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Configure Licenses and Throughput for Cisco Catalyst 8000V Edge Software

Available licenses

This document provides information about the licenses that are available for Cisco Catalyst 8000V Edge Software, the supported throughput options, and how you can configure the license and the throughput.

Note

The information applies predominantly to a device operating in the autonomous mode. References to the controller mode are included in certain sections for the sake of comparison and completeness. Where the information applies to controller mode, this has been called-out categorically.

For a more detailed overview on Cisco Licensing, go to https://cisco.com/go/licensingguide.

What's new and changed

The following table provides a summary of license related changes applicable to the Cisco Catalyst 8000V. The table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Table 1: Release-based changes in licensing

Feature name	Release	Feature information
500 Mbps aggregate for Tier 1 and 250 Mbps throughput configuration in autonomous mode	Cisco IOS XE 17.14.1a	When you configure a throughput of 250 Mbps or T1, if an HSECK9 license is available on the device, then throughput is capped at 500 Mbps transmitted (Tx) data only. In earlier releases, throughput was capped at 200 Mbps Tx. See Release-wise changes in throttling behavior, on page 13.
Aggregate throughput throttling	Cisco IOS XE Cupertino 17.9.1a	For all throughput levels, when you configure a bidirectional throughput value on the device, aggregate throughput throttling is effective. This enhancement does not change the throttling behaviour that has always been applicable to virtual platforms: any throttling applies only to data that is transmitted (Tx). Data that is received (Rx) is unthrottled. See Throughput , on page 9 and Numeric and tier-based throughput, on page 9.

Feature name	Release	Feature information
Tier-based licenses	Cisco IOS XE Cupertino 17.7.1a	Support for tier-based throughput configuration was introduced in addition to existing bandwidth-based (numeric) throughput configuration. Starting with the lowest throughput level, the available tiers are Tier 0 (T0), Tier 1 (T1), Tier 2 (T2), and Tier3 (T3). Each tier represents a throughput level. If the license PID for a product is tier-based, the license is displayed with the tier value in the CSSM Web UI. For a product with a tier-based license, you can *configure* a tier-based throughput value, and you can also *convert* to a tier-based throughput value. See Throughput , on page 9 and Numeric and tier-based throughput, on page 9.
Cisco Digital Network Architecture (DNA) licenses	Cisco IOS XE Amsterdam 17.3.2	Support for Cisco DNA licenses was introduced. Cisco DNA Licenses are categorised into network-stack licenses and a DNA-stack add-on licenses. See Cisco DNA license, on page 2.
High Security license (HSECK9)	Cisco IOS XE Amsterdam 17.3.2	Support for the HSECK9 license was introduced. See High Security license , on page 5.
Cisco Unified Border Element license (Cisco UBE license) Cisco Unified Communications Manager Express license (Cisco Unified CME license) Cisco Unified Survivable Remote Site Telephony license (Cisco Unified SRST license)	Cisco IOS XE Amsterdam 17.3.2	Support for Cisco UBE, Cisco Unified CME, Cisco Unified SRST licenses was introduced. See Cisco Unified Border Element license, on page 7, Cisco Unified CME license, on page 8, and Cisco Unified SRST license, on page 8.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Cisco DNA license

A Cisco Digital Network Architecture (DNA) software license is a subscription-based licensing model that combines several feature-specific licenses. A Cisco DNA license includes all feature licenses except the following: High Security (HSECK9), Cisco Unified Border Element (Cisco UBE), Cisco Unified Communications Manager Express (Cisco Unified CME), and Cisco Unified Survivable Remote Site Telephony (Cisco Unified SRST).

Cisco DNA licenses are categorized into network-stack licenses and DNA-stack add-on licenses. The following Cisco DNA Licenses are available on Cisco Catalyst 8000V:

Network-stack licenses:

- Network Essentials
- Network Advantage: Includes features available with Network Essentials, and more.
- Network Premier: Includes features available with Network Essentials, Network Advantage, and more.

DNA-stack add-on licenses:

- Cisco DNA Essentials: Add-on license that is available only with Network Essentials.
- Cisco DNA Advantage: Add-on license that is available only with Network Advantage. Includes features available with DNA Essentials and more.
- Cisco DNA Premier: Add-on license that is available only with Network Premier. Includes features available with DNA Essentials, DNA Advantage, and more.

Guidelines for using a Cisco DNA license

- A network-stack license is a perpetual or permanent license and has no expiration date.
- A DNA-stack add-on license is a subscription or a term license that is valid only until a certain date. A 3-year and a 5-year option is available for all DNA-stack add-on licenses. A 7-year subscription option is also available for certain DNA-stack add-on licenses.
- Tier 3 (T3) or higher tiers are not supported with the Network Essentials and DNA Essentials licenses. If you have configured T3 or higher tiers as the throughput, you cannot change the boot level license to Network Essentials and DNA Essentials. For information about the various tiers available with Cisco DNA Licenses, see Tier and numeric throughput mapping.
- When you configure a network-stack license, you must also configure the corresponding DNA-stack add-on license.

Ordering considerations for a Cisco DNA license

- A Cisco DNA license subsumes all performance, boost, and technology package licenses (securityk9, uck9, and appxk9). Thus, when you order a Cisco DNA network-stack license, or a Cisco DNA-stack add-on license, if a performance, boost, and technology package license is required or applicable, it is automatically added to the order.
- The license Product ID (PID) you purchase can only be a DNA-stack add-on license PID.
- Even if you order a Cisco DNA license along with a new hardware, the license is not preconfigured on the device. You must configure the boot level license and then the throughput on the device.
- When ordering a Cisco DNA license, you must also specify a throughput value. If the throughput you order is greater than 250 Mbps, an HSECK9 license is required. For more information, see High Security license , on page 5.
- When you order a license PID with a tier-based throughput value of **T1**, an HSECK9 license is automatically added to the order.

Configure a boot level license

If you've purchased a Cisco DNA license for a new device, or if you have an existing device and want to upgrade, downgrade, add, or remove the currently configured license on your device, perfrom this task.

This task sets a boot level license and requires a reload before the configured changes are effective.

Step 1 **show version**

Displays the currently set boot level license.

In the accompanying example, Network Advantage and DNA Advantage licences are configured on the device.

Example:

```
Device# show version
<output truncated>
Technology Package License Information:

------------------------------------------------------------------
Technology     Type         Technology-package Technology-package
                            Current           Next Reboot
------------------------------------------------------------------
Smart License  Perpetual    network-advantage  network-advantage
Smart License  Subscription dna-advantage      dna-advantage

<output truncated>
```

Step 2 **configure terminal**

Enters global configuration mode.

Example:

```
Device# configure terminal
```

Step 3 [**no**] **license boot level** {**network-advantage** {**addon dna-advantage**} | **network-essentials** {**addon dna-essentials**} | **network-premier** {**addon dna-premier**} }

Sets a boot level license.

You must configure a network-stack license before you configure the corresponding add-on license.

The configuration of a DNA-stack add-on license is mandatory.

Step 4 **exit**

Exits global configuration mode and returns to privileged EXEC mode.

Example:

```
Device# exit
```

Step 5 **copy running-config startup-config**

Saves your entries in the configuration file.

Example:

```
Device# copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
<output truncated>
```

Step 6 **reload**

Reloads the device. The license levels you've configured are effective and displayed only after this reload.

Example:

```
Device# reload
Proceed with reload? [confirm]

*Dec  8 01:04:12.287: %SYS-5-RELOAD: Reload requested by console.
```

```
Reload Reason: Reload Command.
<output truncated>
```

Step 7 **show version**

Displays the currently set boot level license.

In the accompanying example, the output confirms that Network Premier and DNA-Premier licenses are configured.

Example:

```
Device# show version
<output truncated>
Technology Package License Information:

------------------------------------------------------------------
Technology     Type         Technology-package Technology-package
                            Current            Next Reboot
------------------------------------------------------------------
Smart License  Perpetual    network-premier    network-premier
Smart License  Subscription dna-premier        dna-premier
<output truncated>
```

Step 8 **show license summary**

Displays a summary of the license usage which includes information about the licenses being used, the count, and the status.

Example:

```
Device# show license summary

Account Information:
  Smart Account: Eg-SA As of Dec 08 08:10:33 2021 UTC
  Virtual Account: Eg-VA

License Usage:
  License                Entitlement Tag               Count Status
  -----------------------------------------------------------------------------
  network-premier_T2      (NWSTACK_T2_P)                   1 IN USE
  dna-premier_T2          (DSTACK_T2_P)                    1 IN USE
```

What's next

Configure the throughput based on your license. For more information, see Throughput , on page 9.

High Security license

The High Security license (HSECK9 license) is an export-controlled license and is restricted by U.S. export control laws. This license is required for the use of full cryptographic functionality. That is, for throughput greater than 250 Mbps and tunnel count over and above a certain number.

In the absence of an HSECk9 license, the supported tunnel count and throughput are restricted. This list specifies the supported tunnel count and the supported throughput without the HSECK9 license:

- Number of tunnels without HSECK9 license: 150
- Supported throughput without HSECK9 license: T0, T1

Here, throughput refers to encrypted and unencrypted throughput, combined.

By using an HSECK9 license, the tunnel count restriction is lifted and you can configure throughput greater than 250 Mbps. For detailed information about the available throughput options, see Tier and numeric throughput mapping.

Verify HSECK9 license usage

To know if an HSECK9 license is being used on your device, enter the **show license summary** command in privileged EXEC mode. The HSECK9 license as displayed as: `Router US Export Lic. for DNA (DNA_HSEC).`

For example:

```
Device# show license summary

Account Information:
  Smart Account: Eg-SA As of Dec 03 15:26:02 2021 UTC
  Virtual Account: Eg-VA

License Usage:
  License                 Entitlement Tag               Count Status
  -----------------------------------------------------------------------------
  network-advantage_T2    (NWSTACK_T2_A)                    1 IN USE
  dna-advantage_T2        (DSTACK_T2_A)                     1 IN USE
  Router US Export Lic... (DNA_HSEC)                      1 IN USE
```

Guidelines for using an HSECK9 license

HSECK9 license is tied to the chassis. Therefore, one HSECK9 license is required for each chassis UDI where you want to use cryptographic functionality.

An HSECK9 license requires authorization before you can use it. This authorisation is provided by a Smart Licensing Authorization Code (SLAC). Generate and obtain an SLAC from the Cisco SSM portal before you install the SLAC for each HSECK9 license you use.

The method of obtaining an SLAC from the Cisco SSM portal depends on the topology you have implemented. For more information, see Install SLAC for HSECK9 license, on page 7.

Verify SLAC installation status

To know if SLAC is installed, enter the **show license authorization** command in privileged exec mode. If SLAC is already installed, the status field displays: `SMART AUTHORIZATION INSTALLED on <timestamp>`.

For example:

```
Device# show license authorization
Overall status:
  Active: PID:C8300-1N1S-4T2X,SN:FDO2250A0J5
      Status: SMART AUTHORIZATION INSTALLED on Dec 03 08:24:35 2021 UTC
      Last Confirmation code: 418b11b3

Authorizations:
  Router US Export Lic. for DNA (DNA_HSEC):
    Description: U.S. Export Restriction Compliance license for DNA based Routers
    Total available count: 1
    Enforcement type: EXPORT RESTRICTED
    Term information:
      Active: PID:C8300-1N1S-4T2X,SN:FDO2250A0J5
        Authorization type: SMART AUTHORIZATION INSTALLED
        License type: PERPETUAL
          Term Count: 1

Purchased Licenses:
  No Purchase Information Available
```

Ordering considerations for an HSECK9 license

If you place an order for Cisco Catalyst 8000V and your DNA licenses together, the HSECK9 license is automatically added to the order because throughput support starts at greater than 250 Mbps. Further, the requisite SLAC for the HSECK9 license is also factory-installed on the device.

If you order your DNA license separately, the HSECK9 license is not added automatically to your oder. You must separately order the HSECK9 license, if required.

If you plan to use an HSECK9 license with Cisco Catalyst 8000V, provide your Smart Account and Virtual Account information with the hardware order. This enables Cisco to factory-install SLAC for the HSECK9 license on the router. You must still configure throughput on the device before you start using it.

Note

If you order the HSECK9 license separately and not with the device, SLAC cannot be factory-installed.

Install SLAC for HSECK9 license

A Smart Licensing Authorization Code (SLAC) is generated in and obtained from the Cisco Smart Software Manager (Cisco SSM) portal.

To obtain the SLAC, there are multiple ways in which a product may be connected to the Cisco SSM portal. Each way of connecting to Cisco SSM is called as a topology. You must implement one of the supported topologies before you can install SLAC.

For information about all the topologies, see the Supported Topologies section in the Smart Licensing Using Policy for Cisco Enterprise Routing Platforms document.

Note

Ensure that a boot level license is already configured on the device. To know how to configure a boot license, see Configure a boot level license, on page 3.

In the output of the **show version** privileged EXEC command, ensure that a license is mentioned in the `License Level` field.

What to do next:

Configure the throughput based on your license. For more information, see Throughput , on page 9.

Cisco Unified Border Element license

A Cisco Unified Border Element license (Cisco UBE license) does not require any boot level configuration before you enable it. After purchase, you can refer to the configuration guide to configure the available Cisco UBE features.

You must order a Cisco UBE license separately, if required. Cisco UBE license is not automatically included with any other license.

Additional references

- For information about the features available with a Cisco UBE license, see the *Cisco Unified Border Element Configuration Guide*.
- For release-based information, see https://www.cisco.com/c/en/us/support/unified-communications/unified-border-element/products-installation-and-configuration-guides-list.html.

- For information about supported platforms and about purchasing a Cisco UBE license, see https://www.cisco.com/c/en/us/products/collateral/unified-communications/unified-border-element/data-sheet-c78-729692.html.
- For information about how to report usage of a Cisco UBE license, see Smart Licensing Using Policy for Cisco Enterprise Routing Platforms. In the context of this document, a Cisco UBE license is an unenforced license.

What to do next:

After you enable your license, configure the throughput. For more information, see Throughput , on page 9.

Cisco Unified CME license

A Cisco Unified Communications Manager Express license (Cisco Unified CME license) does not require any boot level configuration before you enable it. After purchase, you can refer to the configuration guide to configure the available features.

Additional references

- For information about the features available with a Cisco Unified CME license, see the Cisco Unified Communications Manager Express System Administrator Guide.
- For information about supported platforms and about purchasing a Cisco Unified CME license, see https://www.cisco.com/c/en/us/products/collateral/unified-communications/unified-communications-manager-express/datasheet-c78-744069.html. You must order a Cisco Unified CME license separately, if required. It is not automatically included with any other license.
- For information about how to report usage of a Cisco Unified CME license, see Smart Licensing Using Policy for Cisco Enterprise Routing Platforms. In the context of this document, a Cisco Unified CME license is an unenforced license.

What to do next:

After you enable your license, configure the throughput. For more information, see Throughput , on page 9.

Cisco Unified SRST license

A Cisco Unified Survivable Remote Site Telephony License (Cisco Unified SRST license) does not require any boot level configuration before you enable it.

In the context of this licensing model, a Unified SRST license is an unenforced license. You must order a Cisco Unified SRST license separately, if required. It is not automatically included with any other license.

Additional references

- To configure the available Unified SRST features, refer to the configuration guide. For information about the features available with a Cisco Unified SRST license, see the Cisco Unified SCCP and SIP SRST System Administrator Guide (All Versions).
- For information about supported platforms and about purchasing a Cisco Unified SRST license, see https://www.cisco.com/c/en/us/products/collateral/unified-communications/unified-communications-manager-express/datasheet-c78-744069.html.
- For information about how to report usage of a Unified SRST license, see Smart Licensing Using Policy for Cisco Enterprise Routing Platforms.

What to do next:

After you purchase this license, configure the throughput. For more information, see Throughput , on page 9.

Throughput

Throughput is a measure of the data that is transmitted through a network in a given amount of time. In the context of licensing, throughput tells you how much data is allowed to be transferred through a device.

You must first configure the throughput value in the autonomous mode before data can be transmitted (Tx) and received (Rx) at the configured rate. If you don't explicitly configure a throughput value, the default throughput is effective.

To know the throughput that's configured in your device, enter the **show platform hardware throughput level** command in privileged EXEC mode.

The following sections provide information about how a throughput value is represented, whether the throughput on a device refers to encrypted or unencrypted throughput and what this means, and if and how a limit may be enforced on a device throughput.

Numeric and tier-based throughput

Your Cisco DNA license product ID or PID contains the throughput you are entitled to. The throughput value is either represented by a number or by a tier in the PID. The same value is configured on the device.

Numeric throughput value

When throughput is represented by a number, it is called a numeric throughput value. For example, DNA-C-**10M**-E-3Y is a license PID with a numeric throughput value of 10M or 10 Mbps.

Depending on the device, some of the other available numeric throughput values are: 15M, 25M, 50M, 100M, 250M, 500M, 1G, 2.5G, 5G, 10G, and so on. Throughput greater than 250 Mbps requires an HSECK9 license.

Tier-based throughput value

When throughput is represented by a tier, it is called a tier-based throughput value. A tier represents a throughput level and is mapped to a numeric throughput value. For example, DNA-C-**T0**-E-3Y is a license PID with a tier-based throughput value of T0. The numeric equivalent it is mapped to is a throughput of up to 25 Mbps.

Note

Tier-based throughput configuration is supported starting with Cisco IOS XE Cupertino 17.7.1a. From this release onwards, tier-based throughput configuration is also a recommended way of configuring throughput on the device.

Starting with the lowest throughput level, the available tiers are Tier 0 (T0), Tier 1 (T1), Tier 2 (T2), Tier 3 (T3), Tier 4 (T4), and Tier 5 (T5). T2 and higher tiers require an HSECK9 license.

Notes about tiers

- Not all tiers are available with all the Cisco DNA licenses. For example, T3 and higher tiers are not available with the Network Essentials and DNA-Essentials licenses. This also means that if you have T3 as the configured throughput, you cannot change the boot level license to Network Essentials and DNA Essentials.
- Each tier maps to a different numeric value for each platform.

Additional references

- To know which tiers are available with a particular DNA License and to know the numeric equivalent of each tier for a particular platform and see the Tier and numeric throughput mapping section.
- To know when to configure a numeric throughput value and when to configure tier-based throughput on your device, see the Numeric vs. tier-based throughput configuration, on page 10 section.

Numeric vs. tier-based throughput configuration

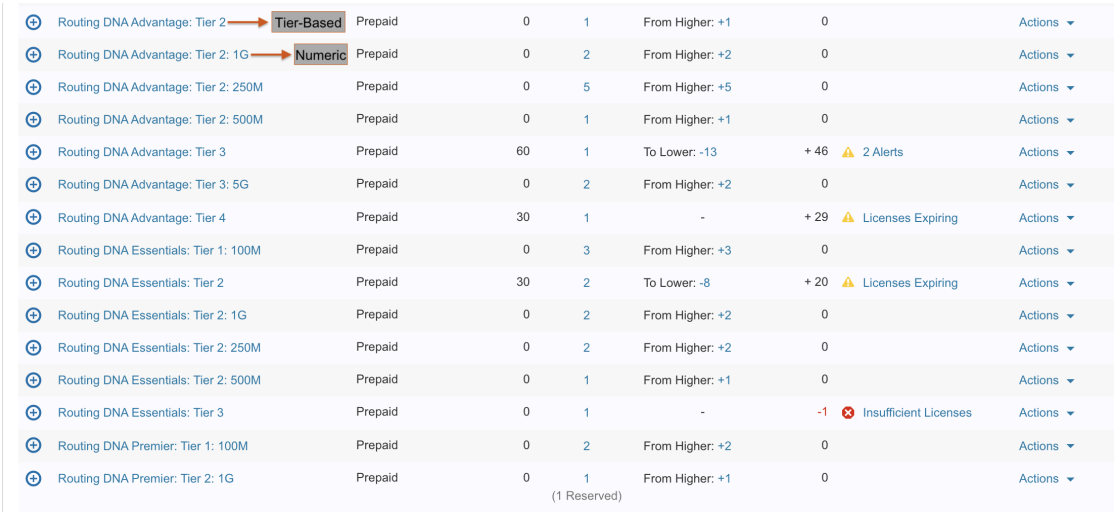
With the introduction of tier-based throughput configuration in Cisco IOS XE Cupertino 17.7.1a, you can configure both numeric and tier-based throughput on your device. This section provides information about when to configure a numeric throughput value and when to configure tier-based throughput.

Identify throughput type

Cisco Smart Software Manager (Cisco SSM) is a portal that enables you to manage all your Cisco software licenses. All the license PIDs you purchase are listed in the Cisco SSM Web UI. To view the PIDs, go to https://software.cisco.com → **Manage licenses**.

To identify whether you have a tier-based license or a numeric license, log in to the portal and in the corresponding Smart Account and Virtual Account, navigate to **Inventory** > **Licences**. The UI displays the throughput type. See this sample screenshot that shows you how tier-based and numeric licenses are displayed:

Figure 1: Numeric and tier values - Cisco SSM web UI



Configure a numeric or tier-based throughput value

- If you purchase a numeric license PID, the license is displayed with the numeric throughput value and tier-based value in the Cisco SSM Web UI. For such a license, we recommend that you configure only a numeric throughput value. For more information, see Configure a numeric throughput, on page 14.
- If you purchase a tier-based license PID, the license is displayed with only the tier value in the Cisco SSM Web UI. For such a license, you can either configure a tier-based throughput value to match the display in the CSSM Web UI, or you can configure a numeric throughput value. For more information, see Configure tier-based throughput, on page 16 or Configure a numeric throughput, on page 14.

Note

There is no functional impact if you have tier-based license PID in Cisco SSM and you configure a numeric throughput value on the device.

Convert a numeric throughput to tier-based and vice versa

This table specifies when you can convert from numeric to tier-based throughput configuration, or vice versa, when this conversion is required, and when it is optional.

If you...	then...
configure a numeric throughput value on the device and the license PID is a numeric license,	do not convert to tier-based throughput value.
configure a numeric throughput value on the device and the license PID is a tier-based license,	you can convert the throughput configuration to tier-based value. There is no functional impact if you do not convert to a tier-based throughput value. For more information, see Convert numeric throughput to tier-based throughput, on page 18.
upgrade to a release where tier-based throughput values are supported and the license PID is tier-based,	you can convert the throughput to tier-based value after upgrade.There is no functional impact if you do not convert to a tier-based throughput value. For more information, see Upgrade from numeric throughput to tier-based throughput, on page 19.
upgrade to a release where tier-based throughput values are supported, and your license PID is numeric,	do not convert to a tier-based throughput value.
downgrade to a release where only numeric throughput values are supported and your license PID and throughput configuration are tier-based,	change the configuration to a numeric throughput value before you downgrade. For more information, see Downgrade from a tier-based throughput to a numeric throughput, on page 19.

Tier and numeric throughput mapping

This section provides information about about the numeric equivalent of each tier and the DNA licenses that each tier is available with.

The image with the mapping table clarifies only the numeric equivalent of a tier. This mapping does not reflect the final throughput that you are entitled to. The entitled throughput depends on the device's capability, the software version running on the device, and throttling behavior for that version. For more information, see Throughput and throttling specifications - autonomous mode, on page 13.

Tier and numeric throughput mapping for Cisco Catalyst 8000V

Y: Network Premium and DNA Premium

Y: Network Advantage and DNA Advantage

Y: Network Essentials and DNA Essentials

* = HSECK9 license required.

Tiers from 17.9.1a:	T0		T1		T2*	
Tiers in 17.7.x, 17.8.x:	T0	T1			T2*	
Numeric Mapping:	15M	25M	50M	100M	250M	500M
Available DNA Licenses:	Y Y Y	Y Y Y	Y Y Y	Y Y Y	Y Y Y	Y Y Y

Note

When you purchase a license PID with a tier-based throughput value of *T1*, an HSECK9 license is automatically provided.

Encrypted and unencrypted throughput

Encrypted throughput, also known as crypto throughput, is throughput that is protected by a cryptographic algorithm.

Unencrypted throughput on the other hand, is in plain text. Unencrypted throughput is also referred to as Cisco Express Forwarding (CEF) traffic.

Important

All references to throughput in this document refers to encrypted and unencrypted throughput, combined.

Throttled and unthrottled throughput

Throttled throughput is throughput on which a limit has been enforced. When you configure a throughput value, you are throttling the device throughput to the configured extent.

Unthrottled throughput means that no limit is enforced, and the device throughput is at the maximum capability of the device.

Note

If throughput is throttled, throttling applies only to Tx data. Rx is always unthrottled.

Types of throttling behavior: aggregate and bidirectional

The system can impose throttling in these ways:

Bidirectional throughput throttling

Here, the system throttles data in each direction. When bidirectional throttling is effective, Tx and Rx data are capped at the bidirectional throughput value separately. For Cisco Catalyst 8000V, Rx is unthrottled.

For example, if the bidirectional throughput value is 25 Mbps or T0, and bidirectional throughput throttling is effective, Tx data is capped at 25 Mbps. Rx is unthrottled.

Note

The value that you see in a license PID (whether numeric or tier-based) represents a bidirectional throughput value.

Aggregate throughput throttling

Here, the system doubles the configured value and throttles throughput at this aggregate limit. When aggregate throughput throttling is effective, traffic is not throttled separately in each direction.

For example, if the bidirectional throughput value that is configured is 500 Mbps and aggregate throughput throttling is effective, Tx data is capped at 1 Gbps. Rx is unthrottled.

Release-wise changes in throttling behavior

To know if the throughput on your device will be throttled in a bidirectional manner or in an aggregate manner, check the software version running on the device. Refer to the release-wise changes in throttling behavior described in this table to identify the throttling behavior.

Cisco IOS XE release	**Throttling behavior**
Until Cisco IOS XE Cupertino 17.7.x	Only bidirectional throughput throttling is effective.
Starting with Cisco IOS XE Cupertino 17.8.1a	Tx throttling continues to apply, and Rx continues to remain unthrottled.
Starting with Cisco IOS XE Cupertino 17.9.1a	For all throughput levels and all tiers, aggregate throughput throttling is effective. **Note** If the aggregate for the throughput level you configure amounts to greater than 250 Mbps, the aggregate throughput throttling is not effective unless an HSECK9 license is available on the device.
Starting with Cisco IOS XE 17.14.1a	When you configure a throughput of 250 Mbps or T1, aggregate throughput throttling is effective as long as an HSECK9 license is available on the device. This means that Tx throughput is capped at 500 Mbps. If an HSECK9 license is not available on the device and you configure a throughput value of 250 Mbps, or T1, then bidirectional throughput throttling is effective. That is, the Tx throughput is throttled at 250 Mbps.

Throughput and throttling specifications - autonomous mode

This table tells you about the throughput you are entitled to. The throughput value, which can be aggregate or numeric, and the release, which determines if throttling is imposed in an aggregate or bidirectional manner.

Table 2: Cisco Catalyst 8000V

Throughput = Encrypted and Unencrypted Throughput
Rx is Unthrottled
* HSECK9 license is required.

Supported throughput values (default 10M)	Entitled throughput & throttling in >= 17.4.1a	Entitled throughput & throttling in >= 17.7.1a	Entitled throughput & throttling in >=17.9.1a	Entitled throughput & throttling in >=17.14.1a
10M	10M Tx only	10M Tx only	20M Tx only	20M Tx only
15M	15M Tx only	15M Tx only	30M Tx only	30M Tx only
25M	25M Tx only	25M Tx only	50M Tx only	50M Tx only
50M	50M Tx only	50M Tx only	100M Tx only	100M Tx only
100M	100M Tx only	100M Tx only	200M Tx only	200M Tx only
250M	250M Tx only	250M Tx only	250M Tx only	With HSECK9: 500M Tx Without HSECK9: 250M Tx
500M*	500M Tx only	500M Tx only	1G Tx only	1G Tx only
1G*	1G Tx only	1G Tx only	2G Tx only	2G Tx only
2.5G*	2.5G Tx only	2.5G Tx only	5G Tx only	5G Tx only
5G*	5G Tx only	5G Tx only	10G Tx only	10G Tx only
10G*	10G Tx only	10G Tx only	20G Tx only	20G Tx only
T0	-	15M Tx only	50M Tx only	50M Tx only
T1	-	100M Tx only	200M Tx only	With HSECK9: 500M Tx Without HSECK9: 250M Tx
T2*	-	1G Tx only	2G Tx only	2G Tx only
T3*	-	10 Tx only	20G Tx only	20G Tx only
T4*	-	Unthrottled	Unthrottled	Unthrottled

Configure a numeric throughput

This task shows you how to change the numeric throughput level on physical and virtual platforms. If you do not configure a throughput level, the platform's default throughput level is effective.

- Read sections Numeric and tier-based throughput, on page 9 and Numeric vs. tier-based throughput configuration, on page 10.
- Ensure that a boot level license is already configured on the device. Otherwise you will not be able to configure a throughput value. See Configure a boot level license, on page 3. In the output of the **show version** privileged EXEC command ensure that a license is mentioned in the `License Level` field.

- If you are configuring throughput greater than 250 Mbps, you must install a Smart Licensing Authorization Code (SLAC) before you start with this task. See Install SLAC for HSECK9 license, on page 7.
- You can configure the `250M` value with or without an HSECK9 license. The system allows both. The difference is that aggregate throttling is effective if HSECK9 is available on the device. See: Release-wise changes in throttling behavior, on page 13.
- Note the throughput you are entitled to. This is indicated in the Cisco DNA license PID you purchase.

Step 1 **show platform hardware throughput level**

Displays the current throughput level on the device.

Example:

```
Device# show platform hardware throughput level
The current throughput level is 1000000 kb/s
```

Step 2 **configure terminal**

Enters global configuration mode.

Example:

```
Device# configure terminal
```

Step 3 **platform hardware throughput level MB** {**100** | **1000** | **10000** | **15** | **25** | **250** | **2500** | **50** | **500** | **5000**}

Configures the throughput level. The displayed throughput options depend on the device.

Note Ensure that a boot level license is configured. Otherwise the command is not recognized as a valid one on the command line interface.

In the accompanying example, 5000 Mbps is configured on Cisco Catalyst 8000V. The software version running on the device is Cisco IOS XE Cupertino 17.8.1a and this means Tx data is throttled at 5000 Mbps. Rx is unthrottled.

Example:

```
Device(config)# platform hardware throughput level MB 5000
%Throughput has been set to 5000 Mbps.
```

Step 4 **exit**

Exits global configuration mode and returns to privileged EXEC mode.

Example:

```
Device# exit
```

Step 5 **copy running-config startup-config**

Saves your entries in the configuration file.

Example:

```
Device# copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
```

Step 6 **show platform hardware throughput level**

Displays the current throughput level on the device.

Example:

```
Device# show platform hardware throughput level
The current throughput level is 5000000 kb/s
```

Configure tier-based throughput

This task shows you how to configure a tier-based throughput level on your device. If you do not configure a throughput level, the platform's default throughput level is effective.

Tier-based throughput levels are supported starting with Cisco IOS XE Cupertino 17.7.1a only.

- Read sections Numeric and tier-based throughput, on page 9 and Numeric vs. tier-based throughput configuration, on page 10.
- Ensure that a boot level license is already configured on the device. Otherwise you will not be able to configure a throughput value. See Configure a boot level license, on page 3. In the output of the **show version** privileged EXEC command ensure that a license is mentioned in the `License Level` field.
- If you are configuring Tier 2 (T2) or a higher tier, you must install a Smart Licensing Authorization Code (SLAC) before you start with this task. See Install SLAC for HSECK9 license, on page 7. All tier options are displayed even if SLAC is not installed. But SLAC is required if you want to configure T2 or a higher tier.
- If you want to configure Tier 3 (T3) ensure that the boot level license is Network Advantage/ DNA Advantage, or Network Premier/DNA Premier. T3 and higher tiers are not supported with Network Essentials and DNA Essentials.
- You can configure the `T1` value with or without an HSECK9 license. The system allows both. The difference is that aggregate throttling is effective if HSECK9 is available on the device. See: Release-wise changes in throttling behavior, on page 13.
- Note the throughput you are entitled to. This is indicated in the Cisco DNA license PID you purchase.

Step 1 **show platform hardware throughput level**

Displays the current throughput level on the device.

In the accompanying example, the **show platform hardware throughput level** sample output has the current throughput level is 10 Mbps.

Example:

```
Device# show platform hardware throughput level
The current throughput level is 10000 kb/s
```

Step 2 **show license authorization**

(Optional) Displays SLAC information on the product instance.

In the accompanying example, SLAC is not available on the platform. Note how this affects throughput configuration in the subsequent steps.

Example:

```
Device# show license authorization
Overall status:
  Active: PID:C8000V,SN:9I8GRCH8CMN
      Status: NOT INSTALLED
```

Step 3 **configure terminal**

Enters global configuration mode.

Example:

```
Device# configure terminal
```

Step 4 **platform hardware throughput level MB** {**T0** | **T1** | **T2** | **T3** | **T4** }

Configures a tier-based throughput. The throughput options that are displayed depend on the device.

Note Only tiers are mentioned in command, for the sake of clarity. When you enter the command on the CLI, numeric and tier values are displayed - as shown in the accompanying example.

- Ensure that you have configured a boot level license already. Otherwise the command for throughput configuration is not recognized as a valid one on the command line interface.
- If you are configuring T2 or a higher tier, you have installed SLAC.

  If you configure T2 or a higher tier without SLAC, the product instance automatically tries to reach Cisco SSM to request and install SLAC. If it is successful, throughput is set to the configured tier. If it is not successful, the system sets the throughput *to* 250 Mbps. If and when SLAC is installed, the throughput is automatically set to the last configured value.

In the accompanying example, 5000 Mbps is configured on the virtual platform. The software version running on the device is Cisco IOS XE Cupertino 17.8.1a and this means Tx data is throttled at 5000 Mbps. Rx is unthrottled.

On the device, **platform hardware throughput level MB**, all tiers are displayed. After T2 is configured, the system message alerts you to the fact that the configuration is not set, because SLAC is not installed.

Example:

```
Device(config)# platform hardware throughput level MB ?
  100    Mbps
  1000   Mbps
  10000  Mbps
  15     Mbps
  25     Mbps
  250    Mbps
  2500   Mbps
  50     Mbps
  500    Mbps
  5000   Mbps
  T0     Tier0(up to 15M throughput)
  T1     Tier1(up to 100M throughput)
  T2     Tier2(up to 1G throughput)
  T3     Tier3(up to 10G throughput)
  T4     Tier4(unthrottled)

Device(config)# platform hardware throughput level MB T2
%Requested throughput will be set once HSEC authorization
code is installed
```

Step 5 **exit**

Exits global configuration mode and returns to privileged EXEC mode.

Example:

```
Device# exit
```

Step 6 **copy running-config startup-config**

Saves your entries in the configuration file.

Example:

```
Device# copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
```

Step 7 **show platform hardware throughput level**

Displays the current throughput level on the device.

In the accompanying example, the throughput is set to 250 Mbps. If and when SLAC is installed, the throughput will be automatically set to the last configured value, which is T2.

Example:

```
Device# show platform hardware throughput level
The current throughput level is 250000 kb/s
```

Convert numeric throughput to tier-based throughput

This task shows you how to convert a numeric throughput value to a tier-based throughput value. To know how numeric throughput values are mapped to tier values refer to the Tier and numeric throughput mapping table.

- Read the Numeric vs. tier-based throughput configuration, on page 10 section.
- If you are converting numeric throughput that is equal or greater than 250 Mbps, ensure that a SLAC is installed on the device. See Install SLAC for HSECK9 license, on page 7.
- The software version running on the device is Cisco IOS XE Cupertino 17.7.1a or a later release.

Step 1 **show platform hardware throughput level**

Displays the currently running throughput on the device.

Example:

```
Device# show platform hardware throughput level
The current throughput level is 100000 kb/s
```

Step 2 **license throughput level auto-convert**

Converts the numeric throughput to a tier-based throughput value. The converted tier value is displayed on the CLI.

Example:

```
Device# license throughput level auto-convert
%Throughput tier set to T1 (100 Mbps)
% Tier conversion is successful.
Please write memory to save the tier config
```

Step 3 **copy running-config startup-config**

Saves your entries in the configuration file.

Note Even though the command you use to convert from numeric to tier-based throughput is a privileged EXEC command, it changes running configuration from a numeric value to a tier-based value. You must therefore save configuration for the next reload to be displayed with a tier value.

Example:

```
Device# copy running-config startup-config
Destination filename [startup-config]?
```

```
Building configuration...
[OK]
```

Step 4 **show platform hardware throughput level**

Displays the currently running throughput on the device.

Example:

```
Device# show platform hardware throughput level
The current throughput level is 100000 kb/s
```

Step 5 **license throughput level auto-convert**

Tip To cross-check that conversion is complete, you can also enter the conversion command again. If the numeric throughput value has already been converted, the system displays a message confirming this.

Example:

```
Device# license throughput level auto-convert
% Tier conversion not possible since the device is already
in tier licensing
```

Upgrade from numeric throughput to tier-based throughput

If you're upgrading to Cisco IOS XE Cupertino 17.7.1 or a later release, and the license PID is a tier-based one, you can convert throughput configuration to a tier-based value. You can also retain the numeric throughput configuration.

Note

There is no functional impact if you have a tier-based license PID in Cisco SSM and you configure a numeric throughput value on your device.

If you want to convert to a tier-based value, note the required action depending on the throughput level that is configured:

Throughput configuration before upgrade	Action before upgrade	Action after upgrade to 17.7.1 or later
Lesser than 250 Mbps	No action required.	Convert numeric throughput to tier-based throughput, on page 18
Equal to 250 Mbps	Obtain an HSECK9 license and install SLAC if you want to convert to T2.	Convert numeric throughput to tier-based throughput, on page 18
Greater than 250 Mbps	No action required.	Convert numeric throughput to tier-based throughput, on page 18

Downgrade from a tier-based throughput to a numeric throughput

If you're downgrading to a release where only numeric throughput configuration is supported, you must convert tier-based throughput configuration to a numeric throughput value before you perform the downgrade. This is applicable even if the license PID is a tier-based license PID.

Caution

If you configured a tier-based throughput value before you performed a downgrade, and the downgrade goes through, the tier-based configuration is not recognized by a pre-17.7.1 image. The configuration fails, and the throughput is not restored to the pre-downgrade level. In this scenario, you must configure a numeric throughput level after the downgrade is complete.

Throughput configuration before downgrade	Action before downgrade	Action after downgrade to a pre-17.7.1 version
Numeric	No action required.	No action required.
Tier	Configure a numeric throughput, on page 14	No action required.

Configure an interface for 10 Gbps maximum throughput

If you installed a license with a maximum throughput with 10 Gbps, or if you're installing an evaluation license for a feature set with a maximum throughput of 10 Gbps, perform the steps outlined in this task to obtain the 10 Gbps throughput on an interface.

Step 1 **enable**

Enables privileged EXEC mode. Enter your password, if prompted.

Example:

```
Router> enable
```

Step 2 **configure terminal**

Enters global configuration mode.

Example:

```
Router# configure terminal
```

Step 3 **interface GigabitEthernet***number*

Enters interface configuration mode. Here, number specifies the interface number.

Example:

```
Router(config)# interface GigabitEthernet1
```

Step 4 **no negotiation auto**

Disables the autonegotation protocol setting on the interface.

Example:

```
Router(config-if)# no negotiation auto
```

Step 5 **speed 10000**

Configures the interface speed to 10 Gbps.

Example:

```
Router(config-if)# speed 10000
```

Report license usage

After you install your license and configure the throughput value, you should be able to use the features associated with your license. The next step is to monitor your license usage to account for or report the licenses that you use, to Cisco.

After you configure your license level and throughput, you should be able to use the features associated with your license. The next step is to monitor your license usage to account for or report the licenses that you use, to Cisco. For this, you have to send a RUM report (Resource Utilization Measurement Report) to Cisco SSM to report license usage information.

To know if reporting is required, wait for a system message or refer to the policy using show commands.

- If reporting is required, the system displays the message: %SMART_LIC-6-REPORTING_REQUIRED: A Usage report acknowledgment will be required in [dec] days. Here, [dec] is the amount of time (in days) left to meet reporting requirements.
- If you're using show commands, refer to the output of the **show license status** privileged EXEC command and check the `Next ACK deadline` field. This means a RUM report must be sent and the acknowledgment (ACK) from Cisco SSM must be installed by this date.

How you send the RUM report depends on the topology you have implemented in the Smart Licensing Using Policy environment. For more information on sending RUM reports based on your implementation, see How to Configure Smart Licensing Using Policy: Workflows by Topology.The following sections tell you how to monitor the license usage as per the license model.

Smart Licensing Using Policy

With this licensing model, you purchase the licenses you want to use, configure them on the device, and then report license usage, as required. You do not have to complete any licensing-specific operations such as registering or generating keys before you start using the software and the licenses that are tied to it; unless you're using export-controlled and enforced licenses.

For more information, see Smart Licensing Using Policy for Cisco Enterprise Routing Platforms.

Pay As You Go (PAYG) licensing

Cisco Catalyst 8000V supports the PAYG licensing model with Amazon Web Services (AWS) and Microsoft Azure Marketplace, in both the autonomous mode and the controller mode. The Cisco Catalyst 8000V hourly-billed Amazon Machine Image (AMI) or the Pay As You Go licensing model allows you to consume an instance for a defined period of time.

- In the autonomous mode, you can directly launch an instance from the AWS or Azure Marketplace and start using it. The licenses are embedded in the image and the selected license package and configured throughput level are effective when you launch the instance.
- In the controller mode, which is supported from Cisco IOS-XE Bengaluru 17.5.1, you must first onboard the device into Cisco SD-WAN as per Onboard Cisco Catalyst 8000V Edge Software Hosted by a Cloud Service, Using PAYG Licensing. After this, when you launch an instance from AWS, the device comes-up with the license already installed for unlimited throughput.

Managed Service Licensing Agreement

A Managed Service License Agreement (MSLA) is a buying program agreement, designed for Service Providers.

- **MSLA in Cisco SD-WAN controller mode**

  In the Cisco SD-WAN controller mode, an MSLA is supported on all products in the Cisco Catalyst 8000 Edge Platforms Family. For more information, see:

  Managed Service Licensing Agreement (MSLA) for Cisco SD-WAN At-a-Glance

Cisco SD-WAN Getting Started Guide → *Manage Licenses for Smart Licensing Using Policy*.

Cisco vManage How-Tos for Cisco IOS XE SD-WAN Devices → *Manage Licenses for Smart Licensing Using Policy*.

- **MSLA in autonomous mode**

  In the autonomous mode, an MSLA is available with Catalyst 8000V Edge Software starting from Cisco IOS XE Cupertino 17.9.1a. For more information, see: MSLA.