



## **Cisco NCS 2000 Series Licensing Configuration Guide**

**First Published:** 2013-11-25

**Last Modified:** 2019-07-24

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# CHAPTER 1

## Install and Manage Licenses

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This document provides detailed information about installing and managing licenses for the DWDM cards. This document includes the following sections:

- [Understanding Licensing, on page 1](#)
- [License Types, on page 3](#)
- [License Synchronization, on page 9](#)
- [Licensing Rules, on page 10](#)
- [Rehost License, on page 11](#)
- [NTP-L3 Transfer a License Between Working Devices, on page 11](#)
- [NTP-L4 Transfer License Between a Failed and a Working Device, on page 12](#)
- [Licensing After Software Upgrade, on page 13](#)

## Understanding Licensing

A license is a permit for a software feature to be functional or enabled on a device. The "pay as you grow" model enables you to upgrade your hardware and software capacity by using a license key. As a result, the upfront deployment cost is reduced and additional capacity or features can be purchased on a need basis. You need not complete a return merchandise authorization (RMA) process to add a new hardware. Instead, you can purchase the license, have it electronically delivered, and use the license key to enable the licensed feature.



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**Note** On a device, some ports and features are active by default. These are known as base functionality and do not require any license for their use. However, to activate additional ports or features, you need to purchase licenses.

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The Cisco Transport Controller (CTC) assists you in deploying the licenses to the Cisco devices in your network, discovering the devices, and managing and viewing your inventory of licenses and devices. The licensing operations are not supported on TL1, SNMP, or Cisco IOS interfaces.

New devices are shipped with preinstalled licenses for specific functionalities based on your order. New licenses have to be added for enabling additional functionalities. New or upgraded Cisco devices must be registered in the [Cisco Product License Registration portal](#) and must have a product authorization key (PAK) to obtain licenses from Cisco.

## Product Authorization Key

The Product Authorization Key (PAK) is an 11-character alphanumeric key printed on the purchase order document shipped with your hardware device. Accessing Cisco licensing portals require a PAK, which is provided when you order and purchase the right to use a feature set for a particular device. The PAK serves as a receipt and is an important component in the process of obtaining, upgrading, and activating a license. The registration process requires a PAK.

You can also purchase a bulk PAK to fulfill multiple licenses on a device.

## Unique Device Identifier

Every Cisco device is provided with a unique device identifier (UDI). The UDI is printed on a label located on the back of most Cisco hardware devices.

Licenses are associated with the UDI. The UDI information present on the license file is compared with the actual UDI of the device during license installation. If they do not match, the UDI mismatch error is displayed.

The UDI has three main components—product ID (PID), version ID (VID), and serial number (SN). However, the license uses only the PID and SN for product identification.

Ensure that the correct UDI information, comprising of PID and SN, is used when the license is registered. For more information, see [NTP-L1 Register Cisco Product Licenses, on page 2](#).

To view the PID and SN using CTC, go to the node view, and then click the **Inventory** tab. The PID and SN are displayed in the 'Product ID' and 'Serial #' columns, respectively. The PID and SN can also be retrieved using the TL1 interface command RTRV-INV. The licensable PIDs for the devices are listed in [Card Licensing Information, on page 15](#).

## NTP-L1 Register Cisco Product Licenses

<b>Purpose</b>	This procedure explains how to register Cisco product licenses.
<b>Tools/Equipment</b>	None
<b>Prerequisite Procedures</b>	None
<b>Required/As Needed</b>	As Needed
<b>Onsite/Remote</b>	Onsite or Remote

### Procedure

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- Step 1** Collect the PAK and unique device identifier (UDI) information for the devices you need to register.
- Ensure that the correct UDI (PID and serial number) is used during license registration. For more information about PAK and UDI, see [Product Authorization Key, on page 2](#) and [Unique Device Identifier, on page 2](#). The licensable PIDs for the devices are listed in [Card Licensing Information, on page 15](#).
- Step 2** Go to the [Cisco Product License Registration](#) portal. You must have a Cisco.com account before you can access the portal.
- Step 3** You need to provide information on the web page in the following sequence:

- a) Enter a PAK Number—Provide the PAK information in the "Product Authorization Key (PAK)" section of the web page and click **Submit**.
- b) Validate Features—Validate the product information and click **All Done**.
- c) Designate Licensee—Enter the Product ID and serial number and select the **Agreement** check box. Click **Continue**.

**Note** Do not enter any "=" symbol in the Product ID.

- d) Finish and Submit—Verify the information summary and click **Submit**.

The Cisco Product License Registration portal sends you the license file to the e-mail ID registered with the license portal. The license file has the information about the number of licenses, features, and Stock Keeping Unit (SKUs) supported. The SKU identifies the set of licensed features on the card.

**Stop. You have completed this procedure.**

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### What to do next

Install the license file and deploy the license on your device using CTC. See [NTP-L2 Install and Manage Licenses, on page 5](#).

## Cisco Software License Validation

The Cisco software licensing (CSL) uses validation keys to deploy new feature sets that helps the user to upgrade and maintain software.

The [Cisco licensing portal](#) issues a license key to enable the specified number of ports or features, and the license is locked to the device UDI. This is known as a node-locked license.

## Software End-User License Agreement

As part of the licensing process, you must accept the terms and conditions provided in the end-user license agreement. You must accept the agreement when you first use a new device.

Read the terms and conditions of the end-user license agreement located in the following URL:

[http://www.cisco.com/en/US/docs/general/warranty/English/EU1KEN\\_.html](http://www.cisco.com/en/US/docs/general/warranty/English/EU1KEN_.html)

## License Types

Licenses are classified as:

- Count-based license—This is used to activate certain number of ports on the card.
- Feature-based license— This is used to activate a feature on the card.

The different types of licenses are:

- [Permanent Licenses, on page 4](#)
- [Temporary Licenses for Emergencies, on page 4](#)

- [Built-in Evaluation Licenses, on page 4](#)

## Permanent Licenses

Permanent licenses do not have an expiry date, that is, they do not have any limitation in the usage period associated with them. Procure and install a permanent license to increase the number of licensed ports or activate additional features. Permanent licenses provide the necessary permissions required to access the licensed ports and provision licensed features on the device. All permanent licenses are device locked and validated by the Cisco licensing infrastructure. After a permanent license is installed, you do not need to upgrade the license for subsequent releases.

The different types of permanent license are:

- Exclusive Permanent License
- Additive Permanent License

## Temporary Licenses

Temporary licenses are limited to a specific usage period. The different types of temporary licenses are:

- [Temporary Licenses for Emergencies](#)
- [Built-in Evaluation Licenses](#)

### Temporary Licenses for Emergencies

To avoid network downtime in the event of device failure and if the replaced device does not have the same licenses as the failed device, a temporary license can be used on the device. It is not possible to buy temporary license from the license portal. Temporary license is provided by Cisco TAC for a limited usage period.

The “TEMP-LIC” condition is raised on the card when the temporary license is in use. This condition clears after a permanent license is installed. For more information on the “TEMP-LIC” condition, see the Troubleshooting guide.



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**Note** Prior to expiry of a temporary license, you must go to the [Cisco Product License Registration](#) portal to obtain a permanent RMA replacement license and install it on the device. For more information, see [NTP-L4 Transfer License Between a Failed and a Working Device, on page 12](#).

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### Built-in Evaluation Licenses

Evaluation licenses are temporary and can be used to evaluate a feature set on new hardware for 60 days. The built-in evaluation license comes preinstalled on the device and cannot be deleted or rehosted.

The “EVAL-LIC” condition is raised on the card when the evaluation license is in use. This condition clears after a permanent license is installed.



**Note** You must go to the [Cisco Product License Registration portal](#) prior to the expiration of the evaluation license to upgrade the license status to permanent license.

The following conditions prevail for the usage of count-based evaluation licenses:

- If you are using  $m$  number of ports in the evaluation license, and then if you install the permanent license for  $n$  ports (where  $m > n$ ), the evaluation license takes higher priority and will be in use. The evaluation license is in use until the reset of the licensed device or controller card, or the priority of the evaluation license is changed to “Low”.



**Note** In case of 80-WXC-C, 40-SMR1-C and 40-SMR2-C cards,  $m$  and  $n$  represent the number of circuits on express (EXP) ports.

- When the evaluation license expires, the permanent license is used with  $n$  ports and the traffic goes down on the extra ports. The number of ports that exceed the license count are displayed in the **Provisioning > Licensing > Counted License Features > Unlicensed Count** field in CTC. To avoid the traffic hit on ports, increase license counts or unconfigure the ports before the evaluation period expires.
- When the evaluation license is in use with the usage count as  $m$  and you install the permanent license for count  $n$  where ( $n > m$ ), the permanent license takes the priority and continues to run in the permanent mode.

If no permanent licenses are installed on a device, the evaluation license is automatically activated when you try to provision the port or feature that is licensed. An evaluation license enables the full functionality supported by the device only for the evaluation period.

The device defaults to the base functionality when the evaluation license expires. When the evaluation license expires, the traffic continues to flow until the next reset of the device or the controller card. After the reset, the permanent license (if installed) takes the priority and the traffic flow is maintained. If the permanent license does not exist, then the traffic goes down. However, traffic is unaffected on the ports that are under base functionality.

## NTP-L2 Install and Manage Licenses

<b>Purpose</b>	This procedure explains how to install and manage licenses.
<b>Tools/Equipment</b>	None
<b>Prerequisite Procedures</b>	<a href="#">Log into CTC</a>
<b>Required/As Needed</b>	As Needed
<b>Onsite/Remote</b>	Onsite or Remote
<b>Security Level</b>	Superuser

## Procedure

**Step 1** From the CTC View menu, choose **Go to Other Node**. Choose the node on which the card to be licensed is present and click **OK**.

**Step 2** Double-click the In shelf view, double-click the licensed card.

**Step 3** As needed, choose the operation described in the following table that best suits your requirement.

**Note** The Licensing tab is displayed only when the card has licensable PIDs and the software release supports licensing for the card.

Operation	Description
Install the license on the card. <ol style="list-style-type: none"> <li>Choose the <b>Provisioning &gt; Licensing &gt; License Operations</b> tab.</li> <li>Choose <b>Install License</b> from the “Choose the operation to perform” drop-down list.</li> <li>Click <b>Browse</b> to navigate to the license file location and select the saved license file.</li> <li>Click <b>Open &gt; OK</b>.</li> </ol>	Installs the license on the card.  The license file would have been emailed to your registered e-mail address after the license registration on the licensing portal.
Save the license file. <ol style="list-style-type: none"> <li>Choose the <b>Provisioning &gt; Licensing &gt; License Operations</b> tab.</li> <li>From the “Choose the operation to perform” drop-down list, choose <b>Save Licenses</b>.</li> <li>Click <b>Browse</b> to choose the folder and file name on which the license will be saved.</li> <li>Click <b>Save &gt; OK</b>.</li> </ol>	Saves the license file.  You can always save a license file that you have installed. If you have lost the license by accidental delete, you can reinstall the license using the saved license file. An evaluation license cannot be saved.
Display details of licensed port counts. <ol style="list-style-type: none"> <li>Choose the <b>Provisioning &gt; Licensing &gt; Counted License Features</b> tab.  The <b>Counted License Features</b> tab is available only for count-based licensing.</li> </ol>	Displays details of licensed port counts. You can view the following information: <ul style="list-style-type: none"> <li>• License Feature Name—Shows the feature name for the license.</li> <li>• Total Base count—Shows the number of ports available in the built-in base functionality.</li> <li>• Available Base Count—Shows the number of ports available for provisioning the base functionality.</li> <li>• Total License Count—Shows the total number of licensed ports that can be used under the current license.</li> </ul>



Operation	Description
	<ul style="list-style-type: none"> <li>• Available License Count—Shows the number of ports available to provision under the current in-use license.</li> <li>• Unlicensed Count—Shows the number of unlicensed ports.</li> </ul> <p><b>Note</b> For the 80-WXC-C, 40-SMR1-C, and 40-SMR2-C cards, the count refers to the number of wavelengths on EXP ports of the licensed cards.</p> <p><b>Note</b> For the 17 SMR9 FS, 24 SMR9 FS, 34 SMR9 FS, and SMR20 FS cards, the count refers to the number of ports on EXP ports of the licensed cards.</p>
<p>Display details of licensed features.</p> <p>a. Choose the <b>Provisioning &gt; Licensing &gt; Feature Licenses</b> tab.</p> <p>The <b>Feature Licenses</b> tab is available only for feature-based licensing.</p>	<p>Displays details of licensed features. You can view the following information:</p> <ul style="list-style-type: none"> <li>• License Feature Name—Shows the feature name for the license.</li> <li>• Base Functionality—Shows whether the feature is a base functionality or not.</li> <li>• License State—Shows whether the license for the feature is provisioned or not.</li> </ul>
<p>Annotate comments to a license line.</p> <p>a. Choose the <b>Provisioning &gt; Licensing &gt; Counted License Features</b> or <b>Feature Licenses</b> tab.</p> <p>b. Choose the license entry and click <b>Manage License Lines</b>.</p> <p>c. Choose the license entry that you want to annotate and click <b>Annotate License</b>.</p>	<p>Enables you to annotate comments to a license line. The comments added are saved in the license file. To view the comments, save the license and view the license file.</p> <p>Evaluation license cannot be annotated. Annotate license allows you to add a maximum of 99 characters. This operation overwrites the existing user comments, if any.</p>
<p>Change the license priority of an evaluation or temporary license.</p> <p>a. Choose the <b>Provisioning &gt; Licensing &gt; Counted License Features</b> tab.</p> <p>b. Choose the license entry and click <b>Manage License Lines</b>.</p> <p>c. Choose the license entry that you want to modify and click <b>Modify License Priority</b>.</p>	<p>Changes the license priority of an evaluation or temporary license.</p> <ul style="list-style-type: none"> <li>• Changing the priority of the license from high to low or vice versa may affect traffic</li> <li>• License priority of a permanent license cannot be modified.</li> </ul>

Operation	Description
<p>d. Choose high or low priority from the “Modify License Priority” drop-down list.</p> <p>e. Click <b>OK</b> to continue.</p> <p>f. Click <b>Refresh Licenses</b>.</p>	
<p>Deletes a permanent or temporary license from the card.</p> <p>a. Choose the <b>Provisioning &gt; Licensing &gt; Counted License Features or Feature Licenses</b> tab.</p> <p>b. Choose the license entry and click <b>Manage License Lines</b>.</p> <p>c. Choose the license entry that you want to delete.</p> <p>d. Click <b>Delete License</b>.</p>	<p>Deletes a permanent or temporary license from the card.</p> <p>You can delete a license only when the license has expired or when it is in the "Inactive" or "Active, not in use" state.</p>
<p>Refresh the license data.</p> <p>a. Choose the <b>Provisioning &gt; Licensing &gt; Counted License Features or Feature Licenses</b> tab.</p> <p>b. Choose the license entry to refresh the license data.</p> <p>c. Click <b>Refresh License Data</b></p>	<p>Refreshes the license data. The refresh license data shows the updated (most recent) license data.</p>
<p>Display license line details.</p> <p>a. Choose the <b>Provisioning &gt; Licensing &gt; Counted License Features or Feature Licenses</b> tab.</p> <p>b. Choose the license entry.</p> <p>c. Click <b>Manage License Lines</b>.</p> <p><b>Note</b> You can also view the licensing details of all the devices in a network. To view the licensing details of all the devices in a network, go to network view, click <b>Maintenance &gt; License explorer</b> tab.</p> <p><b>Note</b> When you change the system time in CTC, the updated expiry date is not reflected in CTC. To view the updated expiry date in CTC, install or delete the license, or change the license priority.</p>	<p>Displays license line details. You can view the following information:</p> <ul style="list-style-type: none"> <li>• License Index—In count-based licenses, the license index is based on the license type and the number of licensed ports. In feature-based licenses, the license index is based on the license type and is always license type-1.</li> </ul> <p>An example of license index in count-based licenses is temporary-4 where the license type is temporary and the number of licensed ports is 4. An example of license index in feature-based licenses is permanent-1 where the license type is permanent.</p> <ul style="list-style-type: none"> <li>• License State—Shows the license state. Active, Inactive, In_use, or Not In use.</li> <li>• License Type—Shows the license type, namely Evaluation, Temporary, or Permanent.</li> </ul>

Operation	Description
	<ul style="list-style-type: none"> <li>• Expired—Shows whether the license is expired or not.</li> <li>• Validity Period Remaining—Shows the time before the In_use licenses expire.</li> <li>• Total License Count—Shows the number of licensed ports.</li> <li>• Priority—Shows the priority of the license, as high, medium, or low.</li> <li>• Expiry Date—Shows the license expiry date.</li> </ul>
<p>Display details of license usage.</p> <ol style="list-style-type: none"> <li>a. Choose the <b>Provisioning &gt; Licensing &gt; Counted License Features</b> tab.</li> <li>b. Choose the license entry.</li> <li>c. Click <b>Get Detail License Usage</b></li> <li>d. Click the <b>Refresh &amp; Sort Ports By Created Order</b> tab to view the ports in order of creation.</li> <li>e. Click the <b>Refresh &amp; Sort By Channel Number</b> tab to view the ports, based on the port numbers.</li> </ol>	<p>Displays details of license usage.</p> <p>You can view the list of ports and the corresponding license status for each of these ports. You can sort the ports displayed, based on the created order or port number.</p>

**Stop. You have completed this procedure.**

## License Synchronization

The license on the licensed device gets synchronized with the control card during the following events:

- Cold or warm restart of the licensed card.
- Cold or warm restart of the controller card.
- Switch over of the controller card.
- Installation or deletion of the license.
- Change of license priority.
- License expiry.
- Creation or deletion of high rate card modes in AR-MXP and AR-XP cards.
- Periodically every 24 hours.

# Licensing Rules

The licensing rules are as follows:

- The default priority is low for the evaluation license, and medium for the permanent license. The priority of the evaluation license can be increased or decreased than the permanent license. The priority of the permanent license cannot be modified.



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**Note** The default license priorities cannot be modified for AR-MXP, AR-XP, and 100G-LC-C cards.

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- The license having higher priority is used when there is a license request.
- All externally installed licenses are active as soon as they are installed.
- Installation of an exclusive permanent license deletes the existing permanent license for that feature but an additive permanent license does not delete the existing permanent license and both the license will be available.
- There can be only one license in high priority for any licensed feature at any given time.
- When there are no high priority licenses, licenses with low priority are considered valid. In this case, the license is selected based on the following logic by the licensing library:
  - Permanent license is selected over any usage-based (evaluation or temporary) license.
  - If more than one permanent license exists, the license with the highest port count is selected.
  - If there are no permanent licenses, and more than one usage based (evaluation or temporary) license exists, the license that has the highest port count is used.
  - If there are no permanent licenses, and more than one evaluation license with the same port count exists, the recently installed license is used.

If a permanent license is already installed on the card, by default the permanent license is used. If you want to use an evaluation license, you must change the priority for that license using CTC. This is useful when there is a need to temporarily use the full capacity supported by the evaluation license while the installed permanent license is for lesser number of ports or features. For example, you have  $m$  port permanent licenses, and want to use  $n$  ports for some period, where  $n > m$ ; you can switch to the evaluation mode with higher port counts enabled.

If an evaluation license is in use and a permanent license is installed after that, the permanent license takes higher priority and will be in use.



**Note** When an active license expires and there is no other valid license available, the traffic is not hit until one of the following events occur:

- Reset of the licensed card
- Reset of the controller card
- Switch over of the controller card

## Rehost License

Transferring a license between two working devices is accomplished by using a process known as rehosting. The rehosting process transfers a license from one UDI to another by revoking the license from the source device and installing it on a new device.

You can also opt for partial revoke. The partial revoke enables you revoke a subset of ports and install it on other devices. For example, if a device is running  $m$  port licenses, you can transfer only  $n$  licensed ports to other devices (where  $m > n$ ), and the remaining  $m - n$  ports can continue on the same device.

For more information about rehosting license procedure, see [NTP-L3 Transfer a License Between Working Devices, on page 11](#).

## NTP-L3 Transfer a License Between Working Devices

<b>Purpose</b>	This procedure explains how to transfer a license between working devices.
<b>Tools/Equipment</b>	None
<b>Prerequisite Procedures</b>	<a href="#">Log into CTC</a>
<b>Required/As Needed</b>	As Needed
<b>Onsite/Remote</b>	Onsite or Remote
<b>Security Level</b>	Superuser

### Procedure

- Step 1** At the node, go to the source device and save the device credentials. Do the following to save the device credentials:
- a) From the CTC View menu, choose **Go to Other Node**.
  - b) Choose the required node, click **OK**.
  - c) If required, open the shelf where the licensed card is present.
  - d) Double-click the licensed card.
  - e) Click the **Provisioning > Licensing > License Operations** tabs.
  - f) Choose **Save Device Credentials (WDC)** from the “Choose the operation to perform” drop-down list.

- g) Browse to navigate to the location where you want to save the file.
- h) Click **Save** and then click **OK**.

The device credentials (WDC) associated with the card are saved at the specified location.

- Step 2** In the [Cisco Product License Registration](#) portal, get the permission ticket. Do the following to get the permission ticket:
- a) Click **Device > Filters** tab.
  - b) Enter the serial number of the source device and click **Apply**.
  - c) Select the device and click **Rehost/Transfer**.
  - d) Select the licenses from source device that needs to be transferred to destination device and click **Next**.
  - e) Enter the device credentials of the source device, saved in the step 1. and click **Ok**.
  - f) Enter the PID, serial number of the destination device and the quantity of SKU to be transferred to the destination device. Click **Next**.
  - g) Accept the End User Agreement. Click **Submit**. The permission ticket is e-mailed to you.
  - h) Save the e-mailed file to a secure location.
- Step 3** In CTC, choose the **Provisioning > Licensing > License Operations** tab and choose **Rehost License** from the "Choose the operation to perform" drop-down list.
- Step 4** Browse and choose the permission ticket file saved in the previous step and click **OK**.
- At this stage, a temporary license with port counts equal to the permanent license count with a validity period of 60 days is installed; this newly installed license remains in the same state as the permanent license that is rehosted. In case of complete rehost, the permanent license is deleted from the source device.
- Step 5** Save the rehost ticket file that CTC generates.
- Step 6** In the [Cisco Product License Registration](#) portal, click the **Device > Actions > Complete Secure Rehost/Transfer** option.
- Step 7** Open the rehost ticket file saved in the previous step in a text editor, copy and paste all the contents to the Enter Rehost Ticket/Key page with the destination device details. Click **Next**.
- Step 8** Verify the license information, accept the End User Agreement. Click **Get License**. The new license is sent in an e-mail.
- Step 9** Save this license file and install the license on the new device using CTC.
- Stop. You have completed this procedure.**

## NTP-L4 Transfer License Between a Failed and a Working Device

<b>Purpose</b>	This procedure explains how to transfer licence between a failed and a working device.
<b>Tools/Equipment</b>	None
<b>Prerequisite Procedures</b>	None
<b>Required/As Needed</b>	As Needed

<b>Onsite/Remote</b>	Onsite or Remote
<b>Security Level</b>	Superuser

### Procedure

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- Step 1** Obtain the PID and SN of the failed and working devices. See [Unique Device Identifier, on page 2](#) on how to obtain PID and SN.
- Step 2** Log into the Cisco Product License Registration portal at <http://www.cisco.com/go/license>.  
You must have a Cisco.com account before you can access the portal.
- Step 3** From the **Devices > Actions** drop-down list, choose **RMA**.
- Step 4** From the Product Family drop-down list, choose the product as **Carrier Packet Transport & 15454**.
- Step 5** Enter the source UDI PID and SN, and target UDI PID and SN and click **Next**.  
The license portal determines the licenses associated with the defective device. The new license for the working device is sent by e-mail.
- Step 6** Review the information that you have provided and click **Transfer**.
- Step 7** Install the new license on the working device. Complete the [NTP-L2 Install and Manage Licenses](#) to install the license on the device.
- Stop. You have completed this procedure.**
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## Licensing After Software Upgrade

To enable all the software features, all new or upgraded Cisco devices that require software activation must be registered with Cisco. The registration process converts the PAK to an electronic license file containing a unique key for your hardware device. The license file must then be installed on your device to unlock the product and its features. If you want to extend the number of licenses for the increased number of port or feature usage, you can procure the license as described in the task [NTP-L1 Register Cisco Product Licenses](#).







## CHAPTER 2

# Card Licensing Information and Licensing Alarms

This chapter provides information about card licensing information and licensing alarms. This chapter includes the following sections:

- [Card Licensing Information, on page 15](#)
- [Licensing Alarms, on page 22](#)
- [Communications, Services, and Additional Information, on page 24](#)

## Card Licensing Information

This section provides the licensing information for the following cards:

### AR-MXP and AR-XP Cards

The AR-MXP and AR-XP cards deploy feature-based licenses. The license file is installed in the boot flash of the card. A maximum of 20 licenses are supported per card.

The following low-rate modes on the AR-MXP and AR-XP cards are part of the base functionality and do not need any license for their use.

- TXP-MR-LOW
- TXPP-MR-LOW
- MXP-MR-LOW
- MXPP-MR-LOW
- RGN-2.5G

The following high-rate modes on the AR-MXP and AR-XP cards need license for their use.

- TXP-MR-HIGH
- MXP-DME-HIGH
- MXPP-DME-HIGH
- MXP-MR-HIGH
- MXPP-MR-HIGH

- MXP-4x2.5-10G
- MXPP-4x2.5-10G
- MXP-VDC-10G
- RGN-10G

The licensable PIDs for the AR-MXP and AR-XP cards are:

- 15454-AR-MXP-LIC
- 15454-AR-XP-LIC

The non-licensable PIDs for the AR-MXP and AR-XP cards are:

- 15454-AR-MXP
- 15454-AR-XP

The following table lists the various operating modes of the AR-MXP and AR-XP cards and their corresponding licenses.

**Table 1: Licensing for AR-MXP and AR-XP Operating Modes**

License PID	Description	Operating Mode Name	Card Applicability
NA	Unprotected 2.5G Transponders	TXP_MR	AR-MXP and AR-XP
NA	Protected 2.5G Transponders	TXPP_MR	AR-MXP and AR-XP
NA	Unprotected Multi-Rate Muxponder 2.5G	MXP_MR	AR-MXP and AR-XP
NA	Protected Multi-Rate Muxponder 2.5G	MXPP_MR	AR-MXP and AR-XP
NA	OTU1 Regen	RGN	AR-MXP and AR-XP
15454-LIC-TXP-8G=	Unprotected 10G Transponders	TXP_MR	AR-MXP and AR-XP
15454-LIC-10G-DM=	Unprotected Data Muxponder 10G	MXP_DME	AR-MXP and AR-XP
15454-LIC-10G-DM=	Protected Data Muxponder 10G	MXPP_DME	AR-XP
15454-LIC-MXP-AR=	Unprotected Multi-Rate Muxponder 10G	MXP_MR	AR-MXP and AR-XP
15454-LIC-MXP-AR=	Protected Multi-Rate Muxponder 10G	MXPP_MR	AR-XP
15454-LICMXP4X2.5=	OC48/OTU1 Unprotected Muxponder	MXP_10G	AR-MXP and AR-XP
15454-LICMXP4X2.5=	OC48/OTU1 Protected Muxponder	MXPP_10G	AR-XP

License PID	Description	Operating Mode Name	Card Applicability
15454-LIC-VD-XP=	Video Muxponder (without Drop & Continue)	MPX_VD_10G	AR-XP
15454-LIC-REG-10G=	OTU2 Tri-FEC Mode	RGNsuper	AR-MPX and AR-XP

## 80-WXC-C Card

The 80-WXC-C card uses count-based licenses that represent the number of licensed wavelengths on the express (EXP) ports. The card has a base functionality for the first ten circuits provisioned using the EXP ports. License is required for provisioning any additional circuits on the EXP (Tx) ports. Permanent licenses can be purchased in 10-port increments. A maximum of seven sets of permanent licenses, each supporting ten ports, can be installed.

The evaluation license on the 80-WXC-C card supports full capability and hence, all the ports can be provisioned.

The licensable PID for the 80-WXC-C card is 15454-WXC-LIC. The non-licensable PID for the 80-WXC-C card is 15454-80-WXC-C.

The usage of the 80-WXC-C card licensing impacts the circuit provisioning in the following ways:

- If the card is used on a meshed node (of N degrees) or on a ROADM node, the licensing will determine the number of OCH pass-through circuits that can be provisioned crossing the EXP (Tx) ports.
- If the card is used on a node where a side is defined on the EXP (Tx) port, licensing will determine the number of OCH pass-through or add/drop circuits that can be provisioned on that side.
- If the card is used on a colorless node and configured as multiplexer (mux) or demultiplexer (demux), the Exp (Tx) ports cannot be used to provision any circuit. There is no limitation on the number of provisionable circuits crossing the card or using the card as the circuit source or destination.

If a circuit under base functionality is deleted, an existing circuit under temporary or evaluation license does not get transferred to the base functionality. However, if a new circuit is provisioned on the device, it will use the port available under base functionality.

## 40-SMR1-C and 40-SMR2-C Cards

The 40-SMR1-C and 40-SMR2-C cards use count-based licenses that represent the number of licensed wavelengths on the express (EXP) ports. The card has a base functionality for the first ten circuits provisioned using the EXP ports. License is required for provisioning any additional circuits on the EXP (Tx and Rx) ports. Permanent licenses can be purchased in 10-port increments. A maximum of three sets of permanent licenses, each supporting ten ports, can be installed.

The evaluation license on the 40-SMR1-C and 40-SMR2-C cards supports full capability and hence, all the ports can be provisioned.

The licensable PIDs for the 40-SMR1-C and 40-SMR2-C cards are:

- 15454-SMR1-LIC
- 15454-SMR2-LIC

The non-licensable PIDs for the 40-SMR1-C and 40-SMR2-C cards are:

- 15454-40-SMR1-C
- 15454-40-SMR2-C

The usage of the 40-SMR1-C and 40-SMR2-C card licensing impacts the circuit provisioning in the following ways:

- If the card is used on a meshed node (of N degrees) or on a ROADM node, the licensing will determine the number of OCH pass-through circuits that can be provisioned crossing the EXP (Tx) ports.
- If the card is used on node where a side is defined on the EXP (Tx) port, the licensing will determine the number of OCH pass-through or add/drop circuits that can be provisioned on that side.

If a circuit under base functionality is deleted, an existing circuit under temporary or evaluation license does not get transferred to the base functionality. However, if a new circuit is provisioned on the device, it will use the port available under base functionality.

The 40-SMR1-C card goes to the LIC-Evaluation period without a traffic hit under the following conditions:

- When the 40-SMR1-C card is upgraded to a release that requires a license.
- When a permanent license is purchased for all the 40 channels.

## 17 SMR9 FS, 24 SMR9 FS, 34 SMR9 FS, and SMR20 FS Cards

The 17 SMR9 FS, 24 SMR9 FS, 34 SMR9 FS, and SMR20 FS cards use count-based licenses that represent the number of licensed ports on the express (EXP) ports.

The licensable card versions for the 17 SMR9 FS, 24 SMR9 FS, and 34 SMR9 FS cards have only three ports that are enabled, and by default, they do not have Flex Spectrum capability. The licensable card version for the SMR20 FS card has only four ports that are enabled, and by default, does not have Flex Spectrum capability. Additional ports can be activated through specific licenses. The licenses can be permanent licenses or evaluation licenses.

### Licensable and Non-Licensable PIDs

Card	Licensable PID	Non-Licensable PID
17 SMR9 FS	NCS2K-9-SMR17FS-L=	NCS2K-9-SMR17FS=
24 SMR9 FS	NCS2K-9-SMR24FS-L=	NCS2K-9-SMR24FS=
34 SMR9 FS	NCS2K-9-SMR34FS-L=	NCS2K-9-SMR34FS=
SMR20 FS	NCS2K-20-SMRFS-L=	NCS2K-20-SMRFS=

The following table describes the feature licenses that can be purchased from the licensing portal.

License Feature PID	License Feature Name in CTC	Description
L-NCS2K-SMR-2P=	EXP Ports	Enables two EXP-TX/EXP-RX ports on the 17 SMR9 FS, 24 SMR9 FS, or 34 SMR9 FS cards.
L-NCS2K-SMR-4P=	EXP Ports	Enables four EXP-TX/EXP-RX ports on the SMR20 FS card.

## 100G-LC-C Card

The 100G-LC-C card supports feature-based licensing. The licensable PID for the 100G-LC-C card is 15454-M-100GC-LIC . The non-licensable PID for the 100G-LC-C card is 15454-M-100G-LC-C. The 100G-LC-C card supports the following two license levels:

- Base functionality that supports the MXP-10x10G operating mode. This mode is not supported when licensed 10x10G-LC and 100G-LC-C cards are provisioned together. For more information on 10x10G-LC, refer to [10x10G-LC Card, on page 20](#).
- Permanent license that supports the following operating modes:
  - MXP-10x10G
  - RGN-100G
  - RGN-10G
  - TXP-100G
  - TXP-10G

The 100G-LC-C card with Licensed PID supports the same list of card modes except the TXP-100G and RGN-100G modes. The 100G-LC-C card does not require a license to operate with the CFP-LC card. The supported operating modes on the 100G-LC-C card depend on the card combination because the operating modes involve more than one card. The following table shows the card combinations and their supported operating modes.

**Table 2: Supported 100G-LC-C and 10x10G-LC Card Combinations**

Card Combination	Supported Operating Modes
Standalone 15454-M-100G-LC-C	TXP-100G
Two 15454-M-100G-LC-C	RGN-100G
15454-M-100G-LC-C and 15454-M10x10G-LC	MXP-10x10G
15454-M-100G-LC-C and 15454-M-10x10-LIC	
15454-M-100G-LC-C and 15454-M-CFP-LC	All operating modes
15454-M-100GC-LIC and 15454-M-CFP-LC	

Standalone 15454-M-100GC-LIC	TXP-100G (supported only if the card has active license for this operating mode)
Two 15454-M-100GC-LIC	RGN-100G (supported only if the card has active license for this operating mode)
15454-M-100GC-LIC and 15454-M-100G-LC-C	
15454-M-100GC-LIC and 15454-M-10x10-LIC	MPX-10x10G

## 10x10G-LC Card

The 10x10G-LC card supports count-based licenses. The licensable PID for the 10x10G-LC card is 15454-M-10x10-LIC and the non-licensable PID is 15454-M10x10G-LC.

Though the 10x10G-LC card has ten SFP+ ports, only one port is supported in the base functionality. The remaining nine ports require count-based licenses.

The MPX-10x10G operating mode is supported on the remaining licensed ports of the 10x10G-LC card. However, when the non-licensed version of the 10x10G-LC card is working with the licensed version of the 100G-LC-C card, the MPX-10x10G operating mode is not supported. For more information about the card combinations and supported operating modes, see [Table 2: Supported 100G-LC-C and 10x10G-LC Card Combinations, on page 19](#)

If a circuit under the base functionality is deleted, an existing circuit under a temporary or evaluation license does not get transferred to the base functionality. However, if a new circuit is provisioned on the device, it uses the port available under the base functionality. After the license expiry, the traffic goes down because only the base port is supported on the 10x10G-LC card.

## 200G-CK-LC Card

The 200G-CK-LC card supports feature-based licensing.

**Table 3: Licensable and Non-Licensable PIDs**

Card	Licensable PID	Non-Licensable PID
200G-CK-LC	NCS2K-200G-CK-LIC	NCS2K-200G-CK-LC

The base functionality is enabled in the licensed card version. Additional features are provided through specific feature licenses. The feature licenses can be permanent license or evaluation license.

The following table describes the four feature licenses that can be purchased from the licensing portal.

License Feature PID	License Feature Name in CTC	Description
L-NCS2K-CK-CL=	CPAK	Enables the CPAK client and allows to configure the TXP-100G operating mode.

License Feature PID	License Feature Name in CTC	Description
L-NCS2K-SFEC-16Q	200G	<p>Enables 20% SD-FEC and 200G 16-QAM on the trunk port allowing the MXP_10x10G_100G, MXP_CK_100G and MXP_200G operating modes. This licence also enables CD range for the 200G application (+/- 20000 ps/nm).</p> <p><b>Note</b> Two licenses, L-NCS2K-CK-CL= and L-NCS2K-SFEC-16Q, are required to configure the MXP_CK_100G operating mode.</p>
L-NCS2K-FS=	FLEX_GRID	<p>Enables Flex Spectrum tunability on the trunk port. NCS Flex package is required to use this license.</p>
L-NCS2K-SD-FEC=	100G_SD_FEC_OR_CD_RANGE	<p>Enables wide CD range (+/- 70000 ps/nm) on standard FEC or enables 20% SD-FEC and wide CD range (+/- 92000 ps/nm) for 100G operating modes.</p> <p>The CD Working Range High and CD Working Range Low thresholds value in Provisioning &gt; Line &gt; Ports tab in CTC do not change automatically after installing the 100G_SD_FEC_OR_CD_RANGE license. Hence, it is required to manually change the threshold values in CTC. Otherwise, the Chromatic Dispersion (CD) alarm is raised.</p>

## 400G-XP-LC Card

The licenses for the 400G-XP-LC card are installed by default.

## WSE Card

The encryption functionality on the Wire Speed Encryption (WSE) card is enabled using a licence. The WSE card uses a maximum of four count-based licenses. Licenses are supported only when the WSE card operates in the TXP-10G mode. The PIDs for the WSE card are:

- Licensable—15454-M-WSE-L-K9=
- Non-licensable—15454-M-WSE-K9=

In the TXP-10G mode, each of the ten SFP+ ports can be provisioned as a client or trunk port. The client-trunk port pairs are 1-2, 3-4, 5-6, 7-8, and 9-10. The base functionality is applicable on the first port pair on which encryption is enabled. Licenses are required to enable encryption on additional port pairs. A license is required for every port pair. When a valid license expires, the LIC-MISSING alarm is raised on the trunk port.



**Note** All the port pairs are operational under the TXP-10G mode even without a license. However, encryption is enabled only when valid licenses are installed.

## MR-MXP Card

The MR-MXP card supports feature-based licensing. The base functionality is enabled in the licensed card version. Additional features such as encryption are provided through specific feature licenses. The feature licenses can be permanent license or evaluation license.

*Table 4: Licensable PIDs*

Card	Licensable PID	Encryption as an Appliance PIDs
MR-MXP	NCS2K-MR-MXP-LIC	NCS2K-MR-MXP-K9 and NCS2K-MR-MXP-K9=

The following table describes the encryption licenses that can be purchased from the licensing portal.

License Feature PID	License Feature Name in CTC	Description
L-NCS2K-MRE100GK9=	HS CRYPT	The High Speed Encryption license supports encryption in 100G-B2B and TXP-100G operating modes. This license is used when the 100G CPAK ports are used as clients.
L-NCS2K-MRELRGK9=	LS CRYPT	The Low Speed Encryption license supports encryption in MXP-200G, MXP-100G, 100G-B2B, and MXP_10x10G_100G operating modes. This license is used when the 10G SFP and QSFP+ ports are used as the client ports.

## Licensing Alarms

Various license related alarms are reported on the device based on the license status. These provide indication about the type of license in use and its validity duration.



Following alarms are reported on the device:

- EVAL-LIC—(Minor alarm) Indicates that the evaluation license is in use.
- TEMP-LIC—(Minor alarm) Indicates that the temporary license is in use.
- LIC-EXPIRING-SOON—(Major alarm) Indicates that the cumulative validity period of all the available evaluation and temporary licenses fall in the range of one to fourteen days.
- LIC-EXPIRING-SHORTLY—(Major alarm) Indicates that the cumulative validity period of all the available evaluation and temporary licenses fall in the range of zero to twenty four hours.
- LIC-EXPIRED—(Critical alarm) Indicates that the evaluation or temporary license has expired.




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**Note** The LIC-EXPIRING-SOON and LIC-EXPIRING-SHORTLY alarms are never raised if there is a permanent license available.

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**Note** EVAL-LIC alarm clears in one of the following scenarios:

- When the validity period of the evaluation license is expired. After the validity period, the card raises an LIC-EXPIRED alarm.
  - When the user discontinues or disables the associated feature that raised the evaluation license alarm. After this alarm clears, the line card resumes normal operation. The line card tracks the remaining validity period of the evaluation license that was disabled by the user.
  - When a permanent license is installed.
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**Note** The LIC-EXPIRED alarm clears in one of the following scenarios:

- When the user discontinues or disables the associated feature that raised the license expired alarm. After this alarm clears, the line card resumes normal operation. The line card maintains the associated license status as expired and does not raise an alarm.
  - When a permanent license is installed.
  - When a switchover of control card or soft reboot/hard reboot of the target line card is performed. After the reboot, the card raises an LIC-MISSING alarm.
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Following alarm is reported on the port:

- LIC-MISSING—(Critical alarm) Indicates that the licensed port is no longer licensed. This happens when the license supporting the service on the port has expired.




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**Note** The LIC-MISSING alarm does not move the provisioned OCHCC or OCHNC circuits from the IS state to OOS state. However, the traffic goes down.

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Alarms are raised taking into account all the valid licenses present on the device. When a license expires, the next best license is activated without raising any alarm. However, an alarm is raised when the last valid license is in the expiring state.

The alarms are activated at the card level and are not indicative of which feature-based license has triggered it.

For more information on these alarms, see the Troubleshooting guide.

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# Short Description

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