Software Entitlement

Cisco IOS XR software contains all the supported features for a given release. Before the introduction of software entitlement on Cisco IOS XR software, you could freely activate all available software packages on your network devices and could enable all the bundled features. Software entitlement has been introduced so you pay only for the features that you need today, but can upgrade when necessary while keeping your investment safe. Licensing enables you to purchase individual software features and upgrade hardware capacity in a safe and reliable way.

The licensing methods supported on Cisco IOS XR software are:

- Smart Licensing
- Default (traditional) Licensing

To locate documentation for other commands that might appear in the course of performing a configuration task, search online in *Cisco ASR 9000 Series Aggregation Services Router Commands Master List*.

Table 1: Feature History for Software Entitlement

Release	Modification
Release 3.9.0	The software entitlement feature was introduced.
Release 4.3.1	NV Satellite license was supported.
Release 5.2.0	Smart Licensing was introduced.
Release 5.3.1	Support for Smart Licensing was introduced on Cisco ASR 9000 High Density 100GE Ethernet line cards. General availability release for Smart Licensing on ASR 9000.
Release 6.0.1	Updated consumption model line card support

This model contains the following topics:

What Is Software Entitlement?

Software entitlement is a system that consists of a license manager on a Cisco IOS XR device that manages 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.

Core routing features are available for use without any license. The following features can be enabled on your router using licenses:

Layer 3 VPN

Layer 3 (virtual private network) VPN can be configured only if there is an available Layer 3 VPN license for the line card slot on which the feature is being configured. If the advanced IP license is enabled, 4096 Layer 3 VPN routing and forwarding instances (VRFs) can be configured on a line card. If the infrastructure VRF license is enabled, eight Layer 3 VRFs can be configured on the line card.

To activate the Infrastructure VRF license, you need to configure two interfaces or sub-interfaces in separate VRFs, with at least one physical interface in each of the VRFs.

The key is to have multiple (two or more) user-defined VRFs configured in at least one slot and at least one physical interface in each user-defined VRF; and repeated for each slot.

In a non-consumption model line card, configuring a physical interface in multiple VRFs would consume a L3VPN license. However, configuring other virtual interfaces (such as management, or BVI interfaces) in multiple VRFs would'nt consume L3VPN license. Configuring VRFs under bundle main and sub-interfaces does consume L3VPN license.

See the following modules in *MPLS Configuration Guide for Cisco ASR 9000 Series Routers* for information about Layer 3 VPN configurations:

- *Implementing MPLS Layer 3 VPNs on the Cisco ASR 9000 Series Router*

- *Implementing Virtual Private LAN Services on the Cisco ASR 9000 Series Router*

G.709

If a G.709 license is available, G.709 can be enabled on 10-Gigabit Ethernet interfaces on the following line cards:

- 2-port 10 Gigabit Ethernet / 20-port Gigabit Ethernet line card

- 8-port 10 Gigabit Ethernet line card

- 24-port 10 Gigabit Ethernet line card

- 36-port 10 Gigabit Ethernet line card

- 4-port 10 Gigabit Ethernet modular port adapter

- 2-port 10 Gigabit Ethernet modular port adapter

Refer to the *Configuring Dense Wavelength Division Multiplexing Controllers on the Cisco ASR 9000 Series Router* module in *Interface and Hardware Component Configuration Guide for Cisco ASR 9000 Series Routers*.

Video Monitoring

Video monitoring can be enabled for the Cisco ASR 9000 chassis by using a video monitoring license.

Satellite Network Virtualization (nV)

The Satellite nV license entitles satellite devices to connect to the Cisco ASR 9000 chassis. Satellite licenses are chassis licenses, and can provide the ability for one, five or 20 satellites to connect to a Cisco ASR 9000 host remotely.

Note Smart Licensing is supported on a cluster set-up. There are two A9K-NV-CLUSTR-LIC licenses required/requested, one for each of the chassis.

Implementing Smart Licensing

Information About Smart Licensing

Smart Licensing is a cloud-based, software license management solution that enables you to automate time-consuming, manual licensing tasks. The solution allows you to easily track the status of your license and software usage trends.

Smart Licensing helps simplify three core functions:

- **Purchasing:** The software that you have installed in your network can automatically self-register themselves, without Product Activation Keys (PAKs).
- **Management:** You can automatically track activations against your license entitlements. Additionally, there is no need to install the license file on every node. You can create license pools (logical grouping of licenses) to reflect your organization structure. Smart Licensing offers you Cisco Smart Software Manager, a centralized portal that enables you to manage all your Cisco software licenses from one centralized website. Cisco Smart Software Manager Overview, on page 31 provides details.
- **Reporting:** Through the portal, Smart Licensing offers an integrated view of the licenses you have purchased and what has been actually deployed in your network. You can use this data to make better purchase decisions, based on your consumption.

Smart Versus Traditional Licensing

Traditional (node locked) licencing	Smart (dynamic) licencing
You must procure the license and manually install it on the device.	Your device initiates a call home and requests the licenses it needs. *Configuring Call Home on the Cisco ASR 9000 Series Router* describes the Smart Call Home feature.
Node-locked licences - license is associated with a specific device.	Pooled licences - licences are company account-specific, and can be used with any compatible device in your company. You can activate or deactivate different types of licenses on the device without actually installing a license file on the device.

No common install base location to view licenses purchased or software usage trends	Licenses are stored securely on Cisco servers accessible 24x7x365.
No easy means to transfer licenses from one device to another.	Licenses can be moved between product instances without a license transfer. This greatly simplifies the reassignment of a software license as part of the Return Material Authorization (RMA) process.
Limited visibility into all software licenses being used in the network. Licenses are tracked only on per node basis.	Complete view of all Smart Software Licenses used in the network using a consolidated usage report of software licenses and devices in one easy-to-use portal.

Traditional Licensing Consideration in Smart Licensing, on page 33 describes the scenarios in which you may want to retain the default mode of licensing. It also explains what happens to your traditional license files if you choose to switch to Smart Licensing.

Smart Licensing in Cisco IOS XR 64 bit

Smart Licensing is enabled by default on Cisco IOS XR 64 bit. Here are few things to consider for Smart Licensing in Cisco IOS XR 64 bit:

- Smart Licensing cannot be disabled.

- All the Smart Licensing CLIs are executed from EXEC mode.

- EVAL Period is not supported. Hence licenses are consumed only after registeration.

- Smart Licensing is supported on A9K-8X100GE-CM, A99-8X100GE-CM, A99-12PT-CM-LIC, and A9K-MOD400-CM-LIC line cards.

This table lists supported licenses for non-CM line cards:

Table 2: Non-CM Line Cards Software Licenses for Cisco IOS XR 64-bit

Non-CM Line Cards Software License PID	Description
A9K-800G-IVRF	ASR 9000 8-port 100 GE Infrastructure VRF Right to Use License
A9K-400G-IVRF	ASR 9000 4-port 100 GE Infrastructure VRF license Right to Use License
A99-1200G-IVRF	ASR 9900 Infrastructure VRF license Right to Use License
A9K-800G-AIP-SE	ASR 9000 8-port 100 GE Advance IP Service Edge Right to Use License
A9K-800G-AIP-TR	ASR 9000 8-port 100 GE Advance IP Transport Optimised Right to Use License
A9K-400G-AIP-SE	ASR 9000 4-port 100 GE Advance IP Service Edge Right to Use License

Non-CM Line Cards Software License PID	Description
A9K-400G-AIP-TR	ASR 9000 4-port 100 GE Advance IP Transport Optimised Right to Use License
A99-1200G-AIP	ASR 9900 12port 100GE Advanced IP Right to Use License
A9K-800G-OPT-LIC	ASR 9000 8-port 100 GE Advance Optical Right to Use License
A9K-400G-OPT-LIC	ASR 9000 4-port 100 GE Advance Optical Right to Use License
A99-1200G-ADVRTNG	ASR 9900 12port 100GE Advanced Routng Right to Use License
S-A9K-9901-AIP-LC	ASR 9000 Smart License L3 VPN for NON PAYG 9901 System
S-A9K-9901-VRF-LC	ASR 9000 Smart License I-VRF for NON PAYG 9901 System
S-A9K-9901-120AIP	ASR 9000 Smart License L3 VPN for 120G PAYG 9901 System
S-A9K-9901-256AIP	ASR 9000 Smart License L3 VPN for 256G PAYG 9901 System
S-A9K-BNG-ADV-8K	ASR 9000 Smart License for BNG license for Advance Features
S-A9K-BNG-LIC-8K	ASR 9000 BNG License Unit for 8000 subscribers
A9K-24P-80GRTU-SE	ASR 9000 80G Upgrade license for 24-port 10G/1G dual rate Service Edge
A9K-24P-80GRTU-TR	ASR 9000 80G Upgrade license for 24-port 10G/1G dual rate Transport Optimized
A9K-48P1GE-AIP-SE	ASR 9000 Advance IP Service Edge License for full scale VRFs for 48-port 1G mode
A9K-48P1GE-AIP-TR	ASR 9000 Advance IP Transport Optimized License for full scale VRFs for 48-port 1G mode
A9K-48P10G-SE-UPG	ASR 9000 48-port 1G to 10G Service Edge Upgrade License

This is the list of show commands available for Smart Licensing in Cisco IOS XR 64 bit :

- show license all—shows all information regarding Smart license

- show license platform—shows platform-specific licensing information (cisco-support)

- show license status—shows smart licensing status information

• show license summary—shows smart licensing summary

• show license techsupport—shows smart licensing tech support information

• show license trace—shows tracing for smart licensing code (cisco-support)

• show license udi—shows smart licensing UDI information

• show license usage—shows smart licensing usage information

• show license platform detail—shows smart license detail information (cisco-support)

• show license platform summary—shows smart license summary (cisco-support)

• show license platform trace—shows platform specific licensing trace information (cisco-support)

What is Flexible Consumption Model?

Table 3: Feature History Table

Feature Name	Release Information	Feature Description
Support for Flexible Consumption Model on • A99-8X100GE-SE • A9K-48X10GE-1G-SE • A99-48X10GE-1G-SE • A9K-MOD400-SE • A9K-24X10GE-1G-SE • A9K-4X100GE • A9K-MOD200-SE • ASR-9901	Release 7.3.1	Support for Flexible Consumption Model (FCM) is now extended to the hardware: • A99-8X100GE-SE • A9K-48X10GE-1G-SE • A99-48X10GE-1G-SE • A9K-MOD400-SE • A9K-24X10GE-1G-SE • A9K-4X100GE • A9K-MOD200-SE • ASR-9901

The Flexible Consumption Model (FCM) provides the capability and flexibility to purchase software capacity as needed. FCM delivers the following:

• Pay-as-you-grow—Enables you to lower initial costs and add more capacity over time.

• Simplify operations—FCM delivers the carrier-class IOS-XR software feature set with two software suites, Essentials and Advanced, that simplify license management.

• Utilize capital efficiently—License pooling enables an efficient way to share licenses across the network.

To enable Flexible Consumption model licensing on routers running Cisco IOS XR :

```
Router(config)# license smart flexible-consumption enable
Router(config)# commit
```

To verify the Flexible Consumption Model configuration:

```
Device# show running-config license smart flexible-consumption enable
```

The following table provides information about FCM licenses for ASR 9000 Series routers:

Table 4: Flexible Consumption Model Licensing Usage Pattern

License Name	Hardware Supported	Consumption Pattern
Essential and Advanced Licenses: • ESS-ED-100G-RTU1 • ADV-ED-100G-RTU1	Line-cards: A9K-16X100GE-TR, A99-32X100GE-TR and A99-16X100GE-X-SE	The number of essential or advanced licenses consumed depends on the number of active ports and is reported on per chassis basis
Hardware Tracking Licenses: • A99-32X100GE-TRK • A9K-16X100GE-TRK • A99-16X100G-X-TRK • A99-8X100GE-TRK • A9K-48X10GE-1G-TRK • A99-48X10GE-1G-TRK • A9K-MOD400-TRK • A9K-24X10GE-1G-TRK • A9K-400GE-LAN-TRK • A9K-MOD200-TRK • ASR-9901-TRK	These Tracking licenses are named on the basis of the hardware supported.	The number of licenses consumed depends on the hardware in use.
Software Tracking license: • XR-7.3-A9K-X-TRK • XR-7.1-A9K-X-TRK • XR-7.0-A9K-X-TRK	These Tracking licenses are named on the basis of the software supported. For example, XR-7.1-A9K-X-TRK license supports IOS XR 7.1.x software image.	The licenses consumed depends on the software images used.

This is the list of show commands available for Smart Licensing in Cisco IOS XR 64 bit :

• show license all—shows all information regarding Smart license

• show license platform—shows platform-specific licensing information (cisco-support)

• show license status—shows smart licensing status information

• show license summary—shows smart licensing summary

• show license techsupport—shows smart licensing tech support information

• show license trace—shows tracing for smart licensing code (cisco-support)

• show license udi—shows smart licensing UDI information

• show license usage—shows smart licensing usage information

• show license platform detail—shows smart license detail information (cisco-support)

• show license platform summary—shows smart license summary (cisco-support)

• show license platform trace—shows platform specific licensing trace information (cisco-support)

Software Innovation Access

Table 5: Feature History Table

	Release Information	Feature Description
Software Innovation Access (SIA) Entitlement	Release 7.3.1	SIA license grants you access to the latest software upgrades which contain new features, bug fixes, and security enhancements for devices on your network. Also, it enables the consumption of Advanced and Essential Right-to-Use (RTU) licenses on your device, and allows portability of these RTU licenses from one device to another.

Overview

Software Innovation Access (SIA) subscription, a type of FCM licensing, provides access to the latest software upgrades and features for your network. SIA licenses enable the consumption of Right-to-Use (RTU) licenses for your devices to access software innovation and avail support for your devices throughout the term of subscription.

The benefits of SIA subscription are:

• **Access to software innovation**: SIA subscription provides access to continuous software upgrades which contain latest features, security enhancements, and bug fixes for all your devices at a network level.

• **Pooling of licenses**: SIA subscription enables Right-to-Use (RTU) licenses to be shared across your FCM network from a common license pool through the virtual account.

• **Protects your investment**: SIA subscription enables the portability of perpetual RTU licenses purchased for your current device to a next-generation router when you expand or upgrade your network.

The initial term of a SIA subscription is for a term of three years. You can renew the subscription by contacting your Cisco account representative. An equal number of SIA licenses and corresponding RTU licenses are required to enjoy the benefits, and ensure that your network is in compliance. There are two types of SIA licenses available:

• **Advanced SIA license**: To utilize Advanced RTU licenses, you need Advanced SIA licenses.

• **Essential SIA license**: Essential SIA licenses are required to utilise Essential RTU on your device.

If your device is in a state of SIA Out-of-Compliance (OOC) the benefits cease.

SIA Out-of-compliance (OOC) state

When your device is in a SIA Out-of-compliance state, support for major software version upgrades in your network devices are restricted. However, you can continue to perform minor updates, SMU installations, and RPM installations, and continue to utilize the RTU licenses without support for porting.

A device can get into a SIA Out-of-compliance (OOC) state in the following instances:

- The SIA License *EVAL* period of 90 days has expired.

- The number of SIA licenses consumed has exceeded the number of SIA licenses purchased. This can also occur when the RTU licenses consumed is higher than the number of SIA licenses purchased.

- The term of the SIA license has expired and you haven't renewed the subscription.

- The license authorization status is:

    - Not Authorized: The license authorization code installed doesn't contain sufficient counts for the request. This can occur when you attempt to use more licenses than the licenses available in your Virtual Account.

    - Authorization expired: The device hasn't been able to connect to CSSM for an extended period, due to which the authorization status couldn't be verified.

In order to bring your device to In-Compliance state, perform one of the following steps:

- Register your device with CSSM if the SIA license EVAL period has expired.

- If the SIA license has expired or the number of SIA licenses consumed is more than the number of SIA licenses purchased, contact your Cisco Account Representative to purchase or renew the required licenses.

- If the authorization code has insufficient counts for the request, generate the code with sufficient counts.

- If the authorization has expired, connect the device with CSSM.

When the device enters an OOC state, a grace period of 90 days (cumulative through the lifetime of a device) begins. During this period, SIA license benefits can still be availed. The system attempts to renew the authorization period by connecting with the CSSM during the grace period, or even after the grace period has expired. If an attempt isn't successful, it remains in an OOC state. If the attempt is successful, a new authorization period begins and the device is In-Compliance.

Verification

To verify the device compliance status, use the **show license platform summary** command:

Examples

Status: In-Compliance

```
Router# show license platform summary
Sun Feb 14 22:25:36.115 UTC
Collection: LAST: Sun Feb 14 2021 22:24:40 UTC
            NEXT: Sun Feb 14 2021 22:25:40 UTC
Reporting:  LAST: Sun Feb 14 2021 22:24:40 UTC
            NEXT: Sun Feb 14 2021 22:25:40 UTC
SIA Status: In Compliance

                                                                Count
Feature/Area     Entitlement                                    Last Next
============ ================================================== ==== ====
```

```
FCM           Total A9K-48X10GE-1G LCs in the system                 1     0
FCM           ASR9k Core & Agg Netw SW&Autom Adv 1.0 Perp RTU (pe     1     0
FCM           Advance Edge SIA per 100G Subscription                  1     0
FCM           ASR9k Core & Agg Netw SW&Autom Ess 1.0 Perp RTU (pe     1     0
FCM           Essential Edge SIA per 100G Subscription                1     0
```

Status: Out-of-Compliance (Grace Period Remaining)

```
Router# show license platform summary
Mon Feb 15 12:10:00.009 UTC
Collection: LAST: Mon Feb 15 2021 12:09:17 UTC
            NEXT: Mon Feb 15 2021 12:10:17 UTC
Reporting:  LAST: Mon Feb 15 2021 12:09:17 UTC
            NEXT: Mon Feb 15 2021 12:10:17 UTC
*********************************IMPORTANT*************************************
SIA Status: Out of Compliance(Remaining Grace Period: 89 days, 23 hours)
            SIA license(s) status is Not Authorized.
            SW Upgrade will still be allowed as SIA Grace Period is remaining
*****************************************************************************
                                                               Count
Feature/Area    Entitlement                                    Last Next
============    ================================================ ==== ====
FCM             ASR9k Core & Agg Netw SW&Autom Adv 1.0 Perp RTU (pe   1     0
FCM             Advance Edge SIA per 100G Subscription                1     0
FCM             ASR9k Core & Agg Netw SW&Autom Ess 1.0 Perp RTU (pe   1     0
FCM             Essential Edge SIA per 100G Subscription
```

Status: Out-of-Compliance (Grace Period expired and upgrades are blocked)

```
Router# show license platform summary
Mon Feb 15 12:10:00.009 UTC
Collection: LAST: Mon Feb 15 2021 12:16:17 UTC
            NEXT: Mon Feb 15 2021 12:17:17 UTC
Reporting:  LAST: Mon Feb 15 2021 12:16:17 UTC
            NEXT: Mon Feb 15 2021 12:17:17 UTC
*********************************IMPORTANT*************************************
SIA Status: Out of Compliance(Grace Period Expired)
            SW Upgrades are blocked as SIA license(s) are in "Not Authorized" state
*****************************************************************************
                                                               Count
Feature/Area    Entitlement                                    Last Next
============    ================================================ ==== ====
FCM             ASR9k Core & Agg Netw SW&Autom Adv 1.0 Perp RTU (pe   1     0
FCM             Advance Edge SIA per 100G Subscription                1     0
FCM             ASR9k Core & Agg Netw SW&Autom Ess 1.0 Perp RTU (pe   1     0
FCM             Essential Edge SIA per 100G Subscription
```

Create a Cisco Smart Account

Cisco Smart Account is an account where all products enabled for Smart Licensing are deposited. Cisco Smart Account allows you to manage and activate your licenses to devices, monitor license use, and track Cisco license purchases. Through transparent access, you have a real-time view into your Smart Licensing products. IT administrators can manage licenses and account users within your organization's Smart Account through the Smart Software Manager.

You can create your Cisco Smart Account at this webpage: https://webapps.cisco.com/software/company/smartaccounts/home#accountcreation-account/request.

For information on how to create a Cisco Smart Account, see: http://www.cisco.com/c/en/us/products/collateral/software/one-software/solution-overview-c22-733273.html.

Smart Licensing Working

Smart Licensing involves the three steps shown in the illustration below, that depicts the working model of the Smart Licensing.

Figure 1: Smart Licensing - Example
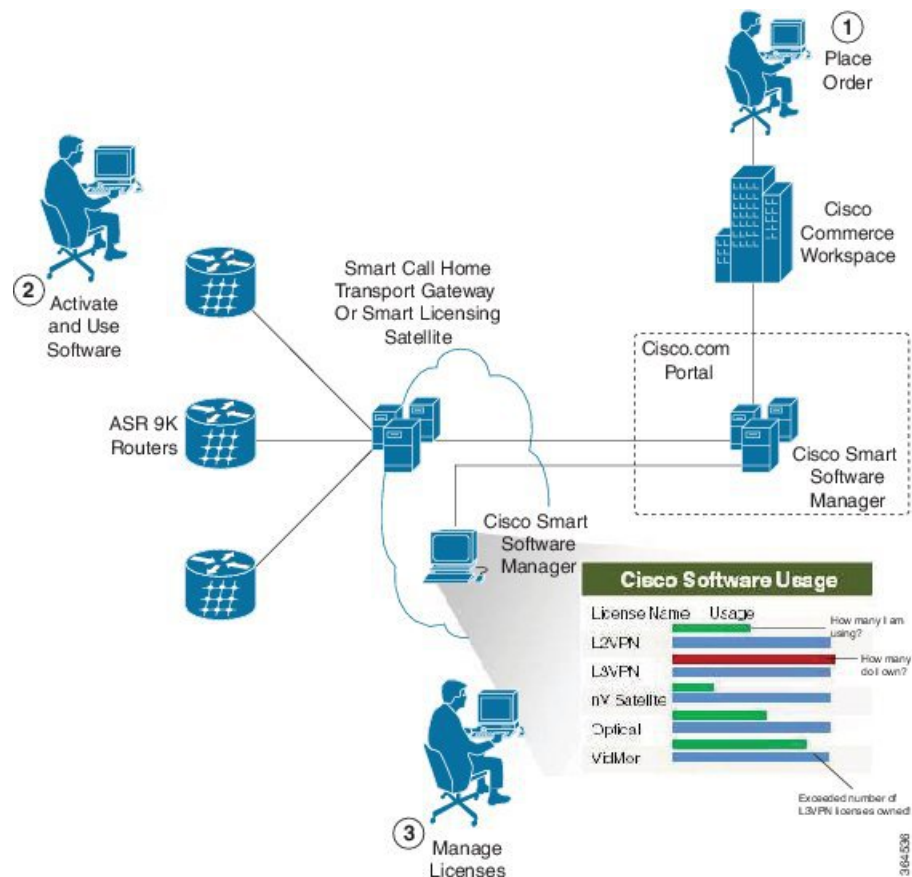
- **Setting up Smart Licensing:** You can place the order for Smart Licensing, to manage licenses on Cisco.com portal. You agree to the terms and conditions governing the use and access of Smart Licensing in the Smart Software Manager portal at http://www.cisco.com/c/en/us/products/collateral/software/one-software/solution-overview-c22-733273.html.
- **Enabling and Use Smart Licensing:** Follow the steps to enable Smart Licensing. *Smart Licencing Workflow* provides an illustration.

  After you enable Smart Licensing, you can use either of the following options to communicate:

  - **Smart Call Home:** The Smart Call Home feature is automatically configured after the Smart Licensing is enabled. Smart Call Home is used by Smart Licensing as a medium for communication with the Cisco license service. Call Home feature allows Cisco products to periodically call-home and perform an audit and reconciliation of your software usage information. This information helps Cisco efficiently track your install base, keep them up and running, and more effectively pursue service and support contract renewals, without much intervention from your end. For more information on Smart Call Home feature, see http://www.cisco.com/c/dam/en/us/td/docs/switches/lan/smart_call_home/SCH_Deployment_Guide.pdf.

- **Smart Licensing Satellite:** The Smart licensing satellite option provides an on-premises collector that can be used to consolidate and manage Smart license usage, as well facilitate communications back to Cisco License Service at http://www.cisco.com.

- **Manage and Report Licenses:** You can manage and view reports about your overall software usage in the Smart Software Manager portal. Compliance reporting, on page 32 describes the types of Smart Licensing reports.

Deployment Options for Smart Licensing

The following illustration shows the various options available for deploying Smart Licensing:

Figure 2: Smart Licensing Deployment Options
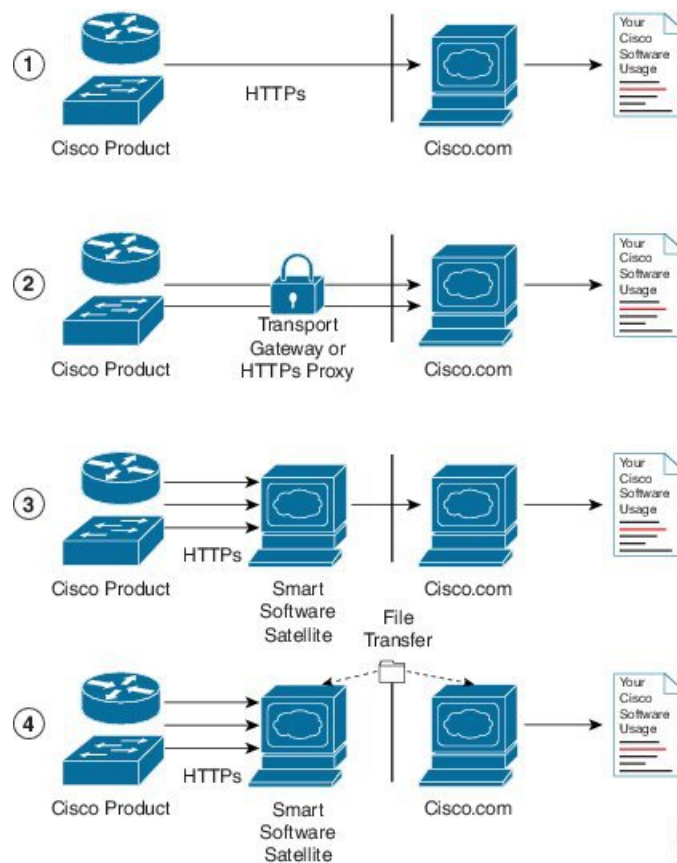
1. **Direct cloud access:** In direct cloud access deployment method, Cisco products send usage information directly over the internet to Cisco.com (Cisco license service); no additional components are needed for deployment.

2. **Direct cloud access through an HTTPs proxy:** In direct cloud access through an HTTPs proxy deployment method, Cisco products send usage information over the internet through a proxy server - either a Smart Call Home Transport Gateway or off-the-shelf Proxy (such as Apache) to Cisco License Service on http://www.cisco.com.

3. **Mediated access through an on-premises collector-connected:** In mediated access through an on-premises collector-connected deployment method, Cisco products send usage information to a locally-connected

collector, which acts as a local license authority. Periodically, the information is exchanged to keep the databases in synchronization.

4. **Mediated access through an on-premises collector-disconnected:** In the mediated access through an on-premises collector-disconnected deployment method, Cisco products send usage information to a local disconnected collector, which acts as a local license authority. Exchange of human-readable information is performed occasionally (maybe once a month) to keep the databases in synchronization.

Options **1** and **2** provide an easy deployment option, and options **3** and **4** provide a secure environment deployment option. Smart Software Satellite provides support for options **3** and **4**.

The communication between Cisco products and Cisco license service is facilitated by the Smart Call Home software. For information on Smart Call Home, see About Call Home

Configure Licenses Using Smart Licensing

Pre-requisites for Configuring Smart Licensing

The following pre-requistites must be met on the Cisco Smart Software Manager to configure Smart Licensing on your device:

- You must set up a Cisco Smart Account.

- You must set up Virtual Account or accounts. For more information, see the Virtual Accounts section in the Smart Software Manager Help

- Create user roles in the **Users** tab in the **Manage Smart Account** page. Provide the appropriate user access rights.

- Accept the Smart Software Licensing Agreement on Cisco Smart Software Manager to register your router.

- Have a layer 3 connection set up on your router.

- Configure a valid DNS and proper time on the router to connect CSSM or CSSM On-Prem.

Setting up the Router for Smart Licensing

Table 6: Three-step Roadmap to Set up the Router for Smart Licensing

Activity	Communication Connection Options		
Step 1—Configure Communications	See the *Configuring a Direct Cloud Connection* section.	See the *Configuring a Connection through a HTTP Proxy* section.	See the *Connecting to CSSM On-Premise* section.
Step 2—Register and Activate	See the *Registering and Activating your Router* section.		
Step 3—Verify the Configuration	See the *Verifying your Smart Licensing Configuration* section.		

Configuring a Communications Connection Between the Router and Cisco Smart Software Manager

Configuring a Direct Cloud Connection

In this deployment option, the **configure call-home profile** is configured by default. Use the **show call-home profile all** command to check the profile status.

Call Home service provides email-based and web-based notification of critical system events to Cisco Smart Software Manager.

To configure and enable Call Home service:

SUMMARY STEPS

1. **configure**
2. **call-home**
3. **service active**
4. **contact-email-addr** *email-address*
5. **profile CiscoTAC-1**
6. **destination transport-method http**
7. **destination address http** *url*
8. **active**
9. **no destination transport-method email**
10. **commit**
11. **exit**
12. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure** **Example:** `Router# configureteral`	Enters global configuration mode.
Step 2	**call-home** **Example:** `Router(config)# call-home`	Enters Call Home configuration mode.
Step 3	**service active** **Example:** `Router(config-call-home)# service active`	Activates Call Home service.

Step 4	**contact-email-addr** *email-address*
	 Example:
	 `Router(config-call-home)# contact-email-addr`
	 `username@example.com`
		Assigns the provided email address. You can enter up to 200 characters in email address format.
		
		 Note Spaces are not allowed in the email address.

	Command or Action	Purpose
Step 5	**profile CiscoTAC-1** **Example:** `Router(config-call-home)# profile CiscoTAC-1`	Enables the CiscoTAC-1 profile to be used with the Call Home service. By default, the CiscoTAC-1 profile is disabled.

Step 6	**destination transport-method http**
	
	Example:
	
	`Router(config-call-home-profile)# destination`
	`transport-method http`
		Enables the Call Home service through an HTTP connection.

Step 7	**destination address http** *url*
	
	Example:
	
	`Router(config-call-home-profile)# destination`
	`address http`
	`https://tools.cisco.com/its/service/oddce/services/DDCEService`
		Connects the router to the Cisco Smart Software Manager.

Step 8	**active** **Example:** `Router(config-call-home-profile)# active`	Enables the destination profile.

Step 9	**no destination transport-method email**
	
	Example:
	
	`Router(config-call-home-profile)# no destination`
	` transport-method email`
		Disables the email option for the Call Home service.

Step 10	**commit** **Example:** `Router(config-call-home-profile)# commit`	Commits the configuration.
Step 11	**exit** **Example:** `Router(config-call-home-profile)# exit`	Exits the Call Home destination profile configuration mode and returns to the Call Home configuration mode.

Step 12	**exit**
	
	Example:
	
	`Router(config-call-home)# exit`
	`Router(config)#`
		Exits the Call Home configuration mode and returns to the global configuration mode.

Configuring a Connection Through an HTTP Proxy

The Call Home service can be configured through an HTTPs proxy server.

SUMMARY STEPS

1. **configure**
2. **call-home**
3. **service active**
4. **contact-email-address** *email-address*

5. **http-proxy** *proxy-address* **port** *port-number*
6. **profile CiscoTAC-1**
7. **no destination transport-method email**
8. **exit**
9. **profile** *profile-name*
10. **reporting smart-licensing-data**
11. **destination transport-method http**
12. **destination address http** *url*
13. **active**
14. **exit**
15. **exit**
16. **commit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure** **Example:** `Router# configure`	Enters global configuration mode.
Step 2	**call-home** **Example:** `Router(config)# call-home`	Enters Call Home configuration mode.
Step 3	**service active** **Example:** `Router(config-call-home)# service active`	Enables the Call Home feature.

Step 4	**contact-email-address** *email-address*
	
	Example:
	
	`Router(config-call-home)# contact-email-addr`
	`sch-smart-licensing@cisco.com`
		Configures the default email address.

Step 5	**http-proxy** *proxy-address* **port** *port-number*
	
	Example:
	
	`Router(config-call-home)# http-proxy 198.51.100.10`
	` port 3128`
		Provides the proxy server information to the Call Home service.

Step 6	**profile CiscoTAC-1** **Example:** `Router(config-call-home)# profile CiscoTAC-1`	Enables the CiscoTAC-1 profile to be used with the Call Home service. By default, the CiscoTAC-1 profile is disabled.

Step 7	**no destination transport-method email**
	
	Example:
	
	`Router(config-call-home-profile)# no destination`
	` transport-method email`
		Disables the email option for the Call Home service.

	Command or Action	Purpose

Step 8	**exit**
	
	Example:
	
	`Router(config-call-home-profile)# exit`
	`Router(config-call-home)#`
		Exits the Call Home destination profile configuration mode and returns to the Call Home configuration mode.

Step 9	**profile** *profile-name* **Example:** `Router(config-call-home)# profile test1`	Enters the Call Home destination profile configuration mode for the specified destination profile name. If the specified destination profile does not exist, it is created.

Step 10	**reporting smart-licensing-data**
	
	Example:
	
	`Router(config-call-home-profile)# reporting`
	`smart-licensing-data`
		Enables data sharing with the Call Home service through the configured transport method, in this case, HTTP.

Step 11	**destination transport-method http**
	
	Example:
	
	`Router(config-call-home-profile)# destination`
	`transport-method http`
		Enables the HTTP message transport method.

Step 12	**destination address http** *url*
	
	Example:
	
	`Router(config-call-home-profile)# destination`
	`address http`
	`https://tools.cisco.com/its/service/oddce/services/DDCEService`
		Connects the router to the Cisco Smart Software Manager.

Step 13	**active** **Example:** `Router(config-call-home-profile)# active`	Enables the destination profile.
Step 14	**exit** **Example:** `Router(config-call-home-profile)# exit`	Exits the Call Home destination profile configuration mode and returns to the Call Home configuration mode.

Step 15	**exit**
	
	Example:
	
	`Router(config-call-home)# exit`
	`Router(config)#`
		Exits the Call Home configuration mode and returns to the global configuration mode.

Step 16	**commit** **Example:** `Router(config)# commit`	Commits the configuration.

Connecting to CSSM On-Premise

This section describes how to configure the Call Home service for on-premise smart software through connected or disconnected mode.

SUMMARY STEPS

1. **configure**
2. **call-home**
3. **profile** *profile-name*
4. **reporting smart-licensing-data**
5. **destination transport-method http**
6. **destination address http** *url*
7. **no destination address http** *url*
8. **destination preferred-msg-format {long-text | short-text | xml}**
9. **active**
10. **exit**
11. **exit**
12. **http client source-interface** *ip-version interface-type interface-number*
13. **crypto ca trustpoint** *name*
14. **commit**
15. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure** **Example:** `Router# configure`	Enters global configuration mode.
Step 2	**call-home** **Example:** `Router(config)# call-home`	Enters Call Home configuration mode.
Step 3	**profile** *profile-name* **Example:** `Router(config-call-home)# profile test1`	Enters the Call Home destination profile configuration mode for the specified destination profile name. If the specified destination profile does not exist, it is created.
Step 4	**reporting smart-licensing-data** **Example:** `Router(config-call-home-profile)# reporting smart-licensing-data`	Enables data sharing with the Call Home service through the configured transport method, in this case, HTTP.
Step 5	**destination transport-method http** **Example:** `Router(config-call-home-profile)# destination transport-method http`	Enables the HTTP message transport method.
Step 6	**destination address http** *url* **Example:**	Configures the destination URL (CSSM) to which Call Home messages are sent.

	Command or Action	Purpose

	`Router(config-call-home-profile)# destination address http http://209.165.201.15/Transportgateway/services/DeviceRequestHandler`
	
	Or
	`Router(config-call-home-profile)# destination address http https://209.165.201.15/Transportgateway/services/DeviceRequestHandler`
		Note Ensure the IP address or the fully qualified domain name (FQDN) in the destination URL matches the IP address or the FQDN as configured for the **Host Name** on the CSSM On-Prem.

Step 7	**no destination address http** *url* **Example:** `Router(config-call-home-profile)# no destination address http https://tools.cisco.com/its/service/oddce/services/DDCEService`	Removes the default destination address.
Step 8	**destination preferred-msg-format** {**long-text** | **short-text** | **xml**} **Example:** `Router(config-call-home-profile)# destination preferred-msg-format xml`	(Optional) Configures a preferred message format. The default message format is XML.
Step 9	**active** **Example:** `Router(config-call-home-profile)# active`	Enables the destination profile.
Step 10	**exit** **Example:** `Router(config-call-home-profile)# exit`	Exits the Call Home destination profile configuration mode and returns to the Call Home configuration mode.

Step 11	**exit**
	
	Example:
	`Router(config-call-home)# exit`
	`Router(config)#`
		Exits the Call Home configuration mode and returns to the global configuration mode.

Step 12	**http client source-interface** *ip-version interface-type interface-number* **Example:** `Router(config)# http client source-interface ipv4 Vlan100`	Configures a source interface for the HTTP client. **Note** This command is mandatory for a VRF interface.

Step 13	**crypto ca trustpoint** *name*
	
	Example:
	`Router(config)# crypto ca trustpoint SLA-TrustPoint`
	`Router(config-trustp)#`
		(Optional) Declares the trustpoint and its name.

	Command or Action	Purpose
Step 14	**commit** **Example:** `Router(config-trustp)# commit`	Commits the configuration.

Step 15	**end**
	
	Example:
	`Router(config-trustp)# end`
	`Router(config)#`
		Returns to the global configuration mode.

Installing CSSM On-Premise

For information on installation instructions, see the Smart Software Manager On-Prem Installation Guide.

Registering and Activating Your Router

Product registration securely associates a device with the Smart Account and the Virtual Account of your choice. It also establishes trust between the end product and the CSSM. Tokens are used to register a product with the appropriate Virtual Account on CSSM Cloud (on Cisco.com) or CSSM On-Premise.

A Registration Token:

- Can be either used once or reused multiple times. You can set a limit to the number of times a token can be reused when you create the token.

- Can be created and revoked at any time.

- Expires after a period of time (default is 30 days; minimum is one day; maximum is 365 days)

A Registration Token is not:

- Product specific: The same Registration Token can be used on different product types.

- A license, key, or PAK.

- Stored on the Cisco device and they are not persistent.

- Required after the product is registered. Token expiration has no effect on previously registered products; it simply means that that token can no longer be used to register a new product.

Generating a New Token from CSSM

Step 1 If you choose the direct cloud access deployment option, log in to CSSM from https://software.cisco.com/#.

If you chose the mediated access deployment option, log in to CSSM On-Prem from *https://<on-prem-ip-address>:8443*.

Step 2 Select the **Inventory** tab.

Step 3 From the Virtual Account drop-down list, choose the virtual account to which you want to register your product.

Step 4 Select the **General** tab.

Step 5 Click **New Token**.

The **Create Registration Token** window is displayed.

Step 6 In the **Description** field, enter the token description.

In the **Expire After** field, enter the number of days the token must be active. The default value is 30 days.

In the **Max. Number of Uses** field, enter the maximum number of uses allowed after which the token expires.

Select the **Allow export-controlled functionality on the products registered with this token** checkbox to ensure Cisco compliance with US and country-specific export policies and guidelines. For more information, see https://www.cisco.com/c/en/us/about/legal/global-export-trade.html.
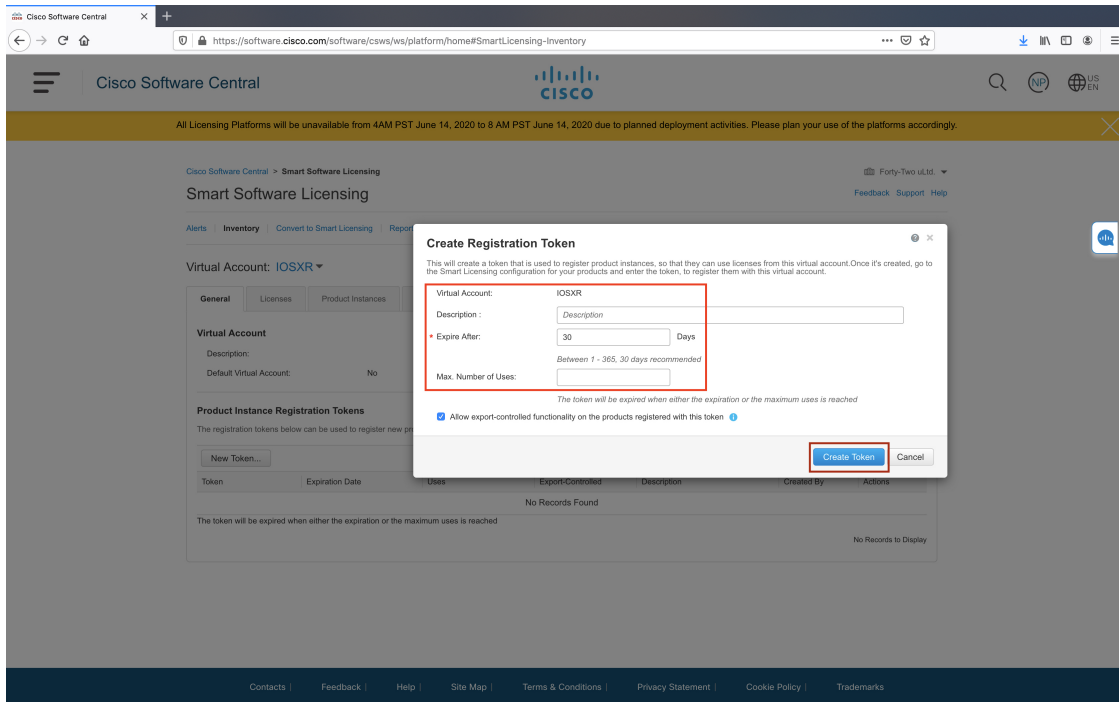
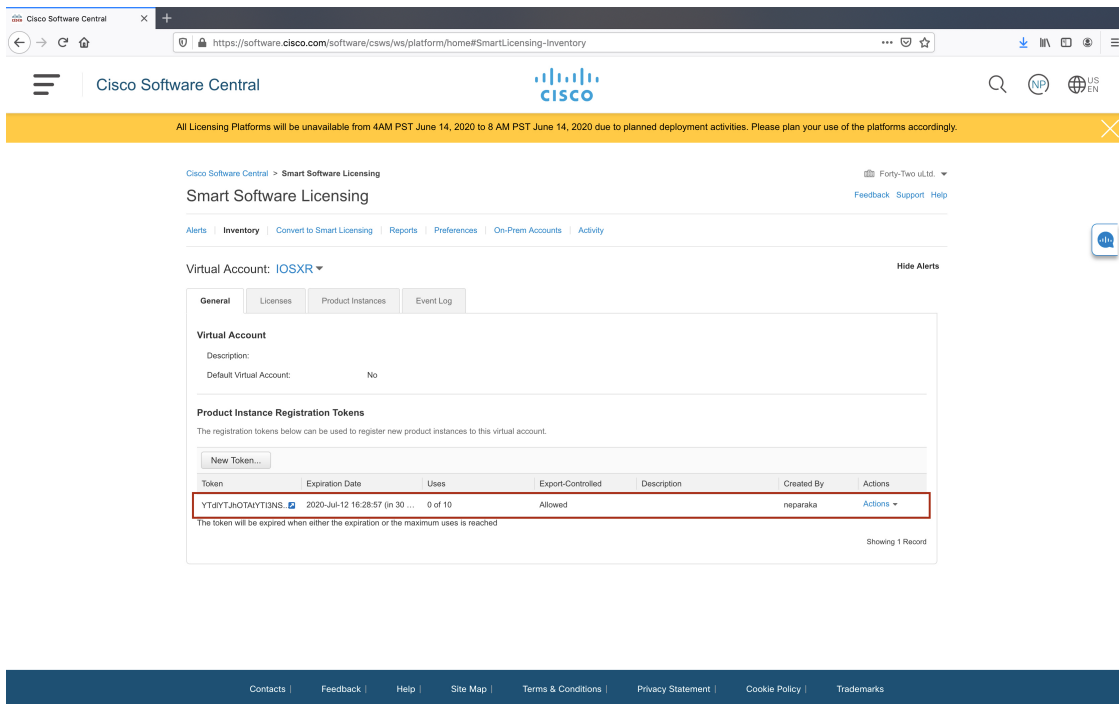Click **Create Token**.

Step 7 After the token is created, select and copy the token to a text file.

You need this token to register your router.

What to do next

See the *Registering Your Device With the Token* section.

Registering Your Device With the Token

SUMMARY STEPS

1. **license smart register idtoken** *token-ID*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**license smart register idtoken** *token-ID* **Example:** ```license smart register idtoken $Tl4UytrNXBzbEs1ck8veUtWaG5abnZJOFdDa1FwbVRa%0AblRMoz0%3D%0A```	Registers Smart Licensing on the router using the registration token created in the CSSM. On successful registration, the product instance is created in the CSSM virtual account and its license usage is displayed on the CSSM.

Renewing Your Smart Licensing Registration

Your registration is automatically renewed every six months. To find the status of the license, use the **license smart renew auth** command.

As long as the license is in an 'Authorized' or 'Out-of-compliance' (OOC) state, the authorization period is renewed. Grace period starts when an authorization period expires. During the grace period or when the grace period is in the 'Expired' state, the system continues to try to renew the authorization period. If a retry is successful, a new authorization period starts.

Note If the smart license renewal fails, then the product instance goes to an unidentified state and starts consuming the evaluation period.

Before you begin

Ensure that the following conditions are met to renew your smart license:

- Smart licensing is enabled.

- The router is registered.

SUMMARY STEPS

1. **license smart renew** {**auth** | **id**}

DETAILED STEPS

	Command or Action	Purpose
Step 1	**license smart renew** {**auth**	**id**} **Example:** `Router# license smart renew auth`	Renews your token ID or authorization with Cisco smart licensing.

Deregistering Your Router from CSSM

When a router is taken off the inventory, shipped elsewhere for redeployment, or returned to Cisco for replacement, you can deregister that router.

Before you begin

Ensure that a Layer 3 connection to CSSM is available to successfully deregister the device.

SUMMARY STEPS

1. **license smart deregister**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**license smart deregister** **Example:** `Router# license smart deregister`	Cancels the registration of the router and sends the router into evaluation mode. All smart licensing entitlements and certificates on the corresponding platform are removed. The product instance of the router stored on CSSM is also removed.

Enable Smart Licensing

Smart Licensing components are packaged into the asr9k mini image. The https client required for configuring the Smart Call Home is packaged into the asr9k-k9sec PIE. By default, traditional licensing mode is on. Use the steps described here to enable Smart Licensing.

Note   Smart Licensing on Cisco ASR 9001-S Router is not supported. Hence you should use the Product Authorization Key (PAK) to activate a license. PAK is provided when you order and purchase the right to use a feature set for a particular device. The PAK is an 11-character alphanumeric key printed on the purchase order document that is shipped with your device hardware. The PAK serves as a receipt and is an important component used in the process of obtaining, upgrading, and activating a license.

For information on how to activate a license using PAK, refer Cisco ASR 9001-S 120G Upgrade License Configuration Guide.

On successful registration, the device will receive an identity certificate. This certificate is saved on your device and automatically used for all future communications with Cisco. Every 30 days, Smart Licensing will automatically renew the registration information with Cisco. If registration fails, an error will be logged. Additionally, license usage data is collected and a report is sent to you every month. If required, you can configure your Smart Call Home settings such that sensitive information (like hostname, username and password) are filtered out from the usage report.

Note   Once Smart Licensing mode is enabled, all CLIs related to the traditional licensing mode are disabled.

Before you begin

You must have purchased the product for which you are adding the license. When you purchase the product, you are provided with a user name and password to the Cisco Smart Software Manager portal, from where you can generate the product instance registration tokens.

SUMMARY STEPS

1. Login to Cisco Smart Software Manager at https://tools.cisco.com/rhodui/index.
2. **admin**
3. **configure**
4. **license smart enable**
5. Use the **commit** or **end** command.
6. **admin**
7. **license smart register idtoken** *token_ID*

DETAILED STEPS

	Command or Action	Purpose
Step 1	Login to Cisco Smart Software Manager at https://tools.cisco.com/rhodui/index.	Get a token from the Cisco portal using the link. You must log in to the portal using a Cisco provided username and password. Once you have generated the token, select **Copy** hyperlink to copy the token or download the token to a text

	Command or Action	Purpose
		file. The token is used to register and activate a device, and assign the device to a virtual account. **Note** This token is valid for 30 days.
Step 2	**admin** **Example:** `RP/0/RSP0/CPU0:router# admin`	Enters administration EXEC mode.
Step 3	**configure** **Example:** `RP/0/RSP0/CPU0:router(admin)# configure`	Enters administration configuration mode.

Step 4	**license smart enable**
	
	Example:
	
	`RP/0/RSP0/CPU0:router(admin-config)#license smart enable`
	`RP/0/RSP0/CPU0:router(admin-config)#show config`
	`Building configuration...`
	`!! IOS XR Configuration 5.2.0.19I`
	`license smart enable`
	`end`
		Enables basic Smart Licensing. Use the **no** form of this command to disable Smart Licensing and revert to the traditional or strict mode of licensing.

Step 5	Use the **commit** or **end** command.	**commit** —Saves the configuration changes and remains within the configuration session. **end** —Prompts user to take one of these actions: • **Yes** — Saves configuration changes and exits the configuration session. • **No** —Exits the configuration session without committing the configuration changes. • **Cancel** —Remains in the configuration mode, without committing the configuration changes.
Step 6	**admin** **Example:** `RP/0/RSP0/CPU0:router# admin`	Enters administration EXEC mode.

Step 7	**license smart register idtoken** *token_ID*
	
	Example:
	
	`RP/0/RSP0/CPU0:router(admin)#license smart register idtoken`
	`NmE1Yzg0OWMtYmJ4`
	
	`license smart register: Registration process is`
		Use the token ID procured in step 1 to register your device.

Command or Action	Purpose
`in progress.Please check the syslog for the` `registration status and result`	

What to do next

You can use the Cisco Smart Software Manager to:

- Create virtual accounts
- Assign a registered device to a virtual account
- View licenses in a virtual account
- Manage product instance registration tokens
- Transfer a license
- View, transfer or remove product instances in a virtual account

Verify Smart Licensing Configuration

After enabling Smart Licensing, you can use the **show** commands to verify the default Smart Licensing configuration. If any issue is detected, take corrective action before making further configurations.

SUMMARY STEPS

1. **admin**
2. **show license status**
3. **show license register-status**
4. **show license entitlement**
5. **show license pool**
6. **show license cert**
7. **show license features**
8. **show license ha**
9. **show license all**
10. **exit**
11. **show call-home smart-licensing statistics**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**admin** **Example:** `RP/0/RSP0/CPU0:router# admin`	Enters administration EXEC mode.
Step 2	**show license status** **Example:** `RP/0/RSP0/CPU0:router(admin)#show license status`	Displays the compliance status of Smart Licensing. Following are the possible status: - **Waiting**: Indicates the initial state after your device has made a license entitlement request. The device establishes communication with Cisco and

	Command or Action	**Purpose**
		successfully registers itself with the Cisco license manager. • **Authorized**: Indicates that your device is able to communicate with the Cisco license manager, and is authorised to initiate requests for license entitlements. • **Out-Of-Compliance**: Indicates that one or more of your licenses are out-of-compliance. You must buy additional licenses. • **Eval Period**: Indicates that Smart Licencing is consuming the evaluation period. You must register the device with the Cisco Licensing manager, else your license expires. • **Grace Period**: Indicates that connectivity to the Cisco license manager is lost. You must try restore connectivity to renew the authorization period. • **Disabled**: Indicates that Smart Licensing is disabled. • **Invalid**: Indicates that Cisco does not recognize the entitlement tag as it is not in the database.
Step 3	**show license register-status** **Example:** RP/0/RSP0/CPU0:router(admin)#show license register-status	Displays the Smart Licensing registration status. If your registration is pending or failed, check for connectivity issues with the Cisco license manager or register the device with a new token ID.
Step 4	**show license entitlement** **Example:** RP/0/RSP0/CPU0:router(admin)#show license entitlement	Displays the details of the various entitlements you own.
Step 5	**show license pool** **Example:** RP/0/RSP0/CPU0:router(admin)#show license pool	Displays the pool to which the device belongs.
Step 6	**show license cert** **Example:** RP/0/RSP0/CPU0:router(admin)#show license cert	Displays details of the licensing certificate.
Step 7	**show license features** **Example:** RP/0/RSP0/CPU0:router(admin)#show license features	Displays the licenses that are supported on a given chassis. You can go ahead and buy the required licenses.
Step 8	**show license ha** **Example:** RP/0/RSP0/CPU0:router(admin)#show license ha	Displays the Smart Licensing high availability status, whether it is in active or standby mode.

	Command or Action	Purpose
Step 9	**show license all** **Example:** `RP/0/RSP0/CPU0:router(admin)#show license all`	Displays all entitlements in use. It can also be used to check if Smart Licensing is enabled. Additionally, it shows associated licensing certificates, compliance status, UDI, and other details.
Step 10	**exit** **Example:** `RP/0/RSP0/CPU0:router(admin)# exit`	Exits administration EXEC mode and returns to EXEC mode.
Step 11	**show call-home smart-licensing statistics**	Displays the statistics of communication between the Smart Licensing manager and the Cisco back-end using Smart Call Home. In case communication fails or drops, check your call home configuration for any errors.

The following example shows sample output from the **show call-home smart-licensing statistics**command:

```
RP/0/RSP0/CPU0:router#show call-home smart-licensing statistics
Success: Successfully sent and response received.
Failed : Failed to send or response indicated error occurred.
Inqueue: In queue waiting to be sent.
Dropped: Dropped due to incorrect call-home configuration.

Msg Subtype      Success Failed  Inqueue Dropped Last-sent (GMT-07:00)
-------------------------------------------------------------------
ENTITLEMENT     2       0        0       0       2014-04-24 18:24:34
REGISTRATION    1       0        0       0       2014-04-25 03:53:57
ACKNOWLEDGEMENT 1       0        0       0       2014-04-23 19:21:21
RENEW           1       0        0       0       2014-04-23 19:21:11
DEREGISTRATION  1       0        0       0       2014-04-25 03:31:35
```

Renew Smart Licensing Registration

In general, your registration is automatically renewed every 30 days. Use this option to make an on-demand manual update of your registration. Thus, instead of waiting 30 days for the next registration renewal cycle, you can issue this command to instantly find out the status of your license.

Before you begin

You must ensure that the following conditions are met to renew your smart license:

- Smart licensing is enabled.
- The device is registered.

SUMMARY STEPS

1. **admin**
2. **license smart renew** {**auth** | **id**}

DETAILED STEPS

	Command or Action	Purpose
Step 1	**admin** **Example:** `RP/0/RSP0/CPU0:router# admin`	Enters administration EXEC mode.

Step 2	**license smart renew** {**auth** | **id**}
	
	Example:
	
	`RP/0/RSP0/CPU0:ROA(admin)#license smart renew auth`
	
	`Tue  Apr 22 09:12:37.086 PST`
	
	`license smart renew auth: Authorization process is in progress.`
	`Please check the syslog for the authorization status and result.`
		Renew your ID or authorization with Cisco smart licensing. If ID certification renewal fails, then the product instance goes to an unidentified state and starts consuming the evaluation period.
		
		Note Authorization periods are renewed by the Smart Licensing system every 30 days. As long as the license is in an 'Authorized' or 'Out-of-compliance' (OOC), the authorization period is renewed. Grace period starts when an authorization period expires. During the grace period or when the grace period is in the 'Expired' state, the system continues to try renew the authorization period. If a retry is successful, a new authorization period starts.

De-register Smart Licensing

When your device is taken off the inventory, shipped elsewhere for redeployment or returned to Cisco for replacement using the return merchandise authorization (RMA) process, you can use the de-register option to cancel the registration on your device. Use the following steps to cancel device registration:

SUMMARY STEPS

1. **admin**
2. **license smart deregister**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**admin** **Example:** `RP/0/RSP0/CPU0:router# admin`	Enters administration EXEC mode.

Step 2	**license smart deregister**
	
	Example:
	
	`RP/0/RSP0/CPU0:IMC0(admin)#license smart deregister`
	
	`license smart deregister: Success`
		Cancels the device registration, and sends it into a 30-day evaluation mode. All Smart Licensing entitlements and certificates on the platform are removed.
		
		Note Though the product instance has been de-registered from the Cisco license cloud service, Smart Licencing is still enabled.

Command or Action	Purpose
License command "license smart deregister " completed successfully.	

Smart Licensing Workflow

The Smart Licensing workflow is depicted in this flowchart.
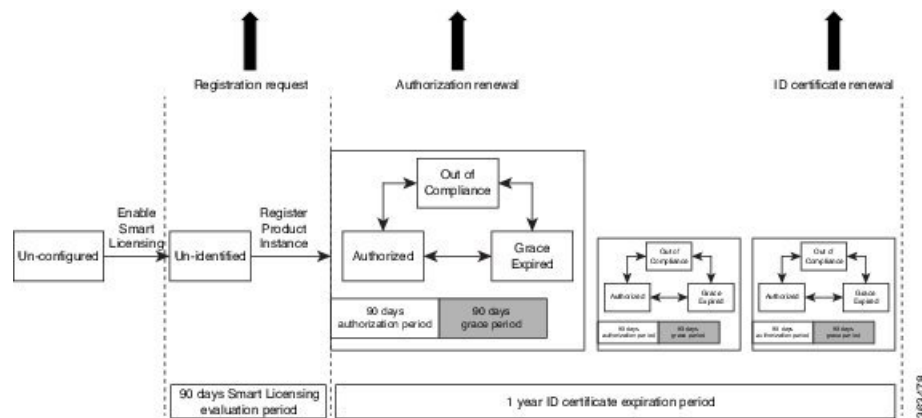
Cisco Smart Software Manager Overview

Cisco Smart Software Manager enables you to manage all of your Cisco Smart software licenses from one centralized website. With Cisco Smart Software Manager, you organize and view your licenses in groups called virtual accounts (collections of licenses and product instances). Use the Cisco Smart Software Manager to do the following tasks:

- Create, manage or view virtual accounts.
- Create and manage Product Instance Registration Tokens.
- Transfer licenses between virtual accounts or view licenses.
- Transfer, remove or view product instances.
- Run reports against your virtual accounts.
- Modify your email notification settings.
- View overall account information.

The Cisco Smart Software Manager **Help** describes the procedures for carrying out these tasks. You can access the Cisco Smart Software Manager on https://webapps.cisco.com/software/csws/ws/platform/home, by clicking **Licensing**, and then selecting **Smart Software Manager**; and then login using the username and password provided by Cisco.

Note Use Chrome 32.0, Firefox 25.0 or Safari 6.0.5 web browsers to access the Cisco Smart Software Manager. Also, ensure that Javascript 1.5 or a later version is enabled in your browser.

Licenses, Product Instances, and Registration Tokens

Licenses

Licenses are required for all Cisco products. All Cisco product licenses are one of two types which vary depending on the product:

- Perpetual licenses—Licenses that do not expire.
- Term licenses—Licenses that automatically expire after a set amount of time: one year, three years, or whatever term was purchased.

In addition, there are demo licenses that expire after at most 60 days. As implied by the name, demo licenses are not intended for production use.

All product licenses reside in a virtual account.

Product Instances

A product instance is an individual device with a unique device identifier (UDI) that is registered using a product instance registration token (or registration token). You can register any number of instances of a product with a single registration token. Each product instance can have one or more licenses residing in the same virtual account. Product instances must periodically connect to the Cisco Smart Software Manager servers during a specific renewal period. If a product instance fails to connect, it is marked as having a license shortage, but continues to use the license. If you remove the product instance, its licenses are released and made available within the virtual account.

Product Instance Registration Tokens

A product requires a registration token until you have registered the product. Registration tokens are stored in the Product Instance Registration Token Table associated with your enterprise account. Once the product is registered the registration token is no longer necessary and can be revoked and removed from the table without effect. Registration tokens can be valid from 1 to 365 days.

Virtual Accounts

Smart Licencing allows you to create multiple license pools or virtual accounts within the Smart Software Manager portal. Using the **Virtual Accounts** option you can aggregate licenses into discrete bundles associated with a cost center so that one section of an organization cannot use the licenses of another section of the organization. For example, if you segregate your company into different geographic regions, you can create a virtual account for each region to hold the licenses and product instances for that region.

All new licenses and product instances are placed in the default virtual account in the Smart Software Manager, unless you specify a different one during the order process. Once in the default account, you may choose to transfer them to any other account as desired, provided you have the required access permissions. See Licenses, Product Instances, and Registration Tokens, on page 31 for details.

Use the Smart Software Manager portal at https://tools.cisco.com/rhodui/index to create license pools or transfer licenses.

Compliance reporting

On a periodic basis, as described by the terms of the Smart Licensing contract, reports are automatically sent to you containing inventory and license compliance data. These reports will take one of three forms:

- **Periodic Record:** This record is generated on a periodic (configurable) basis with relevant inventory data saved at a given point of time. This report is saved within the Cisco cloud for archival.

- **Manual Record:** You can manually generate this record with relevant inventory data saved at any given point of time. This report will be saved within the Cisco cloud for archival.

- **Compliance Warning Report:** This report is automatically or manually generated when a license compliance event occurs. This report does not contain a full inventory data, but only any shortfalls in entitlements for a given software license.

  You can view these reports from the Smart Software Manager portal at https://tools.cisco.com/rhodui/index.

Traditional Licensing Consideration in Smart Licensing

Traditional licensing, and the associated commands, currently co-exist with Smart Licensing. By default, the software image is loaded with the traditional, strictly-enforced mode of licensing. You may want to retain the traditional licensing model in the following scenarios:

- when there are multiple users, and you do not know the actual end user of your software.
- when the software is deployed in a location with limited access to the license and inventory management solution.
- when the user has opted not to establish a Smart Call Home relationship with Cisco.
- when a Smart Call Home relationship cannot be maintained with the user owing to logistics and a fallback is required.

Note All traditional licencing CLI commands are disabled if Smart Licensing is enabled. However, you can continue to access the traditional licenses stored under: /disk0:/license/*. Certificates used by Smart Licencing are located under /disk0:/sla/. Respective CLIs are restored when licensing schemes are switched.

Consumption Model

The consumption model is a new pricing model for line cards to align the initial purchase to your actual needs. This model provides the ability to deploy a line card on day 1 with minimum ports activated to meet the current traffic demands. Over time as the traffic grows, you can add additional ports in 10G port increments. This provides a flexible deployment model with the ability to increase bandwidth to meet your demands.

Figure 3: Comparison - Current Purchasing Model And The New Consumption Model
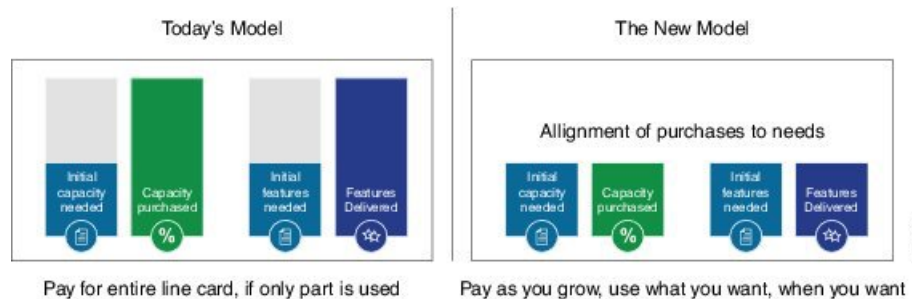
Note   The consumption model line cards require the users to deploy Smart Licensing to help track and provide visibility into license usage across their network. For information on Smart Licensing see Information About Smart Licensing, on page 3.

You must have a Smart Account created to place an order for the consumption model line card. You can create your Cisco Smart Account at this webpage: https://webapps.cisco.com/software/company/smartaccounts/home#accountcreation-account/request. For information on how to create a Cisco Smart Account, see: http://www.cisco.com/c/en/us/products/collateral/software/one-software/solution-overview-c22-733273.html.

Supported Consumption Model Line Cards

The line cards that can be deployed using consumption model are referred to as the consumption model line cards. The supported consumption model line cards are:

- A9K-8X100GE-CM
- A99-8X100GE-CM
- A99-12X100GE-CM
- A9K-MOD400-CM

Ordering the Consumption Model Line Card using the Consumption Model

The three steps involved in ordering a consumption model line card using the Consumption Model are:

Figure 4: Steps involved in ordering the consumption model line card using the Consumption Model
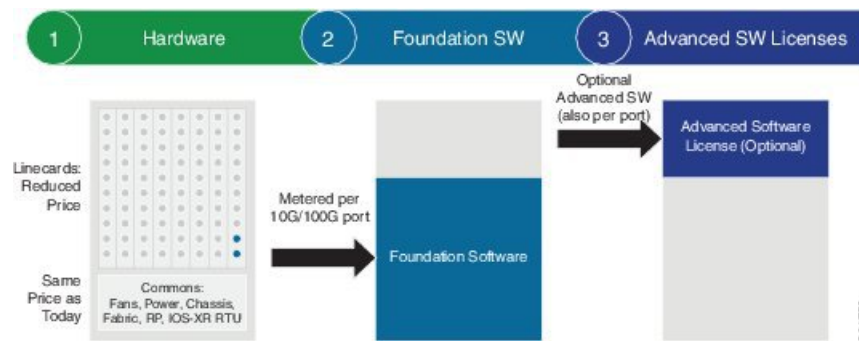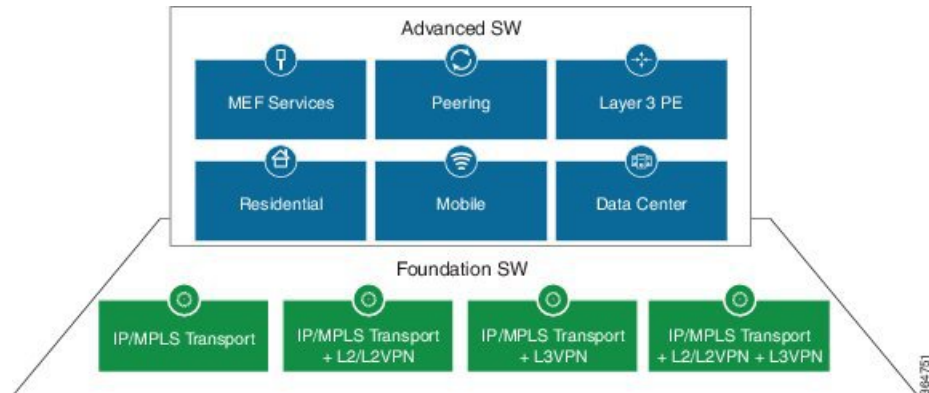
Figure 5: Foundation Software Licenses And Advanced Software Licenses

1. Choose the hardware: Select a line card that supports Consumption Model.

   The consumption model line cards require Smart Licensing to be installed at your location to function. When placing an order, you must enter their Smart Account information. For more information on how to create a Cisco Smart Account, see: http://www.cisco.com/c/en/us/products/collateral/software/one-software/solution-overview-c22-733273.html.

Table 7: Minimum Foundation Software Licenses for the CM line cards

PID	Minimum Foundation Software License Required
A9K-8X100GE-CM	300G (30 x 10G)
A99-8X100GE-CM	300G (30 x 10G)
A99-12X100GE-CM	400G (40 x 10G)
A9K-MOD400-CM-BUN	200G (20 x 10G)

2. Choose your foundation software licenses: This provides the transport protocol (IP/MPLS, L2VPN, L3VPN, or L2VPN and L3VPN) as well as "per 10G" port activation.

   Pick your foundation software licenses based on the feature set and the scale required. The following is the list of the available licenses. The licenses listed are per 10G RTU (Right to Use) and are required to activate a port.

Table 8: Foundation Software Licenses for Cisco IOS XR and Cisco IOS XR 64 bit

Foundation License PID	Description
S-A9K-IPB-10G	ASR 9000 IP/MPLS Basic 10G Foundational License
S-A9K-IPP-10G	ASR 9000 IP/MPLS Premium 10G Foundational License
S-A9K-L2B-10G	ASR 9000 IP/MPLS/L2VPN Basic 10G Foundational License
S-A9K-L2P-10G	ASR 9000 IP/MPLS/L2VPN Premium 10G Foundational License
S-A9K-L3B-10G	ASR 9000 IP/MPLS/L3VPN Basic 10G Foundational License
S-A9K-L3P-10G	ASR 9000 IP/MPLS/L3VPN Premium 10G Foundational License
S-A9K-L2L3B-10G	ASR 9000 IP/MPLS/L2VPN/L3VPN Basic 10G Foundational License

Foundation License PID	Description
S-A9K-L2L3P-10G	ASR 9000 IP/MPLS/L2VPN/L3VPN Premium 10G Foundational License

3. Choose your advanced software licenses: This provides the advanced feature support such as hierarchical QoS, OAM (Operations, Administration, and Maintenance), and virtual interfaces.

Pick your advanced software licenses, optional, you can select one or more of them from the following list. The licenses listed are per 10G RTU (Right to Use).

Below tables list supported advance software licenses for Cisco IOS XR and Cisco IOS XR 64 bit respectively:

Table 9: Advanced Software Licenses for Cisco IOS XR

Advanced Software License PID	Description
S-A9K-HQOS-RTU-10	ASR 9000 H-QoS 10G Right to Use License
S-A9K-MAP-RTU-10	ASR 9000 CGN Stateless MAP 10G Right to Use License
S-A9K-OAM-RTU-10	ASR 9000 OAM 10G Right to Use License
S-A9K-VIRT-RTU-10	ASR 9000 Virtual Interfaces 10G Right to Use License
S-A9K-EVPN-RTU-10	ASR 9000 E-VPN 10G Right to Use License
S-A9K-VXLN-RTU-10	ASR 9000 VxLAN 10G Right to Use License
S-A9K-DWDM-RTU-10	ASR 9000 IPoDWDM 10G Right to Use License
S-A9K-MAC-RTU-10	ASR 9000 MACSec 10G Right to Use License
S-A9K-MAC-RTU-40	ASR 9000 MACSec 40G (4x10G) Right to Use License
S-A9K-MAC-RTU-100	ASR 9000 MACSec 100G (10x10G) Right to Use License

Table 10: Advanced Software Licenses for Cisco IOS XR 64 bit

Advanced Software License PID	Description
S-A9K-HQOS-RTU-10	ASR 9000 H-QoS 10G Right to Use License
S-A9K-OAM-RTU-10	ASR 9000 OAM 10G Right to Use License
S-A9K-VIRT-RTU-10	ASR 9000 Virtual Interfaces 10G Right to Use License
S-A9K-EVPN-RTU-10	ASR 9000 E-VPN 10G Right to Use License
S-A9K-VXLN-RTU-10	ASR 9000 VxLAN 10G Right to Use License
S-A9K-DWDM-RTU-10	ASR 9000 IPoDWDM 10G Right to Use License
S-A9K-MAC-RTU-10	ASR 9000 MACSec 10G Right to Use License

Advanced Software License PID	Description
A9K-NVSAT1-LIC	ASR 9000 NV Satellite Right to Use License
A9K-LI-LIC	ASR 9000 Lawful Intercept Right to Use License
A9K-MOBILE-LIC	ASR 9000 Timing Advanced Mobile License Right to Use License

Configuration Examples:

The Consumption Model line cards provide the flexibility to configure the line card on a per 10G port basis. Here are a few examples of configurations of the existing TR and SE versions of line cards using the Consumption Model.

TR Equivalent Configuration

The TR equivalent configuration is a configuration with L2 Premium Foundation Software License plus OAM and Virtual Advanced Software licenses.

Line Card PID	Description	Quantity
A9K-8X100GE-CM A99-8X100GE-CM A9K-20X10GE-CM A99-12X100GE-CM	ASR 9000 8-port 100GE Consumption Model Line Card ASR 9900 8-port 100GE Consumption Model Line Card ASR 9000 20-port 10GE Consumption Model Line Card ASR 9900 12-port 100GE Consumption Model Line Card	1
Foundation Software PID	**Scale**	**Quantity of 10G Licenses**
S-A9K-L2P-10G	L2-P (Layer 2 Premium Foundation Software License)	30
Advanced Software PID	**Description**	**Quantity**
S-A9K-OAM-RTU-10	ASR 9000 OAM 10Gbps Right to Use License	30
S-A9K-VIRT-RTU-10	ASR 9000 Virtual Interfaces 10Gbps Right to Use License	30

SE Equivalent Configuration

The SE equivalent configuration is a configuration with L2 Premium Foundation Software License plus H-QoS, OAM, and Virtual Advanced Software licenses.

Line Card PID	Description	Quantity
A9K-8X100GE-CM A99-8X100GE-CM	ASR 9000 8-port 100GE Consumption Model Line Card ASR 9900 8-port 100GE Consumption Model Line Card	1
Foundation Software PID	**Scale**	**Quantity of 10G Licenses**
S-A9K-L2P-10G	L2-P (Layer 2 Premium Foundation Software License)	30
Advanced Software PID	**Description**	**Quantity**
S-A9K-HQOS-RTU-10	ASR 9000 H-QoS 10Gbps Right to Use License	30
S-A9K-OAM-RTU-10	ASR 9000 OAM 10Gbps Right to Use License	30
S-A9K-VIRT-RTU-10	ASR 9000 Virtual Interfaces 10Gbps Right to Use License	30

Implementing Default Licensing

Prerequisites for Configuring Software Entitlement

You must be in a user group associated with a task group that includes the proper task IDs. The command reference guides include the task IDs required for each command. If you suspect user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Information About Default (Traditional) Licensing

To configure software license entitlements using the default mode of licensing, you need to understand the concepts described in this module.

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.

Router License Pools

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

Chassis-Locked Licenses

Licenses are locked to a unique device identifier (UDI). The UDI is comprised of the chassis serial number, along with an additional identifier. 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 readded.

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 eight licenses for Layer 3 VPN in the system, you can configure Layer 3 VPN features on any eight cards in the router, 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 3, and entered into an empty slot with no license, say slot 5, the license remains with slot 3 and the feature cannot be activated on slot 5 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 5, the license is checked out.

Configure Licenses Using Default Licensing

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 evaluation licenses with permanent licenses.

Before you begin

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.

SUMMARY STEPS

1. **admin**
2. **show license udi**
3. http://www.cisco.com/go/license
4. Copy the license to your TFTP server.
5. **admin**
6. **license add** *license-name* [**sdr** *sdr-name*]
7. **configure**
8. **license** *license-name* **location** {**all** | *node-id*}
9. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**admin**	Enters administration EXEC mode.
	Example:	

	Command or Action	**Purpose**
| | ```
RP/0/RSP0/CPU0:router# admin
``` | |
| **Step 2** | **show license udi**<br>**Example:**<br><br>```
RP/0/RSP0/CPU0:router(admin)# show license udi

Mon Jul 13 04:36:32.715 PST

Local Chassis UDI Information:
  PID       : ASR-9010-AC
  S/N       : FOX1232H67M
  Operation ID: 1
``` | Displays the 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 | 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 are required to enter the feature PAK and the chassis UDI 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**<br>**Example:**<br><br>```
RP/0/RSP0/CPU0:router# admin
``` | Enters administration EXEC mode. |
| **Step 6** | **license add** *license-name* [ **sdr** *sdr-name* ]<br>**Example:**<br>```
RP/0/RSP0/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** | **configure**<br>**Example:**<br><br>```
RP/0/RSP0/CPU0:router(admin)# configure
``` | Enters administration configuration mode. |

	Command or Action	Purpose
Step 8	**license** *license-name* **location** {**all** | *node-id*} **Example:** RP/0/RSP0/CPU0:router(admin-config)# **license A9K-ADV-OPTIC-LIC location 0/0/CPU0**	(Optional) Binds the license to the slot where it is to be used. **Note** Beginning with Cisco IOS XR Release 4.3.1, this command is optional. If you do not use this command, it is configured as though the license is bound to all slots.
Step 9	**exit** **Example:** RP/0/RSP0/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 Layer 3 VPN, see the *Implementing MPLS Layer 3 VPNs on Cisco IOS XR Software* module in *MPLS Configuration Guide for Cisco ASR 9000 Series Routers*.

To verify that your Layer 3 VPN configuration is operational, use the **show rsi interface all global** command.

Backing Up Licenses

When your router is configured with the licenses that you require, you should perform this task to back up all licenses. Backing up licenses makes it easier to restore them if there is 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	**admin** **Example:** RP/0/RSP0/CPU0:router# admin	Enters administration EXEC mode.
Step 2	**license backup** *backup-file* **Example:** RP/0/RSP0/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. The backup file 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/RSP0/CPU0:router(admin)# show license backup disk1:/license_back	Displays the contents of the backup file.

Examples

The following example shows sample output from the **show license backup** command.

```
RP/0/RSP0/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


RP/0/RSP0/CPU0:router(admin)# show license backup disk0:/lic_backup.pkg

Tue Jul 27 17:12:44.982 pst

Local Chassis UDI Information:
  S/N          : FOX1316G5TL
  Operation ID:   9

  FeatureID: A9K-ADV-OPTIC-LIC (Slot based, Permanent)
  Total licenses  1
    Pool: Owner  1
    Allocated Node(s):
      0/0/CPU0 1 [Owner]

  FeatureID: A9K-ADV-VIDEO-LIC (Slot based, Evaluation)
  Total licenses  1
    Pool: Owner  1
    Allocated Node(s):
      0/RSP0/CPU0 1 [Owner]

  FeatureID: A9K-iVRF-LIC (Slot based, Permanent)
  Total licenses  1
    Pool: Owner  1

  FeatureID: A9K-iVRF-LIC (Slot based, Evaluation)
  Total licenses  3
    Pool: Owner  3
    Allocated Node(s):
      0/1/CPU0 1 [Owner]
```

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.

Before you begin

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	**admin** **Example:** `RP/0/RSP0/CPU0:router# admin`	Enters administration EXEC mode.
Step 2	**show license backup** *backup-file* **Example:** `RP/0/RSP0/CPU0:router(admin)# show license backup disk1:/license_back`	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/RSP0/CPU0:router(admin)# license restore disk1:/license_back`	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.

Examples

This example shows sample output from the **license restore** command.

```
RP/0/RSP0/CPU0:router(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.
```

Troubleshooting License Issues after a Software Upgrade

In the instance that you were running Cisco IOS XR Release 3.9.0 and had the optic feature enabled on a interface and the A9K-ADV-OPTIC-LIC license was active on a particular slot, when you upgrade to Cisco

IOS XR Release 4.0.0, the A9K-ADV-OPTIC-LIC license is still active, but you may get the following warning message:

```
RP/0/RSP0/CPU0:Jul 27 14:22:22.594 : licmgr[236]:
%LICENSE-LICMGR-4-PACKAGE_LOCATION_LICENSE_INVALID :
Feature associated to package A9K-ADV-OPTIC-LIC configured
on node 0/4/CPU0 without a valid license
```

To solve this issue, configure the **license** command in administration EXEC mode. This binds the A9K-ADV-OPTIC-LIC license to the slot on which you are using the license. For example:

```
RP/0/RSP0/CPU0:router(admin-config)# license A9K-ADV-OPTIC-LIC location 0/4/CPU0
RP/0/RSP0/CPU0:router(admin-config)# commit
```