify, enable boot redundancy on the node.
LICENSE_KEY_EXPIRY	The license key that is deployed on the specified network function is nearing or has expired. To rectify, manually deploy a new license key to the network function.
TLS_CERTIFICATE_NEARING_EXPIRY	The TLS certificates used by the CLM are nearing their expiration date. You need to regenerate new certificates.
TLS_CERTIFICATE_EXPIRED	The TLS certificates used by the CLM have expired. The CLM system will no longer function correctly. You need to regenerate new certificates.

6.4 How do I forward CLM notifications to the NSP Fault Management application?

See the *CLM Installation and Upgrade Guide* for the procedure to enable CLM notification forwarding.

If forwarding is enabled, the CLM notifications are raised and cleared as Fault Management alarms. The synchronization of information between the CLM and Fault Management occurs at 30-second intervals. For example, if a CLM notification clears, the associated Fault Management alarm clears within 30 seconds.

The following notification is not published to the Fault Management application:

- ALARM_FORWARDING_ERROR

6.5 How do I configure notification thresholds?

Perform this procedure to set thresholds for the percentage usage of an entitlement. For example, if you set the Warning Threshold to 75, the CLM raises a warning when an entitlement is 75% used.

1 _____

Sign in as a user with read/write access to CLM and launch the CLM application.

2 _____

Click the **CONFIGURATION** tab and then click Notification Thresholds.

3 _____

Configure the parameters and click **SAVE**.

END OF STEPS _____

6.6 How do I view events history?

Events provide a log of operations on CLM, listing all significant operator-initiated actions. It could be used as an audit log. After a year, events are deleted from the CLM.

1 _____

Sign in and launch the CLM application.

2 _____


Click the **EVENTS** tab. A list of events displays.

3 _____

To sort or filter the events, use the column headings.

- Click on the column heading. An up or down arrow appears, and the list of events is sorted by that column.
- Enter text in the Type or Source ID filter text box and click Enter. Only events that match the text in the filter text box are shown in the list.
- Clear filters by removing the text from the filter text box and clicking Enter.

4

To view more details for an event, hover over the event and click **Log Detail**  . The Event Info pop-up opens.

END OF STEPS
