

Network OS

Supporting Network OS v4.1.0

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Preface

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Document conventions

The document conventions describe text formatting conventions, command syntax conventions, and important notice formats used in Brocade technical documentation.

Text formatting conventions

Text formatting conventions such as boldface, italic, or Courier font may be used in the flow of the text to highlight specific words or phrases.

Format	Description
bold text	Identifies command names Identifies keywords and operands Identifies the names of user-manipulated GUI elements
<i>italic text</i>	Identifies text to enter at the GUI Identifies emphasis Identifies variables and modifiers Identifies paths and Internet addresses
Courier font	Identifies document titles Identifies CLI output Identifies command syntax examples

Command syntax conventions

Bold and italic text identify command syntax components. Delimiters and operators define groupings of parameters and their logical relationships.

Convention	Description
bold text	Identifies command names, keywords, and command options.
<i>italic text</i>	Identifies a variable.
value	In Fibre Channel products, a fixed value provided as input to a command option is printed in plain text, for example, --show WWN.
[]	Syntax components displayed within square brackets are optional.
{ x y z }	Default responses to system prompts are enclosed in square brackets. A choice of required parameters is enclosed in curly brackets separated by vertical bars. You must select one of the options.

Convention	Description
x y	In Fibre Channel products, square brackets may be used instead for this purpose.
< >	A vertical bar separates mutually exclusive elements.
< >	Nonprinting characters, for example, passwords, are enclosed in angle brackets.
...	Repeat the previous element, for example, <i>member[member...]</i> .
\	Indicates a "soft" line break in command examples. If a backslash separates two lines of a command input, enter the entire command at the prompt without the backslash.

Notes, cautions, and warnings

Notes, cautions, and warning statements may be used in this document. They are listed in the order of increasing severity of potential hazards.

NOTE

A note provides a tip, guidance, or advice, emphasizes important information, or provides a reference to related information.

ATTENTION

An Attention statement indicates potential damage to hardware or data.



CAUTION

A Caution statement alerts you to situations that can be potentially hazardous to you or cause damage to hardware, firmware, software, or data.



DANGER

A Danger statement indicates conditions or situations that can be potentially lethal or extremely hazardous to you. Safety labels are also attached directly to products to warn of these conditions or situations.

Brocade resources

Visit the Brocade website to locate related documentation for your product and additional Brocade resources.

You can download additional publications supporting your product at www.brocade.com.

- Adapter documentation is available on the [Downloads and Documentation for Brocade Adapters](#) page. Select your platform and scroll down to the Documentation section.
- For all other products, select the Brocade Products tab to locate your product, then click the Brocade product name or image to open the individual product page. The user manuals are available in the resources module at the bottom of the page under the Documentation category.

To get up-to-the-minute information on Brocade products and resources, go to [MyBrocade](#). You can register at no cost to obtain a user ID and password.

Release notes are available on [MyBrocade](#) under Product Downloads.

White papers, online demonstrations, and data sheets are available through the [Brocade website](#).

Getting technical help

You can contact Brocade Support 24x7 online, by telephone, or by e-mail.

For product support information and the latest information on contacting the Technical Assistance Center, go to <http://www.brocade.com/services-support/index.html>.

Use one of the following methods to contact the Brocade Technical Assistance Center.

Online	Telephone	E-mail
<p>Preferred method of contact for non-urgent issues:</p> <ul style="list-style-type: none"> • My Cases through MyBrocade • Software downloads and licensing tools • Knowledge Base 	<p>Required for Sev 1–Critical and Sev 2–High issues:</p> <ul style="list-style-type: none"> • Continental US: 1-800-752-8061 • Europe, Middle East, Africa, and Asia Pacific: +800-AT FIBREE (+800 28 34 27 33) • For areas unable to access toll free number: +1-408-333-6061 • Toll-free numbers are available in many countries. 	<p>support@brocade.com</p> <p>Please include:</p> <ul style="list-style-type: none"> • Problem summary • Serial number • Installation details • Environment description

Document feedback

To send feedback and report errors in the documentation you can use the feedback form posted with the document or you can e-mail the documentation team.

Quality is our first concern at Brocade and we have made every effort to ensure the accuracy and completeness of this document. However, if you find an error or an omission, or you think that a topic needs further development, we want to hear from you. You can provide feedback in two ways:

- Through the online feedback form in the HTML documents posted on www.brocade.com.
- By sending your feedback to documentation@brocade.com.

Provide the publication title, part number, and as much detail as possible, including the topic heading and page number if applicable, as well as your suggestions for improvement.

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Supported hardware and software

In those instances in which procedures or parts of procedures documented here apply to some switches but not to others, this guide identifies exactly which switches are supported and which are not.

Although many different software and hardware configurations are tested and supported by Brocade Communications Systems, Inc. for Network OS 4.1.0, documenting all possible configurations and scenarios is beyond the scope of this document.

NOTE

The 100-gigabit interface subtype is not supported for Network OS 4.1.0, even though this subtype is referenced in some of the Network OS 4.1.0 user documentation.

The following hardware platforms are supported by this release of Network OS:

- Brocade VDX 6710-54
- Brocade VDX 6720
 - Brocade VDX 6720-24
 - Brocade VDX 6720-60
- Brocade VDX 6730
 - Brocade VDX 6730-32
 - Brocade VDX 6730-76
- Brocade VDX 6740
 - Brocade VDX 6740-48
 - Brocade VDX 6740-64
- Brocade VDX 6740T
 - Brocade VDX 6740T-48
 - Brocade VDX 6740T-64
 - Brocade VDX 6740T-1G
- Brocade VDX 8770
 - Brocade VDX 8770-4
 - Brocade VDX 8770-8

To obtain information about an OS version other than Network OS v4.1.0, refer to the documentation specific to that OS version.

What's new in this document

This document supports Network OS 4.1.0; and the new licenses in this release include:

- 10 GbE Port Upgrade
- 40 GbE Port Upgrade

What's new in this document

For complete information, refer to the Release Notes.

Software Licensing Overview

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Licensing overview

The Brocade Network Operating System (Network OS) includes platform support in standalone and Brocade VCS Fabric modes as well as optional features that are enabled by license keys. You can purchase Brocade licenses per product or per feature. Each switch in a fabric must have its own licenses, but universal licenses for multiple switches are available for trial purposes along with individual trial licenses. Licenses may be part of the licensed paperpack supplied with your switch software, or you can purchase them separately from your switch vendor.

NOTE

The VCS Fabric license is enabled on all VDX platforms by default starting with Network OS 4.1.0; a VCS Fabric license does not need to be installed to enable VCS Fabric functionality.

How software licensing works

A permanent license (for select features on specific units) can be ordered pre-installed in a Brocade switch when first shipped from the factory, or later ordered and installed. In either case, additional licenses can be ordered as needed.

When a license is ordered separately (not pre-installed), an entitlement certificate or e-mail message along with a transaction key are issued to you by Brocade as proof of purchase. The transaction key and license ID (LID) of the Brocade switch are used to generate a license key from the Brocade software licensing portal. The license key is contained within the license file, which is downloaded to your PC. You can add the license key to a switch using the **license add** command. Once a license is installed on the Network OS switch, you may be prompted to reload the switch or to disable and re-enable the chassis or specific ports to activate the license.

When a time-based license expires, the commands and CLI related to the feature are disabled, but the feature itself cannot be disabled until the system reloads. You can display expired licenses with the **show license** command. Expired licenses display a "License has expired" message. RASLog warning messages are generated every hour for licenses that have expired or will expire in the next five days.

License types

The following license types are supported in Network OS:

- Permanent licenses - A permanent license (also referred to as a chassis-wide license) has no expiration date and is locked to a single switch identified by the switch license ID. The switch license ID is initially the same as the switch World Wide Name (WWN). The switch WWN may change through configuration changes on the product, but the switch license ID remains unchanged.

- Temporary licenses - A temporary license (also known as a time-based license) allows you to evaluate a feature for a limited time prior to buying a permanent license. Brocade offers the following types of temporary licenses:
 - Individual time-based licenses - An individual time-based license is locked to a single switch and has a fixed expiration date. You cannot install this license on multiple switches.
 - Universal time-based licenses - A universal time-based license allows you to use a given feature for a limited trial period defined in days, for example, 30, 60, or 90 days from the date you install the license key on the switch. Each universal license key is valid for a single feature and can be used on any product that supports the feature. In addition, each universal time-based license has an absolute shelf life after which it expires. You cannot install a license with an expired shelf life. The expiration date is based on the system time at the installation of the license plus the number of days that the universal time-based license is valid. For this reason, you cannot remove and re-install a universal time-based license.

Software licensing terminology

The following terms are used in this document:

- Entitlement certificate - The proof-of-purchase certificate (*paperpack*) issued by Brocade when a license is purchased. The certificate contains a unique transaction key that is used in conjunction with the license ID (LID) of the Brocade device to generate and download a software license from the Brocade software portal.
- License file - The file produced by the Brocade software portal when the license is generated. The file is uploaded to the Brocade device and controls access to a licensed feature or feature set.
- License ID (LID) - The identification number that uniquely identifies the Brocade device. The LID is used in conjunction with a transaction key to generate and download a software license from the Brocade software portal. The software license is tied to the LID of the Brocade device for which the license was ordered and generated.
- Licensed feature - Any hardware or software feature or set of features that require a valid software license in order to operate on the device.
- Transaction key - A unique key, along with the LID, used to generate a software license from the Brocade software portal. The transaction key is issued by Brocade when a license is purchased. The transaction key is delivered according to the method specified when the order is placed:
 - Paperpack - The transaction key is recorded on an entitlement certificate, which is mailed to the customer.
 - Electronic - The transaction key is contained in an e-mail message, which is sent instantly to the customer after the order is placed. The customer receives the e-mail message within a few minutes after the order is placed, though the timing will vary depending on the network, Internet connection, and so on.

If a delivery method is not specified at the time of the order, the key will be delivered by the way of paperpack.

License requirements

The following table lists the license requirements by platform.

TABLE 1 License requirements by platform

Platform	40 Gb DCB ports	10 Gb DCB ports	1 Gb DCB ports	8 Gb FC ports	License type	POD sets and sizes	Notes
VDX 6710	N/A	6	48	N/A	N/A	N/A	No POD license is required to enable DCB ports. FCoE licenses are not supported on this platform. Layer 3 features do not require a license.

TABLE 1 License requirements by platform (continued)

Platform	40 Gb DCB ports	10 Gb DCB ports	1 Gb DCB ports	8 Gb FC ports	License type	POD sets and sizes	Notes
VDX 6720-24	N/A	24	N/A	N/A	POD1 and FCoE	16 + 8	Enabling VCS Fabric mode no longer requires a full POD license. Layer 3 features do not require a license.
VDX 6720-60	N/A	60	N/A	N/A	POD1, POD2, FCoE	40 + 10 + 10	
VDX 6730-32	N/A	24	N/A	8	POD1 and FCoE	16 + 8 (CEE ports)	FC ports require an FCoE license to be enabled (FC ports are not POD-controlled). Layer 3 features do not require a license.
VDX 6730-76	N/A	60	N/A	16	POD1, POD2, FCoE	40 + 10 + 10 (CEE ports)	
VDX 6740 and 6740T	4	48	N/A	N/A	FCoE, 10 GbE Port Upgrade, 40 GbE Port Upgrade	8 + 8 + 8 (10 Gb ports) 2 + 2 (40 Gb ports)	10 GbE Port Upgrade adds ports in 8-port increments. 40 GbE Port Upgrade adds ports in 2-port increments.
VDX 6740T-1G	4	0	48	N/A	FCoE, 10GbE Port Upgrade, 40 GbE Port Upgrade	16+16+16 (10Gb ports) +2 (40 Gb ports)	10 GbE Port Upgrade converts 1 GbE ports to 10 GbE operation in 16-port increments. 40 GbE Port Upgrade license increments the standard two 40 GbE ports to four 40 GbE ports.
VDX 8770-4	48	192	288	N/A	FCoE, Layer 3, Advanced Services	N/A	There are no POD-enabled ports on the VDX 8770 chassis.
VDX 8770-8	96	384	576	N/A	FCoE, Layer 3, Advanced Services	N/A	There are no POD-enabled ports on the VDX 8770 chassis.

The following table provides descriptive details for each license type.

TABLE 2 Brocade licenses for optional Network OS features

License	Description
Dynamic Ports on Demand: <ul style="list-style-type: none"> PORTS_ON_DEMAND_1 PORTS_ON_DEMAND_2 	A Dynamic POD license allows you to instantly scale the fabric by provisioning additional Ethernet ports on the Brocade VDX 6720 and VDX 6730 platforms. Licenses are assigned dynamically from a pool of resources based on either auto-detection of active links or explicit port reservation by the user.
Brocade VCS Fabric <ul style="list-style-type: none"> VCS_FABRIC 	A Brocade VCS Fabric license allows you to provision a Brocade VCS Fabric with up to 24 nodes. NOTE The VCS Fabric license is enabled on all VDX platforms by default starting with Network OS 4.1.0; a VCS Fabric license does not need to be installed to enable VCS Fabric functionality.
FCoE <ul style="list-style-type: none"> FCOE_BASE 	A Brocade FCoE license is required to enable Fibre Channel over Ethernet functionality. You can use this license on a single switch, but the FCoE capabilities will be limited to that node only. To support multi-hop FCoE traffic, you must enable VCS Fabric mode and install a Brocade FCoE license on each node. A VCS fabric in excess of two nodes requires a VCS Fabric license in addition to the FCoE license to allow FCoE traffic to traverse all nodes in the fabric. Without an FCoE license, FCoE logins are not permitted, FCoE traffic does not transit the switch, and most FCoE commands return an error of "No FCoE license present" when executed. Brocade VDX 6730 switches must be in Brocade VCS Fabric mode and have the FCoE license installed to enable the FC ports. FC ports are not POD-controlled.

TABLE 2 Brocade licenses for optional Network OS features (continued)

License	Description
	The FCoE license is not available on the Brocade VDX 6710. Directly attached FCoE devices are not supported on this platform.
Layer 3 • LAYER_3	<p>On all Brocade VDX compact switches, Layer 3 features are automatically enabled and do not require a license. On modular switches (Brocade VDX 8770-4 and Brocade VDX 8770-8), you must install a license to activate the following Layer 3 features:</p> <ul style="list-style-type: none"> • OSFP • VRRP • PIM-SM • Route-maps • Prefix-List <p>No license is required for the following Layer 3 features:</p> <ul style="list-style-type: none"> • IGMP Snooping • Layer 3 ACL • Layer 3 QoS • RTM/Static routes • Interface IP address • ARP • IP Services (ping/Telnet/FTP) <p>Brocade Layer 3 licenses are independent of any other licenses or operating modes in the fabric. Brocade Layer 3 licenses are required only on modular switches, and only on those switches in the fabric that have interfaces attached that will use the additional licensed Layer 3 features. Any intermediate switches in the fabric between interfaces do not require the license to be installed.</p> <p>Layer 3 features are only supported in VCS mode.</p>
Advanced Services • ADVANCED_SERVICES	For the Brocade VDX 8770 platforms, you have the option of purchasing and installing a single license key that will activate FCoE and Layer 3 features in one convenient bundle. You may also purchase and install each license separately.
10 GbE Port Upgrade • PORT_10G_UPGRADE	<p>License function depends on the VDX 6740 model:</p> <ul style="list-style-type: none"> • For the Brocade VDX 6740 and VDX 6740T, this license adds 10 GbE ports in increments of eight ports (8, 16, 24) per license. For Brocade VDX 6740, ports operate at 1 Gbps, 10 Gbps, or auto-sensing mode and VDX 6740T ports operate at 100 Mbps, 1 Gbps, 10 Gbps, or auto-sensing mode. • For the Brocade VDX 6740T-1G, this license upgrades existing 1 GbE ports to 1/10 GbE operation in increments of 16 ports (16, 32, 48) per license. VDX 6740T-1G ports operate at 100 Mbps, 1 Gbps, or auto-sensing mode. When upgraded with Port Upgrade license, 6740T-1G ports operate at 100 Mbps, 1 Gbps, 10 Gbps.
40 GbE Port Upgrade • PORT_40G_UPGRADE	<p>License function depends on the VDX 6740 model:</p> <ul style="list-style-type: none"> • For the Brocade VDX 6740 and VDX 6740T, this license adds 40 GbE ports in increments of two ports (2, 4) per license to provide four total ports. • For the Brocade VDX 6740T-1G, as the switch ships with two 40 GbE ports, the license is available in a single two-port increment to provide four total ports.

Licensing restrictions and considerations

This section lists the generic rules, restrictions, and considerations related to the software licensing:

- A license is tied to the unique LID of the blade or the switch for which the license was generated. Therefore, a license can be used on one switch only. It cannot be used on any other switch.
- More than one license for multiple features can be installed per switch.

- Only one permanent or temporary license at a time can be in effect for a licensed feature.
- More than one trial license can be in effect at the same time, as long as each trial license applies to a unique licensed feature.
- A trial license cannot replace or supersede a normal license.
- Licenses are not interchangeable between units.
- License management in Network OS v3.0.0 and later is supported only on the local RBridge. You cannot configure or display licenses on remote nodes in the fabric.

Usage restrictions for time-based licenses

The following restrictions apply to all time-based licenses:

- Time-based licenses are always retained in the license database and cannot be deleted.
- Once you have installed a time-based license, you cannot change the system date or time.
- Other mechanisms for changing date and time, such as Network Time Protocol (NTP), are not blocked. If you are using NTP to synchronize the time between your network devices, including switches or enterprise-class platforms, do not attempt to change the system date and time when a time-based license is installed.

Configuration management considerations

Licenses are independent of configuration files and are therefore not affected when you make changes to a configuration file or restore the default configuration. The only exceptions are Dynamic POD configurations. When you download a configuration from another switch or you restore the default configuration, the Dynamic POD configuration is moderated and restricted by whatever POD licenses are present on the switch.

For example, if you download a configuration file from a switch that has POD assignments beyond the base number of allowed Dynamic POD ports and there is no POD license installed, then the additional ports beyond the number of ports in the base Dynamic POD set will not be allowed. When the configuration is played back as part of the copy (or reboot) operation, the licenses are checked for each additional Dynamic POD port that attempts to be assigned a reservation.

Upgrade and downgrade considerations

Downgrading from Network OS v4.1.0 to previous versions without a VCS Fabric license results in loss of VCS functionality.

Downgrading from Network OS v.3.0.0 to a previous version is applicable only to the Brocade VDX 6710, VDX 6720, and VDX 6730. The VDX 8770 chassis only supports Network OS v.3.0.0. There are no downgrade pre-installation requirements for any of the licensed features in Network OS v.3.0.0.

You cannot downgrade to Network OS v2.x when the switch is in Brocade VCS Fabric mode without full POD licenses installed. Network OS v2.x requires full POD licenses to be installed when the switch is in Brocade VCS Fabric mode.

If Dynamic POD reserve port configuration data is stored in the running-config file before you downgrade to Network OS v2.x, restoring that running-config file after downgrade does not restore the Dynamic POD reserve port information.

Obtaining a license

Use the following procedure to generate and obtain a software license.

1. Order a license for the desired licensed feature.

NOTE

To obtain a trial license, contact your Brocade representative.

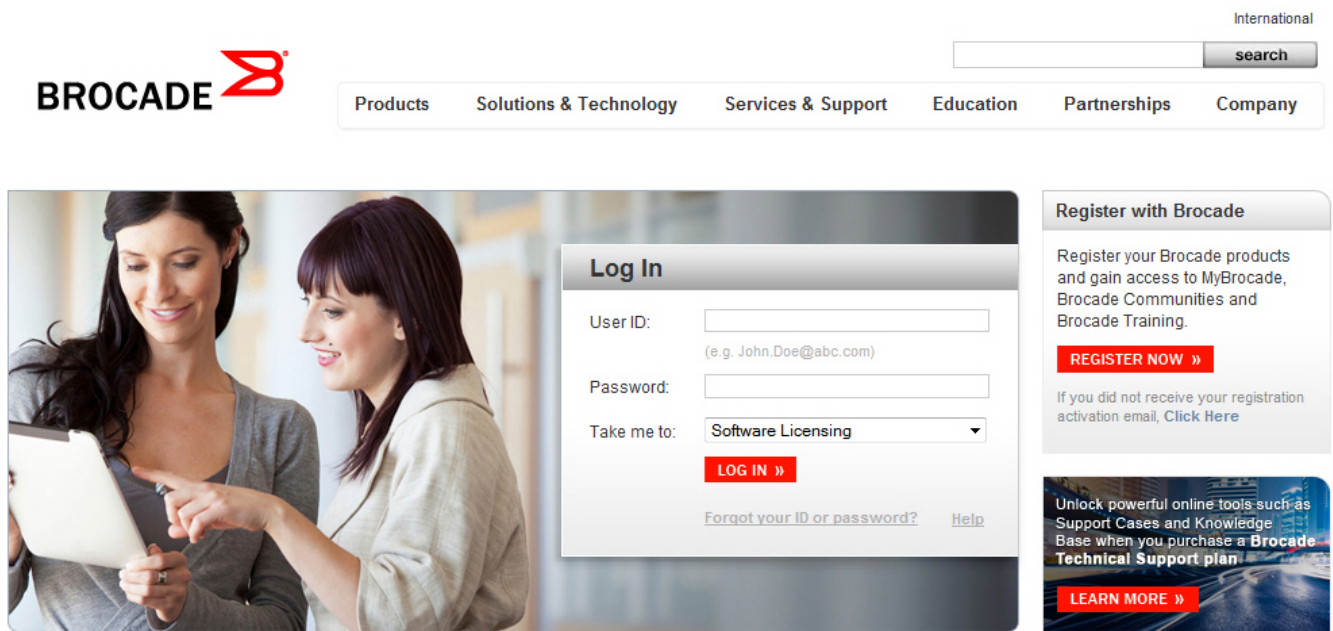
2. When you receive the paperpack or electronic transaction key, retrieve the LID of your Brocade device by entering the **show license id** command on the device or from the label on the unit. If you received a paperpack transaction key, write the LID in the space provided on the entitlement certificate.

NOTE

Do not discard the entitlement certificate or e-mail with the electronic key. Keep it in a safe place in case it is needed for technical support or product replacement (RMAs).

3. Log in to the Brocade software licensing portal at <http://swportal.brocade.com> and complete the software license request. If you do not have a login ID and password, request access by following the instructions on the screen. The following figure shows the software licensing portal login window.

FIGURE 1 Brocade software licensing portal login window



- From the **License Management** menu, select **Brocade NOS > License Generation with Transaction key**. The **Brocade NOS License Generation** window displays.

FIGURE 2 Brocade Network OS License Generation window

- Enter the requested information in the required fields. An asterisk (*) next to a field indicates that the information is required.

NOTE

You can generate more than one license at a time. For each license request, enter the **Unit's Unique ID** and **Transaction Key**, and click **Add**.

- When you have finished entering the required information, read the Brocade End User License Agreement, and select the **I have read and accept** check box.
- Click the **Generate** button to generate the license. The results window displays an order summary and the results of the license request.
 - If the license request is successful, the **Status** field shows "Success" and the **License File** field contains a hyperlink to the generated license file. The license file is automatically sent by e-mail to the specified customer e-mail address.
 - If the license request fails, the **Status** field indicates the reason it failed and the action to be taken.
- Download the license file to your PC by either clicking the hyperlink in the **License File** field or saving the license file from the e-mail attachment.
- Install the license on the Network OS switch by following the procedure in [Installing a license](#) on page 21.

Viewing software license information from the Brocade software portal

This section describes other software licensing tasks supported from the Brocade software portal. You can use the **Unit License Query** option to view software license information for a particular unit, transaction key, or both. You can export the report to Excel for sharing or archiving purposes.

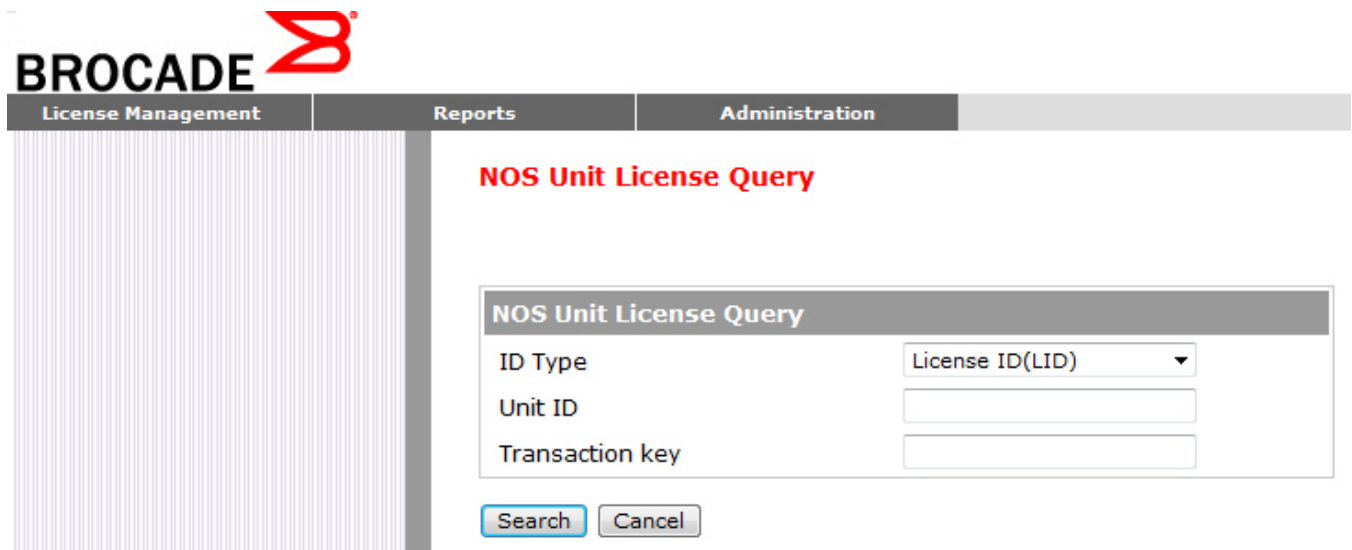
Depending on the status of the license (for example, whether or not the license was generated), the report will include the following information:

- Hardware part number, serial number, and description
- Software part number, serial number, and description
- Date the license was installed
- Transaction key
- LID
- Feature name
- Product line

Use the following procedure to view the license information from the Brocade software portal.

1. To view the license information, select **License Management > Brocade NOS > Unit License Query**. The **NOS Unit License Query** window displays.

FIGURE 3 License Query window



The screenshot shows the Brocade NOS Unit License Query window. The window has a header with the Brocade logo and navigation tabs for License Management, Reports, and Administration. The main content area is titled "NOS Unit License Query" and contains a form with three input fields: "ID Type" (a dropdown menu set to "License ID(LID)"), "Unit ID", and "Transaction key". Below the form are "Search" and "Cancel" buttons.

2. Enter the LID in the **Unit ID** field and the unique number in the **Transaction key** field, and click **Search**.

In the **NOS Unit License Query** results window, the line items for Level 1 display hardware-related information and the line items for Level 2 display software-related information. If the query was performed before the license key was generated, the first row (Level 1) would not appear as part of the search results. Similarly, if the query was performed before the license was generated, some of the information in the second row would not be displayed.

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Installing a license

Use the following procedures to install licenses on a Network OS switch.

1. Install the license on the switch using one of the following commands:
 - Enter the **license add [FTP-URL *ftpPath* | SCP-URL *scpPath*]** command and optionally, an RBridge ID if you are installing the license on a remote switch. This command adds licenses from an XML-tagged license file.

```
switch# license add FTP-URL ftp://fvt:brocadeserver@10.10.2.7/license.xml rbridge-id 1

License Added [*B
UpXEBpegY7wCm0VfViqXLK:vdAFbcIVcEmVuTaiih3V8wzTPV7TCDq8WMHLRPPbifU5ZSVppjMLE, sb9AZeDTtfxKS5gKvRWg
MN37xAMJuunVJ#]
```

- Enter the **license add licstr** command followed by the license key and, optionally, an RBridge ID if you are installing the license on a remote switch. The license key is printed between the XML start `<licKey>` and end `</licKey>` tags in the license file. Be sure to copy the entire string, including spaces and non-alphanumeric characters. If the license key includes spaces, you must enclose the entire string in double quotation marks. Repeat this command for each software license key found in the license file.

```
switch# license add licstr "*B :YFGuJSHxbhlWVwBHjmfAO20R6QzolkyVR4oqJAU0fqhJRCTioavlA:
HMah2E7uL4d8px4ySTAWSg809etcLwfpLjgXZ1lvWiiKEWcfcZMefx#"

License Added [*B :YFGuJSHxbhlWVwBHjmfAO20R6QzolkyVR4oqJAU0fqhJRCTioavlA:
HMah2E7uL4d8px4ySTAWSg809etcLwfpLjgXZ1lvWiiKEWcfcZMefx#]
```

NOTE

Remote management of licenses is supported in Logical Chassis mode.

- Verify that you added the license by entering the **show license** command. The command lists all licensed features currently installed on the switch. If the feature is not listed, enter the **license add licstr** command again.

Depending on the license type, you may be prompted to reload the switch or to disable and re-enable the chassis or specific ports. The following table indicates the minimal steps you may need to take to make the installed features fully functional after the license add operation is complete. Take the appropriate action as indicated by the command output.

TABLE 3 Requirements for activating a license after installation

License	Description
PORTS_ON_DEMAND_1 PORTS_ON_DEMAND_2	One of the following actions may be required depending on the configuration: <ul style="list-style-type: none"> Enabling the ports or the chassis. Disabling and then re-enabling the ports or the chassis.
FCOE_BASE	You must enable any Fibre Channel (FC) ports that you wish to use (applicable only if the product includes FC ports). After installing a license, configure the FC port with the no shutdown command for the port to come online.
LAYER_3	One of the following actions may be required depending on the configuration: <ul style="list-style-type: none"> Enabling the ports or the chassis Disabling and then re-enabling the ports or the chassis
ADVANCED_SERVICES	Combines requirements for FCoE, Layer 3, and VCS licenses.
PORT_10G_UPGRADE	Depends on the switch model. For VDX 6740 and VDX 6740T, may require enabling the added ports or disabling and then re-enabling the added ports.
PORT_40G_UPGRADE	May require enabling the added ports or disabling and then re-enabling the added ports.

Adding an FCoE license

The following example adds an FCoE license on the local switch and verifies the transaction.

```
switch# license add licstr "*B :YFGuJSHxbhlWVwBHjmfAO20R6QzolkyVR4oqJAU0fqhJRCTioavlA:
HMah2E7uL4d8px4ySTAWSg809etcLwfpLjgXZ1lvWiiKEWcfcZMefx#"

License Added [*B :YFGuJSHxbhlWVwBHjmfAO20R6QzolkyVR4oqJAU0fqhJRCTioavlA:
HMah2E7uL4d8px4ySTAWSg809etcLwfpLjgXZ1lvWiiKEWcfcZMefx#]
switch# show license
Rbridge-Id: 2
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
  First Ports on Demand license - additional 10 port upgrade license
  Feature name:PORTS_ON_DEMAND_1
  License is valid
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
  Second Ports on Demand license - additional 10 port upgrade license
  Feature name:PORTS_ON_DEMAND_2
  License is valid
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
  FCoE Base license
  Feature name:FCOE_BASE
  License is valid
```

Displaying a license

You display installed licenses with the **show license** command.

The following example displays a Brocade VDX 8770 licensed for a Layer 3 VCS fabric. This configuration does not include FCoE features.

```
switch# show license
rbridge-id: 60
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
  Layer 3 license
  Feature name:LAYER_3
  License is valid
```

The following example displays a Brocade VDX 8770 licensed for Advanced Services. This configuration enables the use of Layer 3, FCoE, and VCS features.

```
switch# show license
rbridge-id: 60
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
  Advanced Services license
  Feature name:ADVANCED_SERVICES
```

Displaying the switch license ID

The switch license ID identifies the switch for which the license is valid. You will need the switch license ID when you activate a license key.

To display the switch license ID, enter the **show license id** command in privileged EXEC mode.

```
switch# show license id
Rbridge-Id          License ID
=====
2                   10:00:00:05:33:54:C6:3E
```

Removing licenses

Depending on the license type, you may be prompted to clear license-dependent configurations, reload the switch, or disable and re-enable the chassis or specific ports. The following table indicates the minimal steps you may need to take to remove specific licenses. Take the appropriate action as indicated by the command output.

TABLE 4 Requirements for deactivating a license after removal

License	Description
PORTS_ON_DEMAND_1 PORTS_ON_DEMAND_2	One of the following actions may be required after removing the license: <ul style="list-style-type: none"> Enabling the ports or the chassis. Disabling and then re-enabling the ports the chassis.
VCS_FABRIC	Disabling the chassis is no longer required before you can remove the license.
FCOE_BASE	Disabling all Fibre Channel (FC) ports is required before you can remove the license (applicable only if the product includes FC ports).
LAYER_3	Clearing of Layer 3 configurations on all ports is required before you can remove the license.
ADVANCED_SERVICES	Combines requirements for FCoE and Layer 3 licenses.
PORT_10G_UPGRADE	Port reservations for non-Base ports provisioned by the license must be released first. Removal of a port reservation provisioned by this license is blocked if the port is in a configuration not allowed on a 1 GbE port, such as Brocade Trunking or FCoE.

TABLE 4 Requirements for deactivating a license after removal (continued)

License	Description
PORT_40G_UPGRADE	Port reservations for non-Base ports provisioned by the license must be released first.

For some licensed features, you must clear all configurations related to a the feature before you can remove the license for that feature. Some features may require that you reboot the switch and others require you to disable and re-enable selected ports or the entire switch.

For example, removing an FCoE license requires both explicit reset to default of FCoE settings that depend on the license, as well as disabling all FC ports on the platform; all FC ports must be set to a "shut" interface configuration state before the license can be removed.

Refer to the console output for other specific requirements.

Do the following to remove a license.

1. Enter the **show license** command to display the active licenses.
2. Issue the **license remove** command followed by the license key or the feature name.

The license key is case-sensitive and must be entered exactly as shown. If the license key includes spaces, you must enclose the entire string in double quotation marks.

3. Take the appropriate action as indicated by the command output.

Depending on the license type, you may be prompted to clear license-related features, to reboot the switch, or to disable and re-enable the chassis or specific ports.

4. Enter the **show license** command to verify that the license is removed. If there are no license keys, the command output displays "No licenses."

NOTE

You must remember the original license string to use the **license remove** command with the *licenseString* operand.

You cannot display the license key with the **show license** command.

The following example illustrates the display and removal of an FCoE license by its feature name.

```
switch# show license
Rbridge-Id: 2
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
  FCoE Base license
  Feature name:FCOE_BASE
  License is valid
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
  First Ports on Demand license - additional 10 port upgrade license
  Feature name:PORTS_ON_DEMAND_1
  License is valid
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
  Second Ports on Demand license - additional 10 port upgrade license
  Feature name:PORTS_ON_DEMAND_2
  License is valid
switch# license remove "FCOE_BASE"
License Removed [FCOE_BASE]
For license to take effect, enable the switch and any disabled ports...
```

The remaining licenses are displayed as shown in the following example.

```
switch# show license
Rbridge-Id: 2
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
  First Ports on Demand license - additional 10 port upgrade license
  Feature name:PORTS_ON_DEMAND_1
  License is valid
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
  Second Ports on Demand license - additional 10 port upgrade license
  Feature name:PORTS_ON_DEMAND_2
  License is valid
```

Extending a time-based license

You extend a time-based license by adding another temporary license or by installing a permanent license. Re-installing a temporary license that has expired is not permitted. When you replace an expired license, the warning messages cease.

Troubleshooting licensing issues

Some features require licenses in order to work properly. Licenses are created using a switch license identifier (LID), so you cannot apply one license to different switches. Before calling your switch support provider, verify that you have the correct licenses installed by using the **show license** command.

License is not properly installed

If a licensed feature is not functioning, a probable reason is that the license for that feature has not been installed correctly. Either the license was not installed, or it was installed and a required system reboot was not performed.

If on a Brocade VDX 6720-24 or VDX 6730-32 switch only eight Ethernet ports are working, it is probable that no Dynamic Ports on Demand (DPOD) license is installed. Similarly, if on a Brocade VDX 6720-60 or Brocade VDX 6730-76, only 40 Ethernet ports are working, it is probable that no DPOD license is installed.

If on a Brocade VDX 6720-60 or Brocade VDX 6730-76 50 Ethernet ports are working but the remaining 10 are not, it is likely that you have the DPOD1 license installed, but not the DPOD2 license.

If you are unable to add a third switch to a VCS Fabric cluster, it is likely that the VCS Fabric license is not installed.

If you are unable to connect an FCoE device or unable to use Fibre Channel ports on a Brocade VDX 6730 switch, it is likely that the FCoE license is not installed.

If you suspect a license is not properly installed, complete the following steps.

1. In privileged EXEC mode, enter the **show license** command to display the currently installed licenses.

```
switch# show license
rbridge-id: 66
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
FCoE Base license
Feature name:FCOE_BASE
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
VCS Fabric license
Feature name:VCS_FABRIC
```

2. If the FCoE or DPOD license appears in the **show license** command output, but the feature does not work for the expected ports, the probable cause is that the affected ports were not re-enabled after installing the license.

NOTE

After adding an FCoE or DPOD license, you must disable and re-enable all affected ports. The VCS Fabric license does not require re-enabling.

You can disable and then enable each affected port, or you can enter the **chassis disable** command followed by the **chassis enable** command to re-enable the entire chassis.

```
switch# chassis disable
switch# chassis enable
```

3. If the license does not appear in the **show license** command output, then it was not installed. In privileged EXEC mode, enter the **license add licstr** command to install the license. For FCoE and DPOD licenses, you must also disable and enable the switch or port.

```
switch# license add licstr "*B
s1SETgzTgeVGUDeQR4WIfRx7mmXODdSwENoRGENAmX3Ca3uHeZgXK0b,jzxyzfzKLrMsPN8C1SxvDQRRT8VyuULyyKTO0ryU6qm4s
1jjiSAeV,COoedzCx1v6ycQgnYMeSVp#"
License Added [*B
s1SETgzTgeVGUDeQR4WIfRx7mmXODdSwENoRGENAmX3Ca3uHeZgXK0b,jzxyzfzKLrMsPN8C1SxvDQRRT8VyuULyyKTO0ryU6qm4s
1jjiSAeV,COoedzCx1v6ycQgnYMeSVp# ]
For license change to take effect, please disable/enable port or switch...
switch# chassis disable
switch# chassis enable
```

Dynamic Ports on Demand Licensing

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Dynamic Ports on Demand overview

Dynamic Ports on Demand (POD) provides a flexible mechanism for allocating port licenses that you can purchase to extend the base functionality of the Brocade VDX 6720 and VDX 6730 switches. The additional ports are enabled after you install the appropriate license keys. The Dynamic POD feature assigns port licenses based on your connectivity choices. Any port on the switch can claim a free assignment from the pool of available POD licenses.

NOTE

Dynamic POD licenses are not supported on the Brocade VDX 6710, VDX 8770, and on the FC ports on the Brocade VDX 6730. When adding a Dynamic POD license to a platform that does not support Dynamic POD, you will be allowed to add the license, but the license display will show that the Dynamic POD license is not supported on the platform.

In a Dynamic POD system, each port can be associated with one of three port sets:

- Base port set – Ports that can be enabled without any POD license.
- Single POD license port set – Ports that are assigned first and associated with the existence of a single POD license.
- Double POD license port set – Ports that are assigned after the single POD port set is full and are therefore associated with the double POD license.

NOTE

The 10 GbE and 40 GbE Port Upgrade licenses are supported using a base port set plus the ports that are available as specified by the port capacity in the respective port upgrade. These licenses are supported only on the Brocade VDX 6740 and VDX 6740T switches.

NOTE

Licenses are based on the license ID and are not interchangeable between units. For example, if you bought a single POD license for a Brocade VDX 6720-24, you cannot use that license on another Brocade VDX 6720-24, on a Brocade VDX 6720-60, or on a Brocade VDX 6730-76.

You can purchase the Brocade VDX 6720 and VDX 6730 switches with the port options listed in the following table. You can activate unlicensed ports up to the maximum supported per switch by purchasing and installing additional POD licenses.

TABLE 5 List of available ports when implementing Ports on Demand

Platform	Base port set	Single POD set	Double POD set	Total ports
Brocade VDX 6720-24	16	+8	N/A	24
Brocade VDX 6720-60	40	+10	+10	60
Brocade VDX 6730-32	16	+8	N/A	24
Brocade VDX 6730-76	40	+10	+10	60

If you purchase both a PORTS_ON_DEMAND_1 (POD1) license and a PORTS_ON_DEMAND_2 (POD2) license for the Brocade VDX 6720-60 or VDX 6730-76, the system has a "double" POD license. If you purchased only one of these features (POD1 or POD2), the system has a "single" POD license. The specific POD license that is installed is not relevant to the port count determination. Only the number of installed POD licenses is relevant.

ATTENTION

The Brocade VDX 6720-24 and VDX 6730-32 support only a single POD license.

Managing automatic POD port assignments

With the Dynamic POD feature, you can use the base port set plus the number of additional ports you purchased. All ports that do not receive a POD assignment and are trying to come online will go offline. The **show ip interface brief** and **show interface tengigabitethernet rbridge-id/slot/port** commands display the reason for the port-disabled status as related to POD licensing.

The Dynamic POD mechanism detects the ports that have active links, and makes assignments based on the remaining pool of vacancies:

- If the count of assigned ports is below the number of ports in the purchased POD set, additional dynamic assignments can be made at a later time as new links are established. If a port comes online, that port can get assigned if you still have vacancies in your POD set.
- If the number of detected active links is greater than the number of ports in the purchased POD set, port assignments are made in the order in which the ports come online. Because the time it takes for each port to come online varies, the order in which ports are assigned to a given POD set cannot be guaranteed.

If the given assignment order does not align with your intended use of the ports, you can make adjustments using the **dpod rbridge-id/slot/port reserve** or the **dpod rbridge-id/slot/port release** commands. Refer to [Overriding Dynamic POD assignments](#) on page 30 for more information.

Mapping port assignments to a POD port set

Ports are associated with the single or double Ports on Demand (POD) license in the order in which they come online and automatically receive a license assignment from the pool of unassigned ports in the POD set. The first ports that receive a POD assignment are associated with the base port set. When all ports in the base port set are assigned, the next ports that come online receive assignments from the single POD license port set. When this set is full, the remaining port assignments are associated with the double POD license port set.

The association of a specific port to a POD set matters only when you want to remove a POD license from the system. Ports assigned to the double POD license port set are disabled first. The last-assigned licenses are released when you remove POD licenses. Refer to [Releasing a port from a POD set](#) on page 31 for more information.

Activating the Dynamic POD feature

Use the following procedure to activate the Dynamic POD feature.

1. Verify the current states of the ports with the **show ip interface brief** command.
The command output indicates whether a port is licensed.
2. Install the Brocade Dynamic POD license.

- Use the **shutdown** and **no shutdown** commands to disable and re-enable the ports.
Alternatively, you can disable and re-enable the chassis to activate ports.
- Use the **show ip interface brief** command to verify the newly activated ports.
- Use the **show interface tengigabitethernet rbridge-id/slot/port** command to display port details.

The following example shows a Brocade VDX 6720-24 without a Dynamic POD license installed. The 16 ports in the base port set are online and assigned. The remaining 8 ports are unassigned and are down.

```
switch# show ip interface brief
Interface          IP-Address      Status          Protocol
=====          =
TengigabitEthernet 5/0/1    unassigned     up             up
TengigabitEthernet 5/0/2    unassigned     up             up
TengigabitEthernet 5/0/3    unassigned     up             up
TengigabitEthernet 5/0/4    unassigned     up             up
TengigabitEthernet 5/0/5    unassigned     up             up
TengigabitEthernet 5/0/6    unassigned     administratively down down (No DPOD License)
TengigabitEthernet 5/0/7    unassigned     administratively down down (No DPOD License)
TengigabitEthernet 5/0/8    unassigned     up             up
TengigabitEthernet 5/0/9    unassigned     up             up
TengigabitEthernet 5/0/10   unassigned     up             up
TengigabitEthernet 5/0/11   unassigned     administratively down down (No DPOD License)
TengigabitEthernet 5/0/12   unassigned     administratively down down (No DPOD License)
TengigabitEthernet 5/0/13   unassigned     up             up
TengigabitEthernet 5/0/14   unassigned     up             up
TengigabitEthernet 5/0/15   unassigned     up             up
TengigabitEthernet 5/0/16   unassigned     up             up
TengigabitEthernet 5/0/17   unassigned     administratively down down (No DPOD License)
TengigabitEthernet 5/0/18   unassigned     administratively down down (No DPOD License)
TengigabitEthernet 5/0/19   unassigned     administratively down down (No DPOD License)
TengigabitEthernet 5/0/20   unassigned     administratively down down (No DPOD License)
TengigabitEthernet 5/0/21   unassigned     up             up
TengigabitEthernet 5/0/22   unassigned     up             up
TengigabitEthernet 5/0/23   unassigned     up             up
TengigabitEthernet 5/0/24   unassigned     up             up
```

The following example displays details for a single port that is offline because it does not have a Dynamic POD license.

```
switch# show interface tengigabitethernet 5/0/6
TengigabitEthernet 5/0/6 is down, line protocol is down (No DPOD License)
Hardware is Ethernet, address is 0005.1eb6.0a25
Current address is 0005.1eb6.0a25
Tracking status: Disabled
Tracked interfaces: None
Pluggable media present, Media type is sfp
Interface index (ifindex) is 1744896001
MTU 2500 bytes
LineSpeed: Auto - 10000 Mbit, Duplex: Full
Flowcontrol rx: on, tx: on
```

Adding a Dynamic POD license

The following example adds a second Dynamic POD license on the local switch and verifies the transaction. The command prompts you to disable and then re-enable the port or the switch.

```
switch# license add licstr "*B s1SETgzTgeVGUDeQR4WIfRx7mmXODdSwENoRGEAmX3Ca3uHeZgXK0b,
jzxyzfzKlRMsPN8ClSxvDQRRT8VyuULyyKT00ryU6qm4s1jjiSAeV,COoedzCx1v6ycQgnYMeSVp#"
License Added [*B s1SETgzTgeVGUDeQR4WIfRx7mmXODdSwENoRGEAmX3Ca3uHeZgXK0b,
jzxyzfzKlRMsPN8ClSxvDQRRT8VyuULyyKT00ryU6qm4s1jjiSAeV,COoedzCx1v6ycQgnYMeSVp# ]
For license change to take effect, please disable/enable port or switch...
switch# chassis disable
switch# chassis enable
switch# show license
```

```
Rbridge-Id: 2
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
  First Ports on Demand license - additional 10 port upgrade license
  Feature name:PORTS_ON_DEMAND_1
  License is valid
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
  Second Ports on Demand license - additional 10 port upgrade license
  Feature name:PORTS_ON_DEMAND_2
  License is valid
```

Displaying the Dynamic POD assignments

To display the Dynamic POD assignments, enter the **show dpod** command.

The **show dpod** command provides a summary of POD license status and POD license assignments.

In the following example, all 24 ports are licensed and potentially available. The three unassigned ports are currently persistently disabled and therefore are not assigned to any Dynamic POD license port set.

```
switch# show dpod
rbridge-id: 1
24 ports are available in this switch
  1 POD license is installed
  Dynamic POD method is in use
24 port assignments are provisioned for use in this switch:
  16 port assignments are provisioned by the base switch license
  8 port assignments are provisioned by the first POD license
  * 0 more assignments are added if the second POD license is installed
21 ports are assigned to installed licenses:
  16 ports are assigned to the base switch license
  5 ports are assigned to the first POD license
Ports assigned to the base switch license:
  Te 1/0/1, Te 1/0/10, Te 1/0/11, Te 1/0/12, Te 1/0/13, Te 1/0/14, Te 1/0/15, Te 1/0/16, Te 1/0/17, Te 1/0/18,
Te 1/0/19, Te 1/0/20, Te 1/0/21, Te 1/0/22, Te 1/0/23, Te 1/0/24
Ports assigned to the first POD license:
  Te 1/0/5, Te 1/0/6, Te 1/0/7, Te 1/0/8, Te 1/0/9
Ports assigned to the second POD license:
  None
Ports not assigned to a license:
  Te 1/0/2, Te 1/0/3, Te 1/0/4
  3 license reservations are still available for use by unassigned ports
```

Overriding Dynamic POD assignments

You can override the automatic port license assignments by releasing Dynamic POD assignments from a port and by reserving an assignment for a specific port.

Reserving a port assignment

Reserving an assignment for a port assigns that port to a Ports on Demand (POD) license regardless of whether the port is online or offline. Reserving assignments allocates the POD license to specified ports. This operation overrides automatic port assignments. The reserved assignment will not be available to other ports that come online. To reserve an assignment for a port, a free assignment must be available.

1. Enter the **show dpod** command to determine the unassigned ports.

If all ports are assigned, select a port to release its POD assignment. Follow the instructions in [Releasing a port from a POD set](#) on page 31 to release a port from its POD assignment. Once the port is released, you can reuse the assignment for another port.

2. Enter the global configuration mode by issuing the **configure terminal** command.
3. Select the port for which you want to reserve an assignment and enter the **dpod reserve** command.
4. Enter the **exit** command to return to the global configuration mode before you reserve another port.

```
switch# configure terminal
Entering configuration mode terminal
switch(config)# dpod 5/0/10 reserve
%INFO : Port reserved.
switch(config-dpod-5/0/10)# exit
switch(config)# dpod 5/0/11 reserve
%INFO : Port reserved.
switch0 (config-dpod-5/0/11)# exit
```

NOTE

License reservations or removals do not persist across switch reboots and power cycles. To make them persistent, save the configuration changes by issuing the use **copy running-config startup-config** command before you reboot the switch.

5. Save the configuration changes.

```
switch# copy running-config startup-config
```

6. Reboot the switch.
7. Enter the **show running-config dpod** command to verify the port is reserved.

```
switch# show running-config dpod 5/0/10
dpod 5/0/10
  reserve
!
switch# show running-config dpod 5/0/11
dpod 5/0/11
  reserve
```

Releasing a port from a POD set

Once a port has been assigned to a Dynamic POD license port set, it remains licensed (or "reserved") until you remove the port from the port set. You remove a port from the port set by releasing the port with the **dpod release** command. Releasing a port removes it from the Dynamic POD license port set; the port appears as unassigned until it comes back online.

To prevent a port from coming back online and taking a POD assignment, disable the port and save the running configuration. This action will disable the port persistently.

A port POD assignment can only be released if the port is currently offline. Use the **shutdown** command to disable the port or use the **chassis disable** command to disable the switch if you plan to release multiple ports.

1. Enter the global configuration mode by issuing the **configure terminal** command.
2. Select the interface for the port that you wish to disable using the **interface rbridge-id/slot/port** command.
3. Enter the **shutdown** command to take the port offline.
4. Enter the **exit** command to return to the global configuration mode before you release the port.
5. Enter the **dpod release** command to remove the port from the POD license.

6. Enter the **exit** command to return to the global configuration mode before you reserve another port.

```
switch# configure terminal
Entering configuration mode terminal
switch(config)# interface 1/0/10
switch(conf-if-te-1/0/10)# shutdown
switch(conf-if-te-1/0/10)# exit
switch(config)# dpod 1/0/10 release
%INFO : Port released.
switch(config-dpod-1/0/10)# exit
```

7. Enter **exit** to return to privileged EXEC mode.
8. Enter the **show dpod** command to verify that the port is no longer assigned to a POD set.
9. Enter the **enable chassis** command to bring the switch back online.
10. Save the configuration changes.

```
switch# copy running-config startup-config
```

NOTE

Do not release a port unless you plan to disconnect the optical link or disable the port persistently. If you leave the link in a state where the port could be brought online, the POD mechanism will detect this unassigned port and attempt to reassign it to a port set.