Software Entitlement on Cisco IOS XR Software

Cisco IOS XR software contains all of the supported features for a given release. Prior to Cisco IOS XR Release 3.5.0, you could freely activate all available software packages on your network devices and could enable all of the bundled features. The same was true for hardware, as well. For example, modular services cards (MSCs) can be programmed to run in 20-Gbps or 40-Gbps modes. Prior to Cisco IOS XR Release 3.5.0, all MSCs ran in 40-Gbps mode. To enable the pay-as-you-grow model—where you pay only for the features that you need today—but can upgrade when necessary while keeping your investment safe, software entitlement has been introduced in Release 3.5.0. The licensing enables you to purchase individual software features and upgrade hardware capacity in a safe and reliable way.

Note For complete descriptions of the commands listed in this module, see Related Documents, page 80. To locate documentation for other commands that might appear in the course of performing a configuration task, search online in the Cisco IOS XR software master command index for Release 3.5.0.

Feature History for Software Entitlement

Release	Modification
Release 3.5.0	The feature was introduced on the Cisco CRS-1 and Cisco XR 12000 Series Router.

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- How to Configure Cisco IOS XR Software Entitlement, page 74
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Prerequisites for Configuring Software Entitlement

Before configuring software entitlement on your Cisco CRS-1 system, ensure that the following prerequisites are met:

- You must be in a user group associated with a task group that includes the proper task IDs for software entitlement commands. For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of the *Cisco IOS XR System Security Configuration Guide,* Release 3.5.0.

Restrictions for Cisco IOS XR Software Entitlement

In Cisco IOS XR Release 3.5.0, only the following features can be controlled using software entitlement:

- Layer 3 VPN
- Modular services card bandwidth

Information About Cisco IOS XR Software Entitlement

To configure process placement policies, you need to understand the following concepts:

- What Is Software Entitlement?, page 72
- Types of Licenses, page 72
- SDR License Pools, page 73
- Chassis-Locked Licenses, page 73
- Slot-Based Licenses, page 73

What Is Software Entitlement?

Software entitlement is a system that consists of a license manager on a Cisco IOS XR device that issues licenses for various software and hardware features. The license manager parses and authenticates a license before accepting it. The software features on the router use the license manager APIs to check out and release licenses. Licenses are stored in persistent storage on the router.

All core routing features are available for use without any license. Core features are defined as:

- Non-Layer 3 VPN features
- Non-Layer 2 VPN features
- Equivalent of networking features available as of Cisco IOS XR Software Release 3.2.0.

Types of Licenses

The following types of licenses are currently defined:

- Permanent licenses—Licenses that enable a designated feature permanently, as long as the license resides on the router.

- Evaluation or metered licenses—Licenses that enable a feature for a limited period of time. The feature stops working immediately on license expiry. If multiple evaluation licenses are added for the same feature, the expiry period is counted from when the first evaluation license is added to the router.
- Implicit evaluation licenses—Set of evaluation licenses that are included with the software image (upgrade or initial install). Like regular evaluation licenses, these are valid for a period of ninety days, but the countdown to expiry starts as soon as the router is booted with an image containing these licenses.

SDR License Pools

License pools are maintained according to secure domain router (SDR). By default, all added licenses are allocated to the owner SDR license pool, and they can be freely allocated to any slot in any SDR. Features on cards belonging to the owner SDR are granted licenses based on availability in the owner SDR license pool.

You can create SDR-specific license pools by using the **license pool create** command. License requests for features running on cards belonging to SDRs with SDR-specific pools are not served from the owner license pool, even if the owner SDR license pool has licenses available. You must allocate licenses from the owner SDR to other SDRs explicitly for these license requests to succeed. Similarly, if a slot in the owner SDR had a feature license and subsequently was moved to some other SDR with an SDR-specific license pool, the feature license stays with the original SDR license pool.

You can explicitly add new licenses to a particular SDR license pool or move available licenses from the owner SDR license pool to any other SDR.

Chassis-Locked Licenses

Licenses are locked to a unique device identifier (UDI). The UDI is comprised of the chassis serial number, along with a license operation ID number. The license operation ID is incremented by the license manager every time there is a successful license add or remove operation. The complete set of UDI information can be displayed using the **show license udi** command. The license manager parses the user-provided license and verifies that it is valid for the chassis it is running on and determines if the license is being read.

Multiple single-chassis Cisco CRS-1 routers can be connected using a fabric chassis to form a multishelf system. In multishelf systems, licenses are locked to the UDI of the individual chassis, but can be used to enable features on any chassis. The list of available licenses for a multishelf system is a collection of all licenses on each contributing chassis.

Slot-Based Licenses

Feature licenses are allocated to router slots and not cards. Therefore, if a card is replaced, the existing license is applied to the newly inserted card. For example, if you have ten licenses for Layer 3 VPN in the system, you can configure Layer 3 VPN features on any ten cards in an SDR, and the licenses are allocated to the slots within which the cards are installed. If a card is removed from one of these licensed slots, say slot 5, and entered into an empty slot with no license, say slot 7, the license remains with slot 5 and the feature cannot be activated on slot 7 with the permanent license entered earlier by the user. In this case, you can release the license to the appropriate license pool by removing the configuration of the card (while it is inserted), or by using the **license move slot** command. When you configure the feature on slot 7, the license is checked out.

How to Configure Cisco IOS XR Software Entitlement

This section contains instructions for the following tasks:

- Adding a License for a New Feature, page 74
- Using Implicit Licenses After a Software Image Upgrade, page 76
- Enabling 40-Gbps Throughput on an MSC, page 76
- Backing Up Licenses, page 78
- Restoring Licenses, page 79

Adding a License for a New Feature

This task describes how to acquire a permanent license for a feature that you have purchased or an evaluation license for a feature that you have arranged with your sales representative to try. Use this procedure to replace implicit or evaluation licenses with permanent licenses.

Note Evaluation licenses cannot be installed if permanent licenses for the same feature are valid on the chassis. Also note that if you add a permanent license to a chassis, all evaluation or implicit licenses of the same type are disabled.

Prerequisites

You must have purchased the feature for which you are adding the license. When you purchase the feature, you are provided with a product authorization key (PAK) that you use to download the license.

Restrictions

All implicit or evaluation licenses for a feature are disabled when at least one permanent license for a feature is added to the router. This is true even if you had more evaluation licenses than permanent licenses.

SUMMARY STEPS

1. **admin**
2. **show license udi**
3. Go to the license tool on Cisco.com and enter the PAK of the feature and the UDI of the chassis.
4. Copy the license file to a TFTP server accessible from your router.
5. **admin**
6. **license add** *license-name* [**sdr** *sdr-name*]
7. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**admin** **Example:** `RP/0/RP0/CPU0:router# admin`	Enters administration EXEC mode.

Step 2	**show license udi**
	
	Example:
	`RP/0/RP0/CPU0:router# show license udi`
	
	`Local Chassis UDI Information:`
	`  PID         : CRS-8-LCC`
	`  S/N         : TBA09370035`
	`  Operation ID: 1`
		Displays the unique device identifier (UDI) of the chassis. This consists of a product identifier (PID), serial number (S/N), and operation identifier (Operation ID).

Step 3	http://www.cisco.com/go/license **Example:** `http://www.cisco.com/go/license`	Go to the license tool on Cisco.com. You must log in to the site before you can access the license tool. Follow the instructions for product license registration. You will be required to enter the feature PAK and the chassis UDI in order to acquire the license. **Note** If you are installing a permanent license, you should have received the PAK when you purchased the feature. If you are installing an evaluation license, your sales representative should provide you with the PAK.
Step 4	Copy the license to your TFTP server.	You will be issued a license. You can copy the license and store it on your computer, or alternatively, you can request that the license be sent to you in an e-mail. When you have received the license, copy it to a TFTP server that is accessible by your router.

Step 5	**admin**
	
	Example:
	`RP/0/RP0/CPU0:router# admin`
	`RP/0/RP0/CPU0:router(admin)#`
		Enters administration EXEC mode on the router to which you want to add the license.

Step 6	**license add** *license-name* [**sdr** *sdr-name*] **Example:** `RP/0/RP0/CPU0:router(admin)# license add tftp://192.10.10.10/mylicenses/lc40g_lic`	Adds the license to the SDR license pool. By default, the license is added to the owner SDR license pool.
Step 7	**exit** **Example:** `RP/0/RP0/CPU0:router(admin)# exit`	Exits administration EXEC mode.

What to Do Next

To use the feature associated with the added license, you must configure it on your router. To configure 40-Gbps throughput on your MSC, refer to the "Enabling 40-Gbps Throughput on an MSC" section on page 76. To configure Layer 3 VPN, refer to the "Implementing MPLS Layer 2 VPNs" module in *Cisco IOS XR Multiprotocol Label Switching Configuration Guide*, Release 3.5.

To verify that your MSC is operating at 40-Gbps throughput, use the **show hw-module linecard throughput** command. To verify that your Layer 3 VPN configuration is operational, use the **show rsi interface all global** command.

Using Implicit Licenses After a Software Image Upgrade

When you upgrade your Cisco IOS XR software image from a release that does not support software entitlement to one that does, you are provided with implicit licenses to use for all configured features in your original configuration. This enables you to upgrade your software without worrying about the implications of software entitlement.

Implicit licenses are good for a period of 90 days. As soon as the new image boots, the license manager displays a syslog message to the console once a day, indicating that an implicit license is being used and must be replaced with a permanent license. This frequency increases to once an hour on the last day before the expiry of the implicit licenses, to ensure that you do not miss it.

Before your implicit licenses expire, you should purchase licenses for all features that you want to keep running. Refer to the "Adding a License for a New Feature" section on page 74 for more information.

Enabling 40-Gbps Throughput on an MSC

To configure an MSC to operate at 40-Gbps throughput, perform the following task. This must be performed when you add permanent licenses to your router to replace implicit licenses. It also must be performed if you are purchasing a new license for 40-Gbps throughput after using the MSC with the default 20-Gbps throughput.

Note When you upgrade your image from an image that does not support software entitlement to one that does, all existing MSCs default to the 40-Gbps configuration as long as there are active implicit licenses. When the implicit licenses expire, the configuration reverts to the default 20-Gbps.

Prerequisites

You must have a license on your system for 40-Gbps throughput to enable this feature. This could be an implicit license, evaluation license, or permanent license.

SUMMARY STEPS

1. **configure**
2. **hw-module linecard throughput 40 location** *node-id*
3. **end**
   or
   commit

4. **show hw-module linecard throughput**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure** **Example:** `RP/0/RP0/CPU0:router# configure`	Enters global configuration mode.
Step 2	**hw-module linecard throughput 40 location** *node-id* **Example:** `RP/0/RP0/CPU0:router(config)# hw-module linecard throughput 40 location 0/6/0`	Enables 40-Gbps throughput on the MSC in the specified *node-id*. If this command is not added to your configuration, the MSC continues to work at 20 Gbps, even if you have a valid license.

Step 3	**end**
	or
	commit
	
	Example:
	`RP/0/RP0/CPU0:router(config)# end`
	or
	`RP/0/RP0/CPU0:router(config)# commit`
		Saves configuration changes.
		• When you issue the **end** command, the system prompts you to commit changes:
		`Uncommitted changes found, commit them before exiting (yes/no/cancel)? [cancel]:`
		– Entering **yes** saves configuration changes to the running configuration file, exits the configuration session, and returns the router to EXEC mode.
		– Entering **no** exits the configuration session and returns the router to EXEC mode without committing the configuration changes.
		– Entering **cancel** leaves the router in the current configuration session without exiting or committing the configuration changes.
		• Use the **commit** command to save the configuration changes to the running configuration file and remain within the configuration session.

Step 4	**show hw-module linecard throughput** **Example:** `RP/0/RP0/CPU0:router# show hw-module linecard throughput`	Displays the operational throughput on the MSCs in the router.

Examples

The following example shows sample output from the **show hw-module linecard throughput** command. In this example, the MSC in slot 6 has no license to run at 40 Gbps, while the MSC in slot 1 has a license and is operating at 40 Gbps.

```
RP/0/RP0/CPU0:router# show hw-module linecard throughput

 -------------------- Throughput --------------------
 Location        Configured      Lic Acquired    Operating

 0/6/CPU0         no config          No            20G

 0/1/CPU0         no config          Yes           40G
```

Backing Up Licenses

When your router is configured with the licenses that you require, you should perform this task to back up all licenses. This makes it easier to restore your licenses in the event of a problem.

SUMMARY STEPS

1. **admin**
2. **license backup** *backup-file*
3. **show license backup** *backup-file*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure** **Example:** `RP/0/RP0/CPU0:router# configure`	Enters global configuration mode.

Step 2	**license backup** *backup-file*
	
	Example:
	`RP/0/RP0/CPU0:router(admin)# license backup disk1:/license_back`
	
	`License command "license backup disk1:/license_back" completed successfully.`
		Backs up all licenses on the router to a backup file in the specified location. This can be a local file, or a remote file on a TFTP or RCP server.

	Command or Action	Purpose

Step 3	**show license backup** *backup-file*
	
	Example:
	`RP/0/RP0/CPU0:router(admin)# show license backup disk1:/license_back`
	
	`Local Chassis UDI Information:`
	`  S/N         : TBA09370035`
	`  Operation ID:   5`
	`Licenses      :`
	`FeatureID    Type                    #installed`
	`CRS-MSC-40G  Slot based,    Permanent          2`
	`XC-L3VPN     Slot based,    Permanent          1`
		Displays the contents of the backup file.

Restoring Licenses

If your licenses become corrupted, and you have previously created a backup of your licenses, you can perform this task to restore the licenses to your router.

Prerequisites

You must have created a backup file of your licenses before you can restore them on your router.

SUMMARY STEPS

1. **admin**
2. **show license backup** *backup-file*
3. **license restore** *backup-file*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure** **Example:** `RP/0/RP0/CPU0:router# configure`	Enters global configuration mode.

Step 2	**show license backup** *backup-file*
	
	Example:
	`RP/0/0/CPU0:router(admin)# show license backup disk1:/license_back`
	
	`Local Chassis UDI Information:`
	`  S/N         : TBA09370035`
	`  Operation ID:   5`
	`Licenses      :`
	`FeatureID    Type                    #installed`
	`CRS-MSC-40G  Slot based,    Permanent          2`
	`XC-L3VPN     Slot based,    Permanent          1`
		Displays the contents of the backup file. You should verify the contents of the backup file before you restore your licenses.

Step 3	**license restore** *backup-file*
	
	Example:
	`RP/0/RP0/CPU0:P1_CRS-8(admin)# license restore disk1:/license_back`
	
	`Info: This command will erase all existing licenses.`
	`Info: It is strongly recommended to backup existing licenses first.`
	`Do you wish to proceed? [yes/no]: y`
	
	`License command "license restore disk1:/license_back" completed successfully.`
		Restores all licenses on the router from a backup file in the specified location. This can be a local file, or a remote file on a TFTP or RCP server.

Additional References

The following sections provide references related to Cisco IOS XR software entitlement.

Related Documents

Related Topic	Document Title
Cisco IOS XR software entitlement commands	*Software Entitlement Commands on Cisco IOS XR Software* module of *Cisco IOS XR System Management Command Reference*
Layer 3 VPN configuration	*Implementing MPLS Layer 2 VPNs* module of *Cisco IOS XR Multiprotocol Label Switching Configuration Guide*
Cisco IOS XR master command index	*Cisco IOS XR Commands Master List*

Related Topic	Document Title
Cisco IOS XR getting started material	*Cisco IOS XR Getting Started Guide*, Release 3.5
Information about user groups and task IDs	*Configuring AAA Services on Cisco IOS XR Software* module of *Cisco IOS XR System Security Configuration Guide*, Release 3.5

Standards

Standards	Title
No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.	—

MIBs

MIBs	MIBs Link
—	To locate and download MIBs using Cisco IOS XR software, use the Cisco MIB Locator found at the following URL and choose a platform under the Cisco Access Products menu: http://cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml

RFCs

RFCs	Title
No new or modified RFCs are supported by this feature, and support for existing RFCs has not been modified by this feature.	—

Technical Assistance

Description	Link
The Cisco Technical Support website contains thousands of pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content.	http://www.cisco.com/techsupport