Smart Licensing Using Policy

Introduction to Smart Licensing Using Policy

Smart Licensing Using Policy is an enhanced version of Smart Licensing, with the overarching objective of providing a licensing solution that does not interrupt the operations of your network, rather, one that enables a compliance relationship to account for the hardware and software licenses you purchase and use.

Smart Licensing Using Policy is supported starting with Cisco IOS XE Amsterdam 17.3.2a.

The primary benefits of this enhanced licensing model are:

- Seamless day-0 operations

  After a license is ordered, no preliminary steps, such as registration or generation of keys etc., are required unless you use an export-controlled or enforced license. There are no export-controlled or enforced licenses on Cisco Catalyst Wireless Controllers and product features can be configured on the device right-away.

- Consistency in Cisco IOS XE

  Campus and industrial ethernet switching, routing, and wireless devices that run Cisco IOS XE software, have a uniform licensing experience.

- Visibility and manageability

  Tools, telemetry and product tagging, to know what is in-use.

- Flexible, time series reporting to remain compliant

  Easy reporting options are available, whether you are directly or indirectly connected to Cisco Smart Software Manager (CSSM), or in an air-gapped network.

This document provides conceptual, configuration, and troubleshooting information for Smart Licensing Using Policy on Cisco Catalyst Wireless Controllers.

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

Information About Smart Licensing Using Policy

This section provides conceptual information about Smart Licensing Using Policy, supported products, an overview of each supported topology, and explains how Smart Licensing Using Policy interacts, with other features.

Overview

Smart Licensing Using Policy is a software license management solution that provides a seamless experience with the various aspects of licensing.

- Purchase licenses: Purchase licenses through the existing channels and use the Cisco Smart Software Manager (CSSM) portal to view product instances and licenses.

Note For new hardware or software orders, Cisco simplifies the implementation of Smart Licensing Using Policy, by factory-installing the following (terms are explained in the Concepts, on page 6 section further below):

- A custom policy, if available.
- A trust code, which ensures authenticity of data sent to CSSM. This is installed starting with Cisco IOS XE Cupertino 17.7.1. This trust code cannot be used to *communicate* with CSSM.

- Use: All licenses on Cisco Catalyst Wireless Controllers are unenforced. This means that you do not have to complete any licensing-specific operations, such as registering or generating keys before you start using the software and the licenses that are tied to it. License usage is recorded on your device with timestamps and the required workflows can be completed at a later date.
- Report license usage to CSSM: Multiple options are available for license usage reporting. You can use Cisco Smart Licensing Utility (CSLU), or report usage information directly to CSSM. For air-gapped networks, a provision for offline reporting where you download usage information and upload it to CSSM, is also available.The usage report is in plain text XML format. See: Sample Resource Utilization Measurement Report, on page 103.
- Reconcile: For situations where delta billing applies (purchased versus consumed).

Supported Products

This section provides information about the Cisco IOS-XE product instances that support Smart Licensing Using Policy. All models (Product IDs or PIDs) in a product series are supported – unless indicated otherwise.

Table 1: Supported Product Instances: Cisco Catalyst Wireless Controllers

Cisco Catalyst Wireless Controllers	When Support for Smart Licensing Using Policy was Introduced
Cisco Catalyst 9800-40 Wireless Controller	Cisco IOS XE Amsterdam 17.3.2a
Cisco Catalyst 9800-L Wireless Controller	Cisco IOS XE Amsterdam 17.3.2a
Cisco Catalyst 9800-CL Wireless Controller	Cisco IOS XE Amsterdam 17.3.2a
Cisco Catalyst 9800 embedded Wireless Controller	Cisco IOS XE Amsterdam 17.3.2a
Cisco Embedded Wireless Controller on Cisco Catalyst 9100 Access Points (EWC-AP)	Cisco IOS XE Amsterdam 17.3.2a

Architecture

This section explains the various components that can be part of your implementation of Smart Licensing Using Policy. One or more components make up a topology.

Product Instance

A product instance is a single instance of a Cisco product, identified by a Unique Device Identifier (UDI).

A product instance records and reports license usage (RUM reports), and provides alerts and system messages about overdue reports, communication failures, etc. RUM reports and usage data are securely stored in the product instance.

Throughout this document, the term *product instance* refers to all supported physical and virtual product instances - unless noted otherwise. For information about the product instances that are within the scope of this document, see Supported Products, on page 2.

CSLU

Cisco Smart License Utility (CSLU) is a Windows-based reporting utility that provides aggregate licensing workflows. This utility performs the following key functions:

- Provides options relating to how workflows are triggered. The workflows can be triggered by CSLU or by a product instance.
- Collects usage reports from one or more product instances and uploads these usage reports to the corresponding Smart Account or Virtual Account – online, or offline, using files. Similarly, the RUM report ACK is collected online, or offline, and sent back to the product instance.
- Sends authorization code requests to CSSM and receives authorization codes from CSSM, if applicable.

CSLU can be part of your implementation in the following ways:

- Install the windows application, to use CSLU as a standalone tool that is connected to CSSM.
- Install the windows application, to use CSLU as a standalone tool that is disconnected from CSSM. With this option, the required usage information is downloaded to a file and then uploaded to CSSM. This is suited to air-gapped networks.

- Embedded (by Cisco) in a controller such as Cisco DNA Center.
- Deploy CSLU on a machine (laptop or desktop) running Linux.

CSLU supports Windows 10 and Linux operating systems. For release notes and to download the latest version, click *Smart Licensing Utility* on the Software Download page

CSSM

Cisco Smart Software Manager (CSSM) is a portal that enables you to manage all your Cisco software licenses from a centralized location. CSSM helps you manage current requirements and review usage trends to plan for future license requirements.

You can access the CSSM Web UI at https://software.cisco.com. Under the **License** tab, click the **Smart Software Licensing** link.

See the Supported Topologies, on page 11 section to know about the different ways in which you can connect to CSSM

In CSSM you can:

- 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.

Controller

A management application or service that manages multiple product instances.

Note Throughout this chapter, and in the context of Smart Licensing Using Policy, the term "controller"or "Controller" always means a management application or service that manages a product instance. The term is not used to refer to Cisco Catalyst Wireless Controllers, which are *product instances*.

On Cisco Catalyst Wireless Controllers, Cisco DNA Center is the supported controller. Information about the controller, product instances that support the controller, and minimum required software versions on the controller and on the product instance is provided below:

Table 2: Support Information for Controller: Cisco DNA Center

Minimum Required Cisco DNA Center Version for Smart Licensing Using Policy[1]	Minimum Required Cisco IOS XE Version[2]	Supported Product Instances
Cisco DNA Center Release 2.2.2	Cisco IOS XE Amsterdam 17.3.2a	• Cisco Catalyst 9800-40 Wireless Controller • Cisco Catalyst 9800-80 Wireless Controller • Cisco Catalyst 9800-L Wireless Controller • Cisco Catalyst 9800-CL Wireless Controller • Cisco Catalyst 9800 embedded Wireless Controller • Cisco Embedded Wireless Controller on Cisco Catalyst 9100 Access Points (EWC-AP)

1 The minimum required software version on the controller. This means support continues on all subsequent releases - unless noted otherwise

2 The minimum required software version on the product instance. This means support continues on all subsequent releases - unless noted otherwise.

For more information about Cisco DNA Center, see the support page at: https://www.cisco.com/c/en/us/support/cloud-systems-management/dna-center/series.html.

SSM On-Prem

Smart Software Manager On-Prem (SSM On-Prem) is an asset manager, which works in conjunction with CSSM. It enables you to administer products and licenses on your premises instead of having to directly connect to CSSM.

Information about the required software versions to implement Smart Licensing Using Policy with SSM On-Prem, is provided below:

Minimum Required SSM On-Prem Version for Smart Licensing Using Policy[3]	Minimum Required Cisco IOS XE Version[4]	Supported Product Instances
Version 8, Release 202102	Cisco IOS XE Amsterdam 17.3.3	• Cisco Catalyst 9800-40 Wireless Controller • Cisco Catalyst 9800-80 Wireless Controller • Cisco Catalyst 9800-L Wireless Controller • Cisco Catalyst 9800-CL Wireless Controller • Cisco Catalyst 9800 embedded Wireless Controller • Cisco Embedded Wireless Controller on Cisco Catalyst 9100 Access Points (EWC-AP)

[3] The minimum required SSM On-Prem version. This means support continues on all subsequent releases - unless noted otherwise

[4] The minimum required software version on the product instance. This means support continues on all subsequent releases - unless noted otherwise.

For more information about SSM On-Prem, see Smart Software Manager On-Prem on the Software Download page. Hover over the .iso image to display the documentation links.

Concepts

This section explains the key concepts of Smart Licensing Using Policy.

License Enforcement Types

A given license belongs to one of three enforcement types. The enforcement type indicates if the license requires authorization before use, or not.

- Unenforced or Not Enforced

  Unenforced licenses *do not* require authorization before use in air-gapped networks, or registration, in connected networks. The terms of use for such licenses are as per the General Terms and Conditions.

  All licenses available on Cisco Catalyst Wireless Controllers are unenforced licenses.

- Enforced

  Licenses that belong to this enforcement type require authorization before use. The required authorization is in the form of an authorization code, which must be installed in the corresponding product instance.

  An example of an enforced license is the Media Redundancy Protocol (MRP) Client license, which is available on Cisco's Industrial Ethernet Switches.

- Export-Controlled

  Licences that belong to this enforcement type are export-restricted by U.S. trade-control laws and these licenses require authorization before use. The required authorization code must be installed in the corresponding product instance for these licenses as well. Cisco may pre-install export-controlled licenses when ordered with hardware purchase.

  An example of an export-controlled license is the High Speed Encryption (HSECK9) license, which is available on certain Cisco Routers.

License Duration

This refers to the duration or term for which a purchased license is valid. A given license may belong to any one of the enforcement types mentioned above and be valid for the following durations:

- Perpetual: There is no expiration date for such a license.

  AIR Network Essentials and AIR Network Advantage licenses are examples of unenforced, perpetual licenses that are available on Cisco Catalyst Wireless Controllers.

- Subscription: The license is valid only until a certain date.

  AIR Digital Network Architecture (DNA) Essentials and AIR DNA Advantage licenses are examples of unenforced subscription licenses that are available on Cisco Catalyst Wireless Controllers.

Authorization Code

The Smart Licensing Authorization Code (SLAC) allows activation and continued use of a license that is export-controlled or enforced.

A SLAC is not required for any of the licenses available on Cisco Catalyst Wireless Controllers, but if you are upgrading from an earlier licensing model to Smart Licensing Using Policy, you may have a Specific License Reservation (SLR) with its own authorization code. The SLR authorization code is supported after upgrade to Smart Licensing Using Policy.

Note While existing SLRs are carried over after upgrade, you cannot request a new SLR in the Smart Licensing Using Policy environment, because the notion of "reservation" does not apply. For an air-gapped network, the No Connectivity to CSSM and No CSLU topology applies instead

For more information about how the SLR authorization code is handled, see Upgrades, on page 23. If you want to return an SLR authorization code, see Removing and Returning an Authorization Code, on page 89.

Policy

A policy provides the product instance with these reporting instructions:

- License usage report acknowledgement requirement (Reporting ACK required): The license usage report is known as a RUM Report and the acknowledgement is referred to as an ACK (See RUM Report and Report Acknowledgement). This is a yes or no value which specifies if the report for this product instance requires CSSM acknowledgement or not. The default policy is always set to "yes".

- First report requirement (days): The first report must be sent within the duration specified here.

  If the value here is zero, no first report is required.

- Reporting frequency (days): The subsequent report must be sent within the duration specified here.

  If the value here is zero, it means no further reporting is required *unless* there is a usage change.

- Report on change (days): In case of a change in license usage, a report must be sent within the duration specified here.

  If the value here is zero, no report is required on usage change.

  If the value here is not zero, reporting *is* required after the change is made. All the scenarios listed below count as changes in license usage on the product instance:

  - Changing licenses consumed (includes changing to a different license, and, adding or removing a license).
  - Going from consuming zero licenses to consuming one or more licenses.
  - Going from consuming one or more licenses to consuming zero licenses.

Note If a product instance has *never* consumed a license, reporting is not required even if the policy has a non-zero value for any of the reporting requirements (First report requirement, Reporting frequency, Report on change).

Understanding Policy Selection

CSSM determines the policy that is applied to a product instance. Only one policy is in use at a given point in time. The policy and its values are based on a number of factors, including the licenses being used.

`Cisco default` is the default policy that is always available in the product instance. If no other policy is applied, the product instance applies this default policy. The table below (Table 3: Policy: Cisco default, on page 8) shows the `Cisco default` policy values.

While you cannot configure a policy, you can request for a customized one, by contacting the Cisco Global Licensing Operations team. Go to Support Case Manager. Click **OPEN NEW CASE** > Select **Software Licensing**. The licensing team will contact you to start the process or for any additional information. Customized policies are also made available through your Smart account in CSSM.

Note To know which policy is applied (the policy in-use) and its reporting requirements, enter the **show license all** command in privileged EXEC mode.

Table 3: Policy: Cisco default

Policy: `Cisco default`	**Default Policy Values**
Export (Perpetual/Subscription) **Note** Applied only to licenses with enforcement type "Export-Controlled".	Reporting ACK required: Yes First report requirement (days): 0 Reporting frequency (days): 0 Report on change (days): 0

Policy: `Cisco default`	**Default Policy Values**
Enforced (Perpetual/Subscription) **Note** Applied only to licenses with enforcement type "Enforced".	Reporting ACK required: Yes First report requirement (days): 0 Reporting frequency (days): 0 Report on change (days): 0
Unenforced/Non-Export Perpetual[5]	Reporting ACK required: Yes First report requirement (days): 365 Reporting frequency (days): 0 Report on change (days): 90
Unenforced/Non-Export Subscription	Reporting ACK required: Yes First report requirement (days): 90 Reporting frequency (days): 90 Report on change (days): 90

[5] For Unenforced/Non-Export Perpetual: the default policy's first report requirement (within 365 days) applies only if you have purchased hardware or software from a distributor or partner.

RUM Report and Report Acknowledgement

A Resource Utilization Measurement report (RUM report) is a license usage report, which fulfils reporting requirements as specified by the policy. RUM reports are generated by the product instance and consumed by CSSM. The product instance records license usage information and all license usage changes in an open RUM report. At system-determined intervals, open RUM reports are closed and new RUM reports are opened to continue recording license usage. A closed RUM report is ready to be sent to CSSM.

A RUM acknowledgement (RUM ACK or ACK) is a response from CSSM and provides information about the status of a RUM report. Once the ACK for a report is available on the product instance, it indicates that the corresponding RUM report is no longer required and can be deleted.

The reporting method, that is, how a RUM report is sent to CSSM, depends on the topology you implement.

CSSM displays license usage information as per the last received RUM report.

A RUM report may be accompanied by other requests, such as a trust code request, or a SLAC request. So in addition to the RUM report IDs that have been received, an ACK from CSSM may include authorization codes, trust codes, and policy files.

The policy that is applied to a product instance determines the following aspects of the reporting requirement:

- Whether a RUM report is sent to CSSM and the maximum number of days provided to meet this requirement.
- Whether the RUM report requires an acknowledgement (ACK) from CSSM.
- The maximum number of days provided to report a change in license consumption.

RUM report generation, storage, and management

Starting with Cisco IOS XE Cupertino 17.7.1, RUM report generation and related processes have been optimized and enhanced as follows:

- You can display the list of all available RUM reports on a product instance (how many there are, the processing state each one is in, if there are errors in any of them, and so on). This information is available in the **show license rum**, **show license all**, and **show license tech** privileged EXEC commands. For detailed information about the fields displayed in the output, see the command reference of the corresponding release.
- RUM reports are stored in a new format that reduces processing time, and reduces memory usage. In order to ensure that there are no usage reporting inconsistencies resulting from the difference in the old and new formats, we recommend that you send a RUM report in the method that will apply to your topology, in these situations:

  When you upgrade from an earlier release supporting Smart Licensing Using Policy, to Cisco IOS XE Cupertino 17.7.1 or a later release.

  When you downgrade from Cisco IOS XE Cupertino 17.7.1 or a later release to an earlier release supporting Smart Licensing Using Policy.
- To ensure continued disk space and memory availability, the product instance detects and triggers deletion of RUM reports that are deemed eligible.

Trust Code

A *UDI-tied public key*, which the product instance uses to

- Sign a RUM report. This prevents tampering and ensures data authenticity.
- Enable secure communication with CSSM.

There are multiple ways to obtain a trust code.

- From Cisco IOS XE Cupertino 17.7.1, a trust code is factory-installed for all new orders.

Note A factory-installed trust code cannot be used for *communication* with CSSM.

- A trust code can obtained from CSSM, using an ID token.

  Here you generate an *ID token* in the CSSM Web UI to obtain a trust code and install it on the product instance. You must overwrite the factory-installed trust code if there is one. If a product instance is directly connected to CSSM, use this method to enable the product instance to communicate with CSSM in a secure manner. This method of obtaining a trust code is applicable to all the options of directly connecting to CSSM. For more information, see Connected Directly to CSSM, on page 13.
- From Cisco IOS XE Cupertino 17.7.1, a trust code is automatically obtained in topologies where the product instance initiates the sending of data to CSLU and in topologies where the product instance is in an air-gapped network.

  From Cisco IOS XE Cupertino 17.9.1, a trust code is automatically obtained in topologies where CSLU initiates the retrieval of data from the product instance.

  If there is a factory-installed trust code, it is automatically overwritten. A trust code obtained this way can be used for secure communication with CSSM.

Refer to the topology description and corresponding workflow to know how the trust code is requested and installed in each scenario: Supported Topologies, on page 11.

If a trust code is installed on the product instance, the output of the **show license status** command displays a timestamp in the `Trust Code Installed:` field.

Supported Topologies

This section describes the various ways in which you can implement Smart Licensing Using Policy. For each topology, refer to the accompanying overview to know the how the set-up is designed to work, and refer to the considerations and recommendations, if any.

After Topology Selection

After you have selected a topology, see How to Configure Smart Licensing Using Policy: Workflows by Topology , on page 28. These workflows are only for new deployments. They provide the simplest and fastest way to implement a topology.

If you are migrating from an existing licensing model, see Migrating to Smart Licensing Using Policy, on page 41.

After initial implementation, for any additional configuration tasks you have to perform, for instance, changing the AIR license, or synchronizing RUM reports, see the *Task Library for Smart Licensing Using Policy*.

Note Always check the "Supported topologies" where provided, before you proceed.

Connected to CSSM Through CSLU

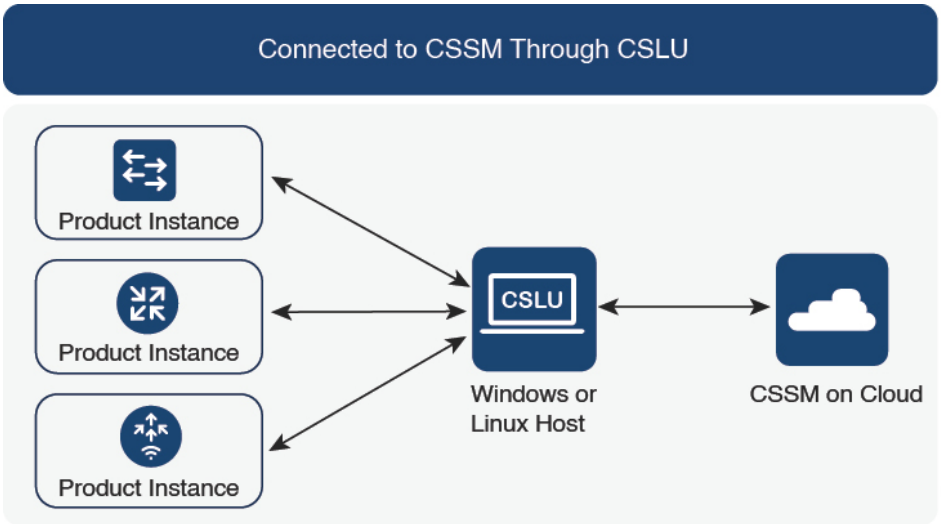
Overview:

Here, product instances in the network are connected to CSLU, and CSLU becomes the single point of interface with CSSM. A product instance can be configured to *push* the required information to CSLU. Alternatively, CSLU can be set-up to *pull* the required information from a product instance at a configurable frequency.

Product instance-initiated communication (push): A product instance initiates communication with CSLU, by connecting to a REST endpoint in CSLU. Data that is sent includes RUM reports and requests for authorization codes, UDI-tied trust codes, and policies. You can configure the product instance to automatically send RUM reports to CSLU at required intervals. This is the default method for a product instance.

CSLU-initiated communication (pull): To initiate the retrieval of information from a product instance, CSLU uses NETCONF, or RESTCONF, or gRPC with YANG models, or native REST APIs, to connect to the product instance. Supported workflows include retrieving RUM reports from the product instance and sending the same to CSSM, authorization code installation, UDI-tied trust code installation, and application of policies.

Figure 1: Topology: Connected to CSSM Through CSLU



Considerations or Recommendations:

Choose the method of communication depending on your network's security policy.

Release-Wise Changes and Enhancements:

This section outlines important release-wise software changes and enhancements that affect this topology.

From Cisco IOS XE Cupertino 17.7.1:

- Trust code request and installation

  If a trust code is not available on the product instance, the product instance detects and automatically includes a request for one, as part of a RUM report. A corresponding ACK from CSSM includes the trust code. If there is an existing factory-installed trust code, it is automatically overwritten. A trust code obtained this way can be used for communication with CSSM.

  This is supported in a standalone, as well as a High Availability set-up. In a High Availability set-up, the active product instance requests the trust code for all connected product instances where a trust code is not available.

  In this release, this enhancement applies only to the product instance-initiated mode.

From Cisco IOS XE Cupertino 17.9.1:

- Trust code request and installation

  From this release, trust code request and installation is supported in the CSLU-initiated mode as well.

- RUM report throttling

  In the product instance-initiated mode, the minimum reporting frequency is throttled to one day. This means the product instance does not send more than one RUM report a day. This resolves the problem of too many RUM reports being generated and sent for certain licenses. It also resolves the memory-related issues and system slow-down caused by an excessive generation of RUM reports.

You can override the throttling restriction by entering the **license smart sync** command in privileged EXEC mode.

RUM report throttling applies to the Cisco IOS XE Amsterdam 17.3.6 and later releases of the 17.3.x trainand Cisco IOS XE Bengaluru 17.6.4 and later releases of the 17.6.x train. From Cisco IOS XE Cupertino 17.9.1, RUM report throttling is applicable to *all* subsequent releases.

Where to Go Next:

To implement this topology, see Workflow for Topology: Connected to CSSM Through CSLU, on page 28.

Connected Directly to CSSM

Overview:

This topology is available in the earlier version of Smart Licensing and continues to be supported with Smart Licensing Using Policy.

Here, you establish a *direct* and *trusted* connection from a product instance to CSSM. The direct connection, requires network reachability to CSSM. For the product instance to then exchange messages and communicate with CSSM, configure one of the transport options available with this topology (described below). Lastly, the establishment of trust requires the generation of a token from the corresponding Smart Account and Virtual Account in CSSM, and installation on the product instance.

Note A factory-installed trust code cannot be used for communication with CSSM. This means that for this topology, even if a factory-installed trust code exists, you must obtain a trust code by generating an ID token in CSSM, and you must overwrite the existing factory-installed trust code. Also see: Trust Code, on page 10.

You can configure a product instance to communicate with CSSM in the following ways:

- Use Smart transport to communicate with CSSM

  Smart transport is a transport method where a Smart Licensing (JSON) message is contained within an HTTPs message, and exchanged between a product instance and CSSM, to communicate. The following Smart transport configuration options are available:

  - Smart transport: In this method, a product instance uses a specific Smart transport licensing server URL. This must be configured exactly as shown in the workflow section.
  - Smart transport through an HTTPs proxy: In this method, a product instance uses a proxy server to communicate with the licensing server, and eventually, CSSM.

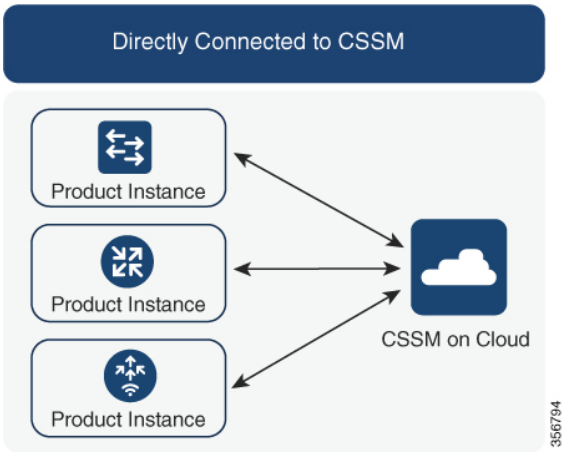
- Use Call Home to communicate with CSSM.

  Call Home provides e-mail-based and web-based notification of critical system events. This method of connecting to CSSM is available in the earlier Smart Licensing environment, and continues to be available with Smart Licensing Using Policy. The following Call Home configuration options are available:

  - Direct cloud access: In this method, a product instance sends usage information directly over the internet to CSSM; no additional components are needed for the connection.

- Direct cloud access through an HTTPs proxy: In this method, a product instance sends usage information over the internet through a proxy server - either a Call Home Transport Gateway or an off-the-shelf proxy (such as Apache) to CSSM.

Figure 2: Topology: Connected Directly to CSSM



Considerations or Recommendations:

Smart transport is the recommended transport method when directly connecting to CSSM. This recommendation applies to:

- New deployments.
- Earlier licensing models. Change configuration after migration to Smart Licensing Using Policy.
- Registered licenses that currently use the Call Home transport method. Change configuration after migration to Smart Licensing Using Policy.
- Evaluation or expired licenses in an earlier licensing model. Change configuration after migration to Smart Licensing Using Policy.

To change configuration after migration, see Workflow for Topology: Connected Directly to CSSM, on page 31 > Product Instance Configuration > Configure a connection method and transport type > Option 1.

Release-Wise Changes and Enhancements:

This section outlines important release-wise software changes and enhancements that affect this topology.

From Cisco IOS XE Cupertino 17.9.1:

- RUM report throttling

  The minimum reporting frequency for this topology, is throttled to one day. This means the product instance does not send more than one RUM report a day. This resolves the problem of too many RUM reports being generated and sent for certain licenses. It also resolves the memory-related issues and system slow-down caused by an excessive generation of RUM reports.

  You can override the throttling restriction by entering the **license smart sync** command in privileged EXEC mode.

RUM report throttling applies to the Cisco IOS XE Amsterdam 17.3.6 and later releases of the 17.3.x trainand Cisco IOS XE Bengaluru 17.6.4 and later releases of the 17.6.x train. From Cisco IOS XE Cupertino 17.9.1, RUM report throttling is applicable to *all* subsequent releases.

Where to Go Next:

To implement this topology, see Workflow for Topology: Connected Directly to CSSM, on page 31.

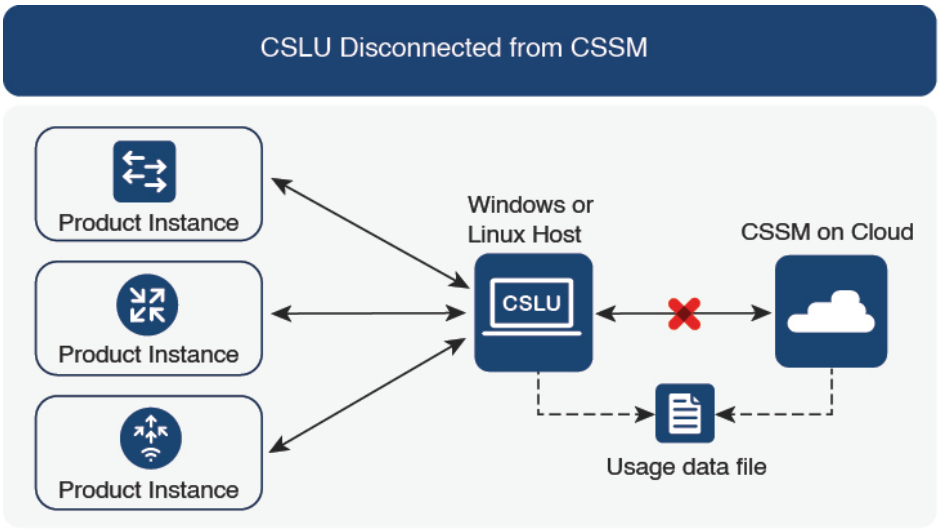
CSLU Disconnected from CSSM

Overview:

Here, a product instance communicates with CSLU, and you have the option of implementing product instance-initiated communication or CSLU-initiated communication (as in the *Connected to CSSM Through CSLU* topology). The other side of the communication, between CSLU and CSSM, is offline. CSLU provides you with the option of working in a mode that is disconnected from CSSM.

Communication between CSLU and CSSM is sent and received in the form of signed files that are saved offline and then uploaded to or downloaded from CSLU or CSSM, as the case may be.

Figure 3: Topology: CSLU Disconnected from CSSM



Considerations or Recommendations:

Choose the method of communication depending on your network's security policy.

Release-Wise Changes and Enhancements:

This section outlines important release-wise software changes and enhancements that affect this topology.

From Cisco IOS XE Cupertino 17.7.1:

- Trust code request and installation

  If a trust code is not available on the product instance, the product instance detects and automatically includes a request for one, as part of a RUM report that is sent to CSLU, which you upload to CSSM. The ACK that you download from CSSM includes the trust code. If there is an existing factory-installed

trust code, it is automatically overwritten. A trust code obtained this way can be used for communication with CSSM.

This is supported in a standalone, as well as a High Availability set-up. In a High Availability set-up, the active product instance requests the trust code for members or standbys where a trust code is not available.

In this release, this enhancement applies only to the product instance-initiated mode.

From Cisco IOS XE Cupertino 17.9.1:

- Trust code request and installation

  From this release, trust code request and installation is supported in the CSLU-initiated mode as well.

- RUM report throttling

  In the product instance-initiated mode, the minimum reporting frequency is throttled to one day. This means the product instance does not send more than one RUM report a day. This resolves the problem of too many RUM reports being generated and sent for certain licenses. It also resolves the memory-related issues and system slow-down caused by an excessive generation of RUM reports.

  You can override the throttling restriction by entering the **license smart sync** command in privileged EXEC mode.

  RUM report throttling applies to the Cisco IOS XE Amsterdam 17.3.6 and later releases of the 17.3.x trainand Cisco IOS XE Bengaluru 17.6.4 and later releases of the 17.6.x train. From Cisco IOS XE Cupertino 17.9.1, RUM report throttling is applicable to *all* subsequent releases.

Where to Go Next:

To implement this topology, see Workflow for Topology: CSLU Disconnected from CSSM, on page 32.

Connected to CSSM Through a Controller

When you use a controller to manage a product instance, the controller connects to CSSM, and is the interface for all communication to and from CSSM. The supported controller for Cisco Catalyst Wireless Controllers is Cisco DNA Center.

Overview:

If a product instance is managed by Cisco DNA Center as the controller, the product instance records license usage and saves the same, but it is the Cisco DNA Center that initiates communication with the product instance to retrieve RUM reports, report to CSSM, and return the ACK for installation on the product instance.

All product instances that must be managed by Cisco DNA Center must be part of its inventory and must be assigned to a site. Cisco DNA Center uses the NETCONF protocol to provision configuration and retrieve the required information from the product instance - the product instance must therefore have NETCONF enabled, to facilitate this.

In order to meet reporting requirements, Cisco DNA Center retrieves the applicable policy from CSSM and provides the following reporting options:

- Ad hoc reporting: You can trigger an ad hoc report when required.
- Scheduled reporting: Corresponds with the reporting frequency specified in the policy and is automatically handled by Cisco DNA Center.

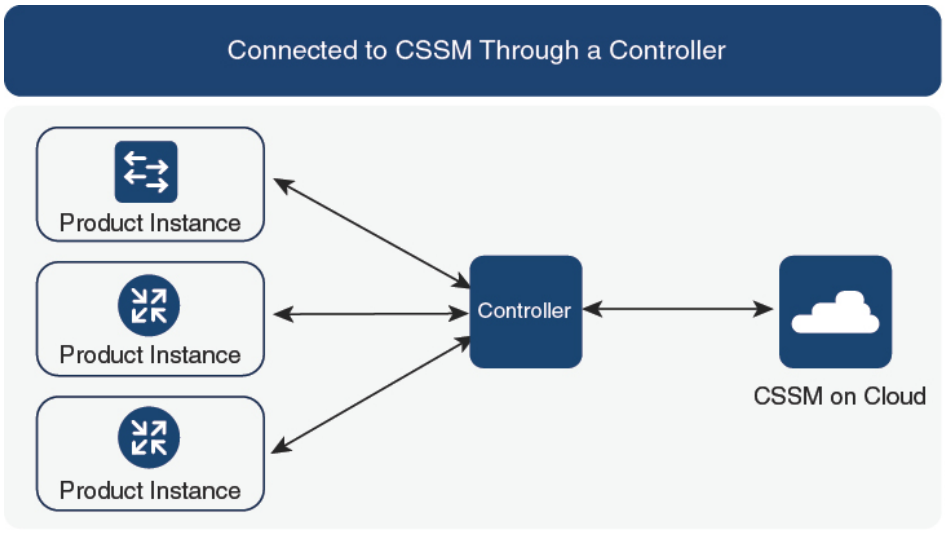
Note Ad hoc reporting must be performed at least once before a product instance is eligible for scheduled reporting.

The first ad hoc report enables Cisco DNA Center to determine the Smart Account and Virtual Account to which subsequent RUM reports must be uploaded. You will receive notifications if ad hoc reporting for a product instance has not been performed even once.

Cisco DNA Center also enables you to install and remove SLAC for export-controlled licenses. Since all available licenses on Cisco Catalyst Wireless Controllers are unenforced licenses, SLAC installation and removal do not apply.

A trust code is *not* required.

Figure 4: Topology: Connected to CSSM Through a Controller



Considerations or Recommendations:

This is the recommended topology if you are using Cisco DNA Center.

Where to Go Next:

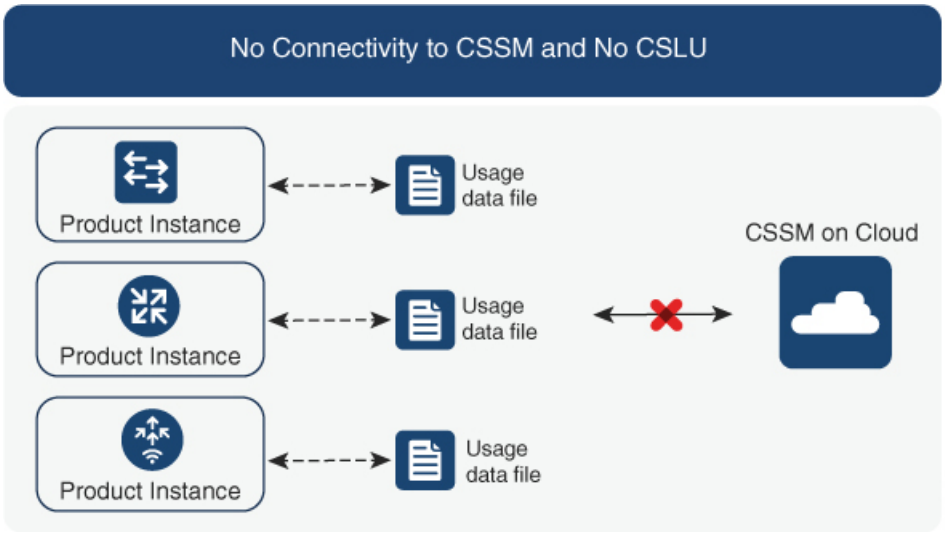
To implement this topology, see Workflow for Topology: Connected to CSSM Through a Controller, on page 35.

No Connectivity to CSSM and No CSLU

Overview:

Here you have a product instance and CSSM disconnected from each other, and without any other intermediary utilities or components. All communication is in the form of uploaded and downloaded files. These files can be RUM reports and requests for UDI-tied trust codes.

Figure 5: Topology: No Connectivity to CSSM and No CSLU



Considerations or Recommendations:

This topology is suited to a high-security deployment where a product instance cannot communicate online, with anything outside its network.

Release-Wise Changes and Enahcements

This section outlines the release-wise software changes and enhancements that affect this topology.

From Cisco IOS XE Cupertino 17.7.1:

- Trust code request and installation

  If a trust code is not available on the product instance, the product instance automatically includes a trust code request in the RUM report that you save, to upload to CSSM. The ACK that you then download from CSSM includes the trust code.

  If there is a factory-installed trust code, it is automatically overwritten when you install the ACK. A trust code obtained this way can be used for secure communication with CSSM.

  This is supported in a standalone, as well as a High Availability set-up. In a High Availability set-up, the active product instance requests the trust code for all connected product instances where a trust code is not available.

- Simpler authorization code return

  A simpler way to upload an authorization code return file is available in the CSSM Web UI. You do not have to locate the product instance in the correct Virtual Account in the CSSM Web UI any longer. You can upload the return file, as you would a RUM report.

Where to Go Next:

To implement this topology, see Workflow for Topology: No Connectivity to CSSM and No CSLU, on page 36.

SSM On-Prem Deployment

Overview:

SSM On-Prem is designed to work as an extension of CSSM that is deployed on your premises.

Here, a product instance is connected to SSM On-Prem, and SSM On-Prem becomes the single point of interface with CSSM. Each instance of SSM On-Prem must be made known to CSSM through a mandatory registration and synchronization of the local account in SSM On-Prem, with a Virtual Account in CSSM.

When you deploy SSM On-Prem to manage a product instance, the product instance can be configured to *push* the required information to SSM On-Prem. Alternatively, SSM On-Prem can be set-up to *pull* the required information from a product instance at a configurable frequency.

- Product instance-initiated communication (push): The product instance initiates communication with SSM On-Prem, by connecting to a REST endpoint in SSM On-Prem. Data that is sent includes RUM reports and requests for authorization codes, trust codes, and policies.

  Options for communication between the product instance and SSM On-Prem in this mode:

  - Use a CLI command to push information to SSM On-Prem as and when required.
  - Use a CLI command and configure a reporting interval, to automatically send RUM reports to SSM On-Prem at a scheduled frequency.

- SSM On-Prem-initiated communication (pull): To initiate the retrieval of information from a product instance, SSM On-Prem NETCONF, RESTCONF, and native REST API options, to connect to the product instance. Supported workflows include receiving RUM reports from the product instance and sending the same to CSSM, authorization code installation, trust code installation, and application of policies.

  Options for communication between the product instance and SSM On-Prem in this mode:

  - Collect usage information from one or more product instances as and when required (on-demand).
  - Collect usage information from one or more product instances at a scheduled frequency.

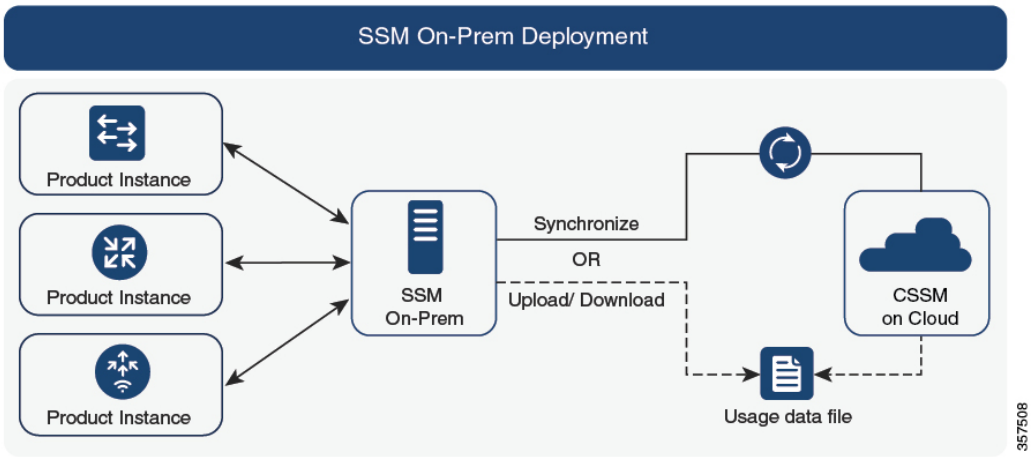
In SSM On-Prem, the reporting interval is set to the default policy on the product instance. You can change this, but only to report more frequently (a narrower interval), or you can install a custom policy if available.

After usage information is available in SSM On-Prem, you must synchronize the same with CSSM, to ensure that the product instance count, license count and license usage information is the same on both, CSSM and SSM On-Prem. Options for usage synchronization between SSM On-Prem and CSSM – for the push *and* pull mode:

- Perform ad-hoc synchronization with CSSM (Synchronize now with Cisco).
- Schedule synchronization with CSSM for specified times.
- Communicate with CSSM through signed files that are saved offline and then upload to or download from SSM On-Prem or CSSM, as the case may be.

Note This topology involves two different kinds of synchronization between SSM On-Prem and CSSM. The first is where the *local account* is synchronized with CSSM - this is for the SSM On-Prem instance to be known to CSSM and is performed by using the **Synchronization** widget in SSM On-Prem. The second is where *license usage* is synchronized with CSSM, either by being connected to CSSM or by downloading and uploading files. You must synchronize the local account before you can synchronize license usage.

Figure 6: Topology: SSM On-Prem Deployment



Considerations or Recommendations:

This topology is suited to the following situations:

- If you want to manage your product instances on your premises, as opposed communicating directly with CSSM for this purpose.
- If your company's policies prevent your product instances from reporting license usage directly to Cisco (CSSM).
- If your product instances are in an air-gapped network and cannot communicate online, with anything outside their network.

Apart from support for Smart Licensing Using Policy, some of the key benefits of SSM On-Prem *Version 8* include:

- Multi-tenancy: One tenant constitutes one Smart Account-Virtual Account pair. SSM On-Prem enables you to manage multiple pairs. Here you create local accounts that reside in SSM On-Prem. Multiple local accounts roll-up to a Smart Account-Virtual Account pair in CSSM. For more information, see the Cisco Smart Software Manager On-Prem User Guide > *About Accounts and Local Virtual Accounts*.

Note The relationship between CSSM and SSM On-Prem instances is still one-to-one.

- Scale: Supports up to a total of 300,000 product instances

- High-Availability: Enables you to run two SSM On-Prem servers in the form of an active-standby cluster. For more information, see the Cisco Smart Software On-Prem Installation Guide > Appendix 4. Managing a High Availability (HA) Cluster in Your System.

  High-Availability deployment is supported on the SSM On-Prem console and the required command details are available in the Cisco Smart Software On-Prem Console Guide.

- Options for online and offline connectivity to CSSM.

SSM On-Prem Limitations:

- Proxy support for communication with CSSM, for the purpose of *license usage* synchronization is available only from Version 8 202108 onwards. The use of a proxy for *local account* synchronization, which is performed by using the **Synchronization** widget, is available from the introductory SSM On-Prem release where Smart Licensing Using Policy is supported.
- SSM On-Prem-initiated communication is not supported on a product instance that is in a Network Address Translation (NAT) set-up. You must use product instance-initiated communication, and further, you must *enable* SSM On-Prem to support a product instance that is in a NAT setup. Details are provided in the workflow for this topology.

Release-Wise Changes and Enhancements:

This section outlines important release-wise software changes and enhancements that affect this topology.

From Cisco IOS XE Cupertino 17.9.1:

- RUM report throttling

  In the product instance-initiated mode, the minimum reporting frequency is throttled to one day. This means the product instance does not send more than one RUM report a day. This resolves the problem of too many RUM reports being generated and sent for certain licenses. It also resolves the memory-related issues and system slow-down caused by an excessive generation of RUM reports.

  You can override the throttling restriction by entering the **license smart sync** command in privileged EXEC mode.

  RUM report throttling applies to the Cisco IOS XE Amsterdam 17.3.6 and later releases of the 17.3.x trainand Cisco IOS XE Bengaluru 17.6.4 and later releases of the 17.6.x train. From Cisco IOS XE Cupertino 17.9.1, RUM report throttling is applicable to *all* subsequent releases.

Where to Go Next:

To implement this topology, see Workflow for Topology: SSM On-Prem Deployment, on page 37

If you are migrating from an existing version of SSM On-Prem, the sequence in which you perform the various upgrade-related activities is crucial. See Migrating to a Version of SSM On-Prem That Supports Smart Licensing Using Policy, on page 60

Interactions with Other Features

High Availability

This section explains considerations that apply to a High Availability configuration, when running a software version that supports Smart Licensing Using Policy. The following High Availability set-ups are within the scope of this document:

A dual-chassis set-up (could be fixed or modular), with the active in one chassis and a standby in the other chassis.

A wireless N+1 topology, where "n" number of wireless controllers act as primary and a "+1" wireless controller acts as the secondary or fallback wireless controller for Access Points (APs). Each Access Point is configured with a primary and a secondary wireless controller. In case of a failure on the primary, all access points that were connected to the primary now fallback to the secondary wireless controller.

Trust Code Requirements in a High Availability Set-Up

The number of trust codes required depends on the number of UDIs. The active product instance can submit requests for all devices in the High Availability set-up and install all the trust codes that are returned in an ACK.

Policy Requirements in a High Availability Set-Up

There are no policy requirements that apply exclusively to a High Availability set-up. As in the case of a standalone product instance, only one policy exists in a High Availability set-up as well, and this is on the active. The policy on the active applies to any standbys in the set-up.

Product Instance *Functions* in a High Availability Set-Up

This section explains general product instance functions in a High Availability set-up, as well as what the product instance does when a new standby or secondary is added to an existing High Available set-up.

For authorization and trust codes: The active product instance can request (if required) and install authorization codes and trust codes for standbys.

For policies: The active product instance synchronizes with the standby.

For reporting: Only the active product instance reports usage. The active reports usage information for all devices in the High Availability set-up. In addition to scheduled reporting, the following events trigger reporting:

- The addition or removal of a standby. The RUM report includes information about the standby that was added or removed.
- A switchover.
- A reload.

When one of the above events occur, the "Next report push" date of the **show license status** privileged EXEC command is updated. But it is the implemented topology and associated reporting method that determine if the report is sent by the product instance or not. For example, if you have implemented a topology where the product instance is disconnected (Transport Type is Off), then the product instance does not send RUM reports even if the "Next report push" date is updated.

For addition or removal of a new standby:

- A product instance that is connected to CSLU, does not take any further action.
- A product instance that is directly connected to CSSM, performs trust synchronization. Trust synchronization involves the following:

  Installation of trust code on the standby if not installed already.

  If a trust code is already installed, the trust synchronization process ensures that the new standby is in the same Smart Account and Virtual Account as the active. If it is not, the new standby is *moved* to the same Smart Account and Virtual Account as the active.

  Installation of an authorization code, policy, and purchase information, if applicable

  Sending of a RUM report with current usage information.

For addition or removal of a secondary:

There are no product instance functions that apply exclusively to the addition or removal of a secondary product instance. Further, all the secondary product instances are in the same Smart Account and Virtual Account as the primary product instance.

Upgrades

This section explains the following aspects:

Migrating from earlier licensing models to Smart Licensing Using Policy. When migrating from earlier licensing models, also see the Migrating to Smart Licensing Using Policy, on page 41 section for examples of migration scenarios that apply to Cisco Catalyst Wireless Controllers.

Upgrading in the Smart Licensing Using Policy environment - where the software version you are upgrading from and the software version you are upgrading to, both support Smart Licensing Using Policy.

Identifying the Current Licensing Model Before Upgrade

Before you upgrade to Smart Licensing Using Policy, if you want to know the current licensing model that is effective on the product instance, enter the **show license all** command in privileged EXEC mode.

How Upgrade Affects Enforcement Types for Existing Licenses

When you upgrade to a software version which supports Smart Licensing Using Policy, the way existing licenses are handled, depends primarily on the license enforcement type.

- An unenforced license that was being used before upgrade, continues to be available after the upgrade. All licenses on Cisco Catalyst Wireless Controllers are unenforced licenses. This includes licenses from all earlier licensing models:
  - Smart Licensing
  - Specific License Reservation (SLR), which has an accompanying authorization code. The authorization code continues to be valid after upgrade to Smart Licensing Using Policy and authorizes existing license consumption.
  - Evaluation or expired licenses from any of the above mentioned licensing models.
- An enforced or export-controlled license that was being used before upgrade, continues to be available after upgrade if the required authorization exists.

There are no export-controlled or enforced licenses on any of the supported Cisco Catalyst Wireless Controllers, therefore, these enforcement types and the requisite SLAC do not apply.

How Upgrade Affects Reporting for Existing Licenses

Existing License	Reporting Requirements After Migration to Smart Licensing Using Policy
Specific License Reservation (SLR)	Required only if there is a change in license consumption. An existing SLR authorization code authorizes existing license consumption after upgrade to Smart Licensing Using Policy.
Smart Licensing (Registered and Authorized license)	Depends on the policy.
Evaluation or expired licenses	Based on the reporting requirements of the Cisco default policy.

How Upgrade Affects Transport Type for Existing Licenses

The transport type, if configured in your existing set-up, is retained after upgrade to Smart Licensing Using Policy.

When compared to the earlier version of Smart Licensing, additional transport types are available with Smart Licensing Using Policy. There is also a change in the default transport mode. The following table clarifies how this may affect upgrades:

Transport type Before Upgrade	License or License State Before Upgrade	Transport Type After Upgrade
Default (callhome)	evaluation	cslu (default in Smart Licensing Using Policy)
	SLR	off
	registered	callhome
smart	evaluation	off
	SLR	off
	registered	smart

How Upgrade Affects the Token Registration Process

In the earlier version of Smart Licensing, a token was used to register and connect to CSSM. ID token registration is not required in Smart Licensing Using Policy. The token generation feature is still available in CSSM, and is used to *establish trust* when a product instance is directly connected to CSSM. See Connected Directly to CSSM.

Upgrades Within the Smart Licensing Using Policy Environment

This section covers any release-specific considerations or actions that apply when you upgrade the product instance from one release where Smart Licensing Using Policy is supported to another release where Smart Licensing Using Policy is supported.

Starting with Cisco IOS XE Cupertino 17.7.1, RUM reports are stored in a format that reduces processing time. In order to ensure that there are no usage reporting inconsistencies resulting from the differences in the old and new formats, we recommend completing one round of usage reporting as a standard practice when upgrading from an earlier release that supports Smart Licensing Using Policy, to Cisco IOS XE Cupertino 17.7.1 or a later release.

Downgrades

This section provides information about downgrades to an earlier licensing model, for new deployments and existing deployments. It also covers information relevant to downgrades within in the Smart Licensing Using Policy environment.

New Deployment Downgrade

This section describes considerations and actions that apply if a newly purchased product instance with a software version where Smart Licensing Using Policy is enabled by default, is downgraded to a software version where Smart Licensing Using Policy is not supported.

The outcome of the downgrade depends on whether a trust code was installed while still operating in the Smart Licensing Using Policy environment, and further action may be required depending on the release you downgrade to.

If the topology you implemented while in the Smart Licensing Using Policy environment was "Connected Directly to CSSM", then a trust code installation can be expected or assumed, because it is required as part of topology implementation. For any of the other topologies, trust establishment is not mandatory. Downgrading product instances with one of these other topologies will therefore mean that you have to restore licenses to a registered and authorized state by following the procedures that are applicable in the Smart Licensing environment. See the table (*Outcome and Action for New Deployment Downgrade to Smart Licensing*) below.

Table 4: Outcome and Action for New Deployment Downgrade to Smart Licensing

In the Smart Licensing Using Policy Environment	Downgrade to..	Outcome and Further Action
Standalone product instance, connected directly to CSSM, and trust established.	Cisco IOS XE Amsterdam 17.3.1 OR Cisco IOS XE Gibraltar 16.12.4 and later releases in Cisco IOS XE Gibraltar 16.12.x	No further action is required. The product instance attempts to renew trust with CSSM after downgrade. After a successful renewal, licenses are in a registered state and the earlier version of Smart Licensing is effective on the product instance.
	Any other release (other than the ones mentioned in the row above) that supports Smart Licensing	Action is required: You must reregister the product instance. Generate an ID token in the CSSM Web UI and on the product instance, configure the **license smart register idtoken** *idtoken* command in global configuration mode.
High Availability set-up, connected directly to CSSM, and trust established.	Any release that supports Smart Licensing	Action is required: You must reregister the product instance. Generate an ID token in the CSSM Web UI and on the product instance, configure the **license smart register idtoken** *idtoken* **all** command in global configuration mode.
Any other topology. (Connected to CSSM Through CSLU, CSLU Disconnected from CSSM, No Connectivity to CSSM and No CSLU)	Any release that supports Smart Licensing	Action is required. Restore licenses to a registered and authorized state by following the procedures that are applicable in the Smart Licensing environment.

Upgrade and Then Downgrade

This section describes considerations and actions that apply if a product instance is upgraded to a software version that supports Smart Licensing Using Policy and then downgraded to an earlier licensing model.

When you downgrade such a product instance, *license consumption does not change* and any product features you have configured on the product instance are preserved – only the features and functions that are available with Smart Licensing Using Policy are not available anymore. Refer to the corresponding section below to know more about reverting to an earlier licensing model.

Upgrade to Smart Licensing Using Policy and then Downgrade to Smart Licensing

The outcome of the downgrade depends on whether a trust code was installed while you were still operating in the Smart Licensing Using Policy environment, and further action may be required depending on the release you downgrade to. See the table below.

Table 5: Outcome and Action for Upgrade to Smart Licensing Using Policy and then Downgrade to Smart Licensing

In the Smart Licensing Using Policy Environment	Downgrade to..	Outcome and Further Action
Standalone product instance, connected directly to CSSM, and trust established.	Cisco IOS XE Amsterdam 17.3.1 OR Cisco IOS XE Gibraltar 16.12.4 and later releases in Cisco IOS XE Gibraltar 16.12.x	No further action is required. The system recognizes the trust code and converts it back to a registered ID token, and this reverts the license to an AUTHORIZED and REGISTERED state.
	Any other release (other than the ones mentioned in the row above) that supports Smart Licensing	Action is required: You must reregister the product instance. Generate an ID token in the CSSM Web UI and on the product instance, configure the **license smart register idtoken***idtoken* command in global configuration mode.
High Availability set-up, connected directly to CSSM, and trust established.	Any release that supports Smart Licensing	Action is required: You must reregister the product instance. Generate an ID token in the CSSM Web UI and on the product instance, configure the **license smart register idtoken** *idtoken* **all** command in global configuration mode.
Any other topology (Connected to CSSM Through CSLU, CSLU Disconnected from CSSM, No Connectivity to CSSM and No CSLU)	Any release that supports Smart Licensing.	Action is required. Restore licenses to a registered and authorized state by following the procedures that are applicable in the Smart Licensing environment.

Note Licenses that were in an evaluation or expired state in the Smart Licensing environment, revert to that same state after downgrade.

Upgrade to Smart Licensing Using Policy and then Downgrade to SLR

To revert to SLR, all that is required is for the image to be downgraded. The license remains reserved and authorized – no further action is required.

However, if you have returned an SLR while in the Smart Licensing Using Policy environment, then you must repeat the process of procuring an SLR as required, in the supported release.

Downgrades Within the Smart Licensing Using Policy Environment

This section covers any release-specific considerations or actions that apply when you downgrade the product instance from one release where Smart Licensing Using Policy is supported to another release where Smart Licensing Using Policy is supported.

Starting with Cisco IOS XE Cupertino 17.7.1, RUM reports are stored in a format that reduces processing time. In order to ensure that there are no usage reporting inconsistencies resulting from the differences in the old and new formats, we recommend completing one round of usage reporting as a standard practice when downgrading from Cisco IOS XE Cupertino 17.7.1 or a later release to an earlier release supporting Smart Licensing Using Policy.

How to Configure Smart Licensing Using Policy: Workflows by Topology

This section provides the simplest and fastest way to implement a topology.

Note These workflows are meant for new deployments only. If you are migrating from an existing licensing model, see Migrating to Smart Licensing Using Policy, on page 41.

Workflow for Topology: Connected to CSSM Through CSLU

Depending on whether you want to implement a product instance-initiated or CSLU-initiated method of communication, complete the corresponding sequence of tasks:

- Tasks for Product Instance-Initiated Communication
- Tasks for CSLU-Initiated Communication

Tasks for Product Instance-Initiated Communication

CSLU Installation → CSLU Preference Settings → Product Instance Configuration

1. ***CSLU Installation***

   Where task is performed: A laptop, destop, or a Virtual Machine (VM) running Windows 10 or Linux.

   Download the file from Smart Software Manager > **Smart Licensing Utility**.

   Refer to Cisco Smart License Utility Quick Start Setup Guide and Cisco Smart Licensing Utility User Guide for help with installation and set-up.

2. ***CSLU Preference Settings***

   Where tasks are performed: CSLU

   a. Logging into Cisco (CSLU Interface), on page 62

b. Configuring a Smart Account and a Virtual Account (CSLU Interface), on page 62

c. Adding a Product-Initiated Product Instance in CSLU (CSLU Interface), on page 63

3. ***Product Instance Configuration***

   Where tasks are performed: Product Instance

   a. Ensuring Network Reachability for Product Instance-Initiated Communication, on page 63

   b. Ensure that transport type is set to **cslu**.

   CSLU is the default transport type. If you have configured a different option, enter the **license smart transport cslu** command in global configuration mode. Save any changes to the configuration file.

   ```
   Device(config)# license smart transport cslu
   Device(config)# exit
   Device# copy running-config startup-config
   ```

   c. Specify how you want CSLU to be discovered (*choose one*):

   - Option 1:

     No action required. Name server configured for Zero-touch DNS discovery of `cslu-local`

     Here, if you have configured DNS (the name server IP address is configured on the product instance), and the DNS server has an entry where hostname `cslu-local` is mapped to the CSLU IP address, then no further action is required. The product instance automatically discovers hostname `cslu-local`.

   - Option 2:

     No action required. Name server and domain configured for Zero-touch DNS discovery of `cslu-local.<domain>`

     Here if you have configured DNS (the name server IP address and domain is configured on the product instance), and the DNS server has an entry where `cslu-local.<domain>` is mapped to the CSLU IP address, then no further action is required. The product instance automatically discovers hostname `cslu-local`.

   - Option 3:

     Configure a specific URL for CSLU.

     Enter the **license smart url cslu** *http://<cslu_ip_or_host>:8182/cslu/v1/pi* command in global configuration mode. For `<cslu_ip_or_host>`, enter the hostname or the IP address of the windows host where you have installed CSLU. 8182 is the port number and it is the only port number that CSLU uses.

     ```
     Device(config)# license smart url cslu http://192.168.0.1:8182/cslu/v1/pi
     Device(config)# exit
     Device# copy running-config startup-config
     ```

Result:

Since the product instance initiates communication, it automatically sends out the first RUM report at the scheduled time, as per the policy. Along with this first report, if applicable, it sends a request for a UDI-tied trust code. CSLU forwards the RUM report to CSSM and retrieves the ACK, which also contains the trust code. The ACK is applied to the product instance the next time the product instance contacts CSLU.

In the Cisco IOS XE Amsterdam 17.3.6 and later releases of the 17.3.x train, Cisco IOS XE Bengaluru 17.6.4 and later releases of the 17.6.x train, and all subsequent releases from Cisco IOS XE Cupertino 17.9.1 onwards: The product instance does not send more than one RUM report a day. You can override this for an on-demand synchronization between the product instance and CSSM, by entering the **license smart sync** command in privileged EXEC mode.

To know when the product instance will be sending the next RUM report, enter the **show license all** command in privileged EXEC mode and in the output, check the date in the `Next report push` field.

To verify trust code installation, enter the **show license status** command in privileged EXEC mode. Check for the updated timestamp in the `Trust Code Installed` field.

In case of a change in license usage, see Configuring an AIR License, on page 99 to know how it affects reporting.

Tasks for CSLU-Initiated Communication

CSLU Installation → CSLU Preference Settings→ Product Instance Configuration → Usage Synchronization

1. ***CSLU Installation***

   Where task is performed: A laptop, destop, or a Virtual Machine (VM) running Windows 10 or Linux.

   Download the file from Smart Software Manager > **Smart Licensing Utility**.

   Refer to Cisco Smart License Utility Quick Start Setup Guide and Cisco Smart Licensing Utility User Guide for help with installation and set-up.

2. ***CSLU Preference Settings***

   Where tasks is performed: CSLU

   a. Logging into Cisco (CSLU Interface), on page 62

   b. Configuring a Smart Account and a Virtual Account (CSLU Interface), on page 62

   c. Adding a CSLU-Initiated Product Instance in CSLU (CSLU Interface), on page 65

3. ***Product Instance Configuration***

   Where tasks is performed: Product Instance

   Ensuring Network Reachability for CSLU-Initiated Communication, on page 67

4. ***Usage Synchronization***

   Where tasks is performed: Product Instance

   Collecting Usage Reports: CSLU Initiated (CSLU Interface), on page 65

Result:

Since CSLU is logged into CSSM, the reports are automatically sent to the associated Smart Account and Virtual Account in CSSM and CSSM will send an ACK to CSLU as well as to the product instance. It gets the ACK from CSSM and sends this back to the product instance for installation. The ACK from CSSM contains the trust code and SLAC if this was requested.

In case of a change in license usage, see Configuring an AIR License, on page 99 to know how it affects reporting.

Trust code request and installation is supported starting with Cisco IOS XE Cupertino 17.9.1.

Workflow for Topology: Connected Directly to CSSM

Smart Account Set-Up → Product Instance Configuration → Trust Establishment with CSSM

1. ***Smart Account Set-Up***

   Where task is performed: CSSM Web UI, https://software.cisco.com/

   Ensure that you have a user role with proper access rights to a Smart Account and the required Virtual Accounts.

2. ***Product Instance Configuration***

   Where tasks are performed: Product Instance

   a. Set-Up product instance connection to CSSM: Setting Up a Connection to CSSM , on page 82

   b. Configure a connection method and transport type (choose one)

      • Option 1:

      Smart transport: Set transport type to **smart** and configure the corresponding URL.

      If the transport mode is set to **license smart transport smart**, and you configure **license smart url default**, the Smart URL (https://smartreceiver.cisco.com/licservice/license) is automatically configured. Save any changes to the configuration file.

      ```
      Device(config)# license smart transport smart
      Device(config)# license smart url default
      Device(config)# exit
      Device# copy running-config startup-config
      ```

      • Option 2:

      Configure Smart transport through an HTTPs proxy. See Configuring Smart Transport Through an HTTPs Proxy, on page 84

      • Option 3:

      Configure Call Home service for direct cloud access. See Configuring the Call Home Service for Direct Cloud Access, on page 85.

      • Option 4:

      Configure Call Home service for direct cloud access through an HTTPs proxy. See Configuring the Call Home Service for Direct Cloud Access through an HTTPs Proxy Server, on page 88.

3. ***Trust Establishment with CSSM***

   Where task is performed: CSSM Web UI and then the product instance

   a. Generate one token for each *Virtual Account* you have. You can use same token for all the product instances that are part of one Virtual Account: Generating a New Token for a Trust Code from CSSM, on page 92

   b. Having downloaded the token, you can now install the trust code on the product instance: Installing a Trust Code, on page 93

Result:

After establishing trust, CSSM returns a policy. The policy is automatically installed on all product instances of that Virtual Account. The policy specifies if and how often the product instance reports usage.

In the Cisco IOS XE Amsterdam 17.3.6 and later releases of the 17.3.x train, Cisco IOS XE Bengaluru 17.6.4 and later releases of the 17.6.x train, and all subsequent releases from Cisco IOS XE Cupertino 17.9.1 onwards: The product instance does not send more than one RUM report a day. You can override this for an on-demand synchronization between the product instance and CSSM, by entering the **license smart sync** command in privileged EXEC mode.

To change the reporting interval, configure the **license smart usage interval** command in global configuration mode. For syntax details see the *license smart (privileged EXEC)* command in the Command Reference for the corresponding release.

In case of a change in license usage, see Configuring an AIR License, on page 99 to know how it affects reporting.

Workflow for Topology: CSLU Disconnected from CSSM

Depending on whether you want to implement a product instance-initiated or CSLU-initiated method of communication. Complete the corresponding table of tasks below.

- Tasks for Product Instance-Initiated Communication
- Tasks for CSLU-Initiated Communication

Tasks for Product Instance-Initiated Communication

CSLU Installation → CSLU Preference Settings → Product Instance Configuration→ Usage Synchronization

1. ***CSLU Installation***

   Where task is performed: A laptop, destop, or a Virtual Machine (VM) running Windows 10 or Linux.

   Download the file from Smart Software Manager > **Smart Licensing Utility**.

   Refer to Cisco Smart License Utility Quick Start Setup Guide and Cisco Smart Licensing Utility User Guide for help with installation and set-up.

2. ***CSLU Preference Settings***

   Where tasks are performed: CSLU

   a. In the CSLU Preferences tab, click the **Cisco Connectivity** toggle switch to **off**. The field switches to “Cisco Is Not Available”.

   b. Configuring a Smart Account and a Virtual Account (CSLU Interface), on page 62

   c. Adding a Product-Initiated Product Instance in CSLU (CSLU Interface), on page 63

3. ***Product Instance Configuration***

   Where tasks are performed: Product Instance

   a. Ensuring Network Reachability for Product Instance-Initiated Communication, on page 63

   b. Ensure that transport type is set to **cslu**.

CSLU is the default transport type. If you have configured a different option, enter the **license smart transport cslu** command in global configuration mode. Save any changes to the configuration file.

```
Device(config)# license smart transport cslu
Device(config)# exit
Device# copy running-config startup-config
```

c. Specify how you want CSLU to be discovered (*choose one*)

- Option 1:

  No action required. Name server configured for Zero-touch DNS discovery of `cslu-local`

  Here, if you have configured DNS (the name server IP address is configured on the product instance), and the DNS server has an entry where hostname `cslu-local` is mapped to the CSLU IP address, then no further action is required. The product instance automatically discovers hostname `cslu-local`.

- Option 2:

  No action required. Name server and domain configured for Zero-touch DNS discovery of `cslu-local.<domain>`

  Here if you have configured DNS (the name server IP address and domain is configured on the product instance), and the DNS server has an entry where `cslu-local.<domain>` is mapped to the CSLU IP address, then no further action is required. The product instance automatically discovers hostname `cslu-local`.

- Option 3:

  Configure a specific URL for CSLU.

  Enter the **license smart url cslu** *http://<cslu_ip_or_host>:8182/cslu/v1/pi* command in global configuration mode. For `<cslu_ip_or_host>`, enter the hostname or the IP address of the windows host where you have installed CSLU. 8182 is the port number and it is the only port number that CSLU uses.

  ```
  Device(config)# license smart url cslu http://192.168.0.1:8182/cslu/v1/pi
  Device(config)# exit
  Device# copy running-config startup-config
  ```

4. ***Usage Synchronization***

Where tasks are performed: CSLU and CSSM

Since the product instance initiates communication, it automatically sends out the first RUM report at the scheduled time, as per the policy. You can also enter the **license smart sync** privileged EXEC command to trigger this. Along with this first report, if applicable, it sends a request for a UDI-tied trust code. Since CSLU is disconnected from CSSM, perform the following tasks to send the RUM Reports to CSSM.

a. Export to CSSM (CSLU Interface), on page 66

b. Uploading Data or Requests to CSSM and Downloading a File, on page 95

c. Import from CSSM (CSLU Interface), on page 67

Result:

The ACK you have imported from CSSM contains the trust code if this was requested. The ACK is applied to the product instance the next time the product instance contacts CSLU.

In the Cisco IOS XE Amsterdam 17.3.6 and later releases of the 17.3.x train, Cisco IOS XE Bengaluru 17.6.4 and later releases of the 17.6.x train, and all subsequent releases from Cisco IOS XE Cupertino 17.9.1 onwards: The product instance does not send more than one RUM report a day. You can override this for an on-demand synchronization between the product instance and CSSM, by entering the **license smart sync** command in privileged EXEC mode.

To know when the product instance will be sending the next RUM report, enter the **show license all** command in privileged EXEC mode and in the output, check the date for the `Next report push` field.

To verify trust code installation, enter the `show license status` command in privileged EXEC mode. Check for the updated timestamp in the `Trust Code Installed` field.

In case of a change in license usage, see Configuring an AIR License, on page 99 to know how it affects reporting.

Tasks for CSLU-Initiated Communication

CSLU Installation → CSLU Preference Settings → Product Instance Configuration → Usage Synchronization

1. ***CSLU Installation***

   Where task is performed: A laptop, destop, or a Virtual Machine (VM) running Windows 10 or Linux.

   Download the file from Smart Software Manager > **Smart Licensing Utility**.

   Refer to Cisco Smart License Utility Quick Start Setup Guide and Cisco Smart Licensing Utility User Guide for help with installation and set-up.

2. ***CSLU Preference Settings***

   Where tasks is performed: CSLU

   a. In the CSLU Preferences tab, click the **Cisco Connectivity** toggle switch to **off**. The field switches to “Cisco Is Not Available”.

   b. Configuring a Smart Account and a Virtual Account (CSLU Interface), on page 62

   c. Adding a CSLU-Initiated Product Instance in CSLU (CSLU Interface), on page 65

   d. Collecting Usage Reports: CSLU Initiated (CSLU Interface), on page 65

3. ***Product Instance Configuration***

   Where task is performed: Product Instance

   Ensuring Network Reachability for CSLU-Initiated Communication, on page 67

4. ***Usage Synchronization***

   Where tasks are performed: CSLU and CSSM

   Collect usage data from the product instance. Since CSLU is disconnected from CSSM, you then save usage data which CSLU has collected from the product instance to a file. Along with this first report, if applicable, an authorization code and a UDI-tied trust code request is included in the RUM report. Then, from a workstation that is connected to Cisco, upload it to CSSM. After this, download the ACK from CSSM. In the workstation where CSLU is installed and connected to the product instance, upload the file to CSLU.

a. Export to CSSM (CSLU Interface), on page 66

b. Uploading Data or Requests to CSSM and Downloading a File, on page 95

c. Import from CSSM (CSLU Interface), on page 67

Result:

The ACK you have imported from CSSM contains the trust code and SLAC if this was requested. The uploaded ACK is applied to the product instance the next time CSLU runs an update.

In case of a change in license usage, see Configuring an AIR License, on page 99 to know how it affects reporting.

Trust code request and installation is supported starting with Cisco IOS XE Cupertino 17.9.1.

Workflow for Topology: Connected to CSSM Through a Controller

To deploy Cisco DNA Center as the controller, complete the following workflow:

Product Instance Configuration → Cisco DNA Center Configuration

1. ***Product Instance Configuration***

   Where task is performed: Product Instance

   Enable NETCONF. Cisco DNA Center uses the NETCONF protocol to provision configuration and retrieve the required information from the product instance - the product instance must therefore have NETCONF enabled, to facilitate this.

   For more information, see the Programmability Configuration Guide, Cisco IOS XE Amsterdam 17.3.x. In the guide, go to *Model-Driven Programmability* > *NETCONF Protocol*.

2. ***Cisco DNA Center Configuration***

   Where tasks is performed: Cisco DNA Center GUI

   An outline of the tasks you must complete and the accompanying documentation reference is provided below. The document provides detailed steps you have to complete in the Cisco DNA Center GUI:

   a. Set-up the Smart Account and Virtual Account.

      Enter the same log in credentials that you use to log in to the CSSM Web UI. This enables Cisco DNA Center to establish a connection with CSSM.

      See the *Cisco DNA Center Administrator Guide* of the required release (Release 2.2.2 onwards) > *Manage Licenses* > *Set Up License Manager*.

   b. Add the required product instances to Cisco DNA Center inventory and assign them to a site.

      This enables Cisco DNA Center to push any necessary configuration, including the required certificates, for Smart Licensing Using Policy to work as expected.

      See the *Cisco DNA Center User Guide* of the required release (Release 2.2.2 onwards) > *Display Your Network Topology* > *Assign Devices to a Site*.

Result:

After you implement the topology, *you* must trigger the very first ad hoc report in Cisco DNA Center, to establish a mapping between the Smart Account and Virtual Account, and product instance. See the *Cisco DNA Center Administrator Guide* of the required release (Release 2.2.2 onwards) > *Manage Licenses* > *Upload Resource Utilization Details to CSSM*. Once this is done, Cisco DNA Center handles subsequent reporting based on the reporting policy.

If multiple policies are available, Cisco DNA Center maintains the narrowest reporting interval. You can change this, but only to report more frequently (a narrower interval). See the *Cisco DNA Center Administrator Guide* of the required release (Release 2.2.2 onwards) > *Manage Licenses* > *Modify License Policy*.

If you want to change the license level after this, see the *Cisco DNA Center Administrator Guide* of the required release (Release 2.2.2 onwards) > *Manage Licenses* > *Change License Level*.

Workflow for Topology: No Connectivity to CSSM and No CSLU

Since you do not have to configure connectivity to any other component, the list of tasks required to set-up the topology is a small one. See, the ***Results*** section at the end of the workflow to know how you can complete requisite usage reporting after you have implemented this topology.

Product Instance Configuration

Where task is performed: Product Instance

Set transport type to **off**.

Enter the **license smart transport off** command in global configuration mode. Save any changes to the configuration file.

```
Device(config)# license smart transport off
Device(config)# exit
Device# copy running-config startup-config
```

Result:

All communication to and from the product instance is disabled. To report license usage you must save RUM reports to a file on the product instance. From a workstation that has connectivity to the Internet and Cisco, upload the file to CSSM:

1. Generate and save RUM reports

   Enter the **license smart save usage** command in provileged EXEC mode. In the example below, all RUM reports are saved to the flash memory of the product instance, in file `all_rum.txt`.

   Starting with Cisco IOS XE Cupertino 17.7.1, if a trust code does not already exist on the product instance, configuring this command automatically includes a trust code request in the RUM report. This is supported in a standalone, as well as a High Availability set-up.

   In the example below, the file is first saved to bootflash and then copied to a TFTP location:

   ```
   Device# license smart save usage all file bootflash:all_rum.txt
   Device# copy bootflash:all_rum.txt tftp://10.8.0.6/all_rum.txt
   ```

2. Upload usage data to CSSM: Uploading Data or Requests to CSSM and Downloading a File, on page 95.
3. Install the ACK on the product instance: Installing a File on the Product Instance, on page 96

If you want to change license usage, see Configuring an AIR License, on page 99.

If you want to return an SLR authorization code, see Removing and Returning an Authorization Code, on page 89.

Workflow for Topology: SSM On-Prem Deployment

Depending on whether you want to implement a product instance-initiated (push) or SSM On-Prem-initiated (pull) method of communication, complete the corresponding sequence of tasks.

Tasks for Product Instance-Initiated Communication

SSM On-Prem Installation → Addition and Validation of Product Instances (Only if Applicable) → Product Instance Configuration→ Initial Usage Synchronization

1. ***SSM On-Prem Installation***

   Where task is performed: A physical server such as a Cisco UCS C220 M3 Rack Server, or a hardware-based server that meets the necessary requirements.

   Download the file from Smart Software Manager > **Smart Software Manager On-Prem**.

   Refer to the *Cisco Smart Software On-Prem Installation Guide* and the *Cisco Smart Software On-Prem User Guide* for help with installation.

   Installation is complete when you have deployed SSM On-Prem, configured a common name on SSM On-Prem (**Security Widget** > **Certificates**), synchronized the NTP server (**Settings** widget > **Time Settings**), and created, registered, and synchronized (**Synchronization** widget) the SSM On-Prem local account with your Smart Account and Virtual Account in CSSM.

Note Licensing functions in the **On-Prem Licensing Workspace** are greyed-out until you complete the creation, registration, and synchronization of the local account with your Smart Account in CSSM. The *local account*synchronization with CSSM is for the SSM On-Prem instance to be known to CSSM, and is different from usage synchronization which is performed in **4. Initial Usage Synchronization** below.

2. ***Addition and Validation of Product Instances***

   Where tasks are performed: SSM On-Prem UI

   This step ensures that the product instances are validated and mapped to the applicable Smart Account and Virtual account in CSSM. This step is required only in the following cases:

   - If you want your product instances to be added and validated in SSM On-Prem before they are reported in CSSM (for added security).
   - If you have created local virtual accounts (in addition to the default local virtual account) in SSM On-Prem. In this case you must provide SSM On-Prem with the Smart Account and Virtual Account information for the product instances in these local virtual accounts, so that SSM On-Prem can report usage to the correct license pool in CSSM.

   a. Assigning a Smart Account and Virtual Account (SSM On-Prem UI), on page 71

   b. Validating Devices (SSM On-Prem UI), on page 72

Note If your product instance is in a NAT set-up, also enable support for a NAT Setup when you enable device validation – both toggle switches are in the same window.

3. ***Product Instance Configuration***

   Where tasks are performed: Product Instance and the SSM On-Prem UI

   Remember to save any configuration changes on the product instance, by entering the **copy running-config startup-config** command in privileged EXEC mode.

   a. Ensuring Network Reachability for Product Instance-Initiated Communication, on page 72

   b. Retrieving the Transport URL (SSM On-Prem UI), on page 75

   c. Setting the Transport Type, URL, and Reporting Interval, on page 97

      The transport type configuration for CSLU and SSM On-Prem are the same (**license smart transport cslu** command in global configuration mode), but the URLs are different.

4. ***Initial Usage Synchronization***

   Where tasks are performed: Product instance, SSM On-Prem, CSSM

   a. Synchronize the product instance with SSM On-Prem.

      On the product instance, enter the **license smart sync** {**all** | **local**} command, in privileged EXEC mode. This synchronizes the product instance with SSM On-Prem, to send and receive any pending data. For example:

      ```
      Device# license smart sync local
      ```

      You can verify this in the SSM On-Prem UI. Log in and select the **Smart Licensing** workspace. Navigate to the **Inventory** > **SL Using Policy** tab. In the **Alerts** column of the corresponding product instance, the following message is displayed: Usage report from product instance.

Note If you have not performed Step 2 above (Addition and Validation of Product Instances), completing this sub-step will add the product instance to the SSM On-Prem database.

   b. Synchronize usage information with CSSM (*choose one*):

      - Option 1:

        SSM On-Prem is connected to CSSM: In the SSM On-Prem UI, Smart Licensing workspace, nagivate to **Reports** > **Usage Schedules** > **Synchronize now with Cisco**.

      - Option 2:

        SSM On-Prem is not connected to CSSM: See Exporting and Importing Usage Data (SSM On-Prem UI), on page 75.

Result:

You have completed initial usage synchronization. Product instance and license usage information is now displayed in SSM On-Prem.

For subsequent reporting, you have the following options:

- To synchronize data between the product instance and SSM On-Prem:

Schedule periodic synchronization between the product instance and the SSM On-Prem, by configuring the reporting interval. Enter the **license smart usage interval** *interval_in_days* command in global configuration mode.

In the Cisco IOS XE Amsterdam 17.3.6 and later releases of the 17.3.x train, Cisco IOS XE Bengaluru 17.6.4 and later releases of the 17.6.x train, and all subsequent releases from Cisco IOS XE Cupertino 17.9.1 onwards: The product instance does not send more than one RUM report a day. You can override this for an on-demand synchronization between the product instance and CSSM, by entering the **license smart sync** command in privileged EXEC mode.

To know when the product instance will be sending the next RUM report, enter the **show license all** command in privileged EXEC mode and in the output, check the `Next report push:` field.

- To synchronize usage information with CSSM schedule periodic synchronization, or , upload and download the required files:
  - Schedule periodic synchronization with CSSM. In the SSM On-Prem UI, navigate to **Reports** > **Usage Schedules** > **Synchronization schedule with Cisco**. Enter the following frequency information and save:
    - **Days**: Refers to how *often* synchronization occurs. For example, if you enter 2, synchronization occurs once every two days.
    - **Time of Day:**: Refers to the time at which synchronization occurs, in the 24-hour notation system. For example, if you enter 14 hours and 0 minutes, synchronization occurs at 2 p.m. (1400) in your local time zone.
  - Upload and download the required files for reporting: Exporting and Importing Usage Data (SSM On-Prem UI), on page 75).

Tasks for SSM On-Prem Instance-Initiated Communication

SSM On-Prem Installation → Product Instance Addition → Product Instance Configuration→ Initial Usage Synchronization

1. ***SSM On-Prem Installation***

   Where task is performed: A physical server such as a Cisco UCS C220 M3 Rack Server, or a hardware-based server that meets the necessary requirements.

   Download the file from Smart Software Manager > **Smart Software Manager On-Prem**.

   Refer to the *Cisco Smart Software On-Prem Installation Guide* and the *Cisco Smart Software On-Prem User Guide* for help with installation.

   Installation is complete when you have deployed SSM On-Prem, configured a common name on SSM On-Prem (**Security Widget** > **Certificates**), synchronized the NTP server (**Settings** widget > **Time Settings**), and created, registered, and synchronized (**Synchronization** widget) the SSM On-Prem local account with your Smart Account and Virtual Account in CSSM.

Note Licensing functions in the **On-Prem Licensing Workspace** are greyed-out until you complete the creation, registration, and synchronization of the local account with your Smart Account in CSSM. The *local account* synchronization with CSSM is for the SSM On-Prem instance to be known to CSSM, and is different from usage synchronization which is performed in **4. Initial Usage Synchronization** below.

2. ***Product Instance Addition***

   Where task is performed: SSM On-Prem UI

   Depending on whether you want to add a single product instance or multiple product instances, follow the corresponding sub-steps: Adding One or More Product Instances (SSM On-Prem UI), on page 76.

3. ***Product Instance Configuration***

   Where tasks are performed: Product Instance and the SSM On-Prem UI

   Remember to save any configuration changes on the product instance, by entering the **copy running-config startup-config** command in privileged EXEC mode: Ensuring Network Reachability for SSM On-Prem-Initiated Communication, on page 77.

4. ***Initial Usage Synchronization***

   Where tasks are performed: SSM On-Prem UI, and CSSM

   a. Retrieve usage information from the product instance.

      In the SSM On-Prem UI, navigate to **Reports** > **Synchronisation pull schedule with the devices** > **Synchronise now with the device**.

      In the **Alerts** column, the following message is displayed: Usage report from product instance.

Tip It takes 60 seconds before synchronization is triggered. To view progress, navigate to the **On-Prem Admin Workspace**, and click the **Support Centre** widget. The system logs here display progress.

   b. Synchronize usage information with CSSM (*choose one*)

      - Option 1:

        SSM On-Prem is connected to CSSM: In the SSM On-Prem UI, Smart Licensing workspace, nagivate to **Reports** > **Usage Schedules** > **Synchronize now with Cisco**.

      - Option 2:

        SSM On-Prem is not connected to CSSM. See: Exporting and Importing Usage Data (SSM On-Prem UI), on page 75.

Result:

You have completed initial usage synchronization. Product instance and license usage information is now displayed in SSM On-Prem. SSM On-Prem automatically sends the ACK back to the product instance. To verify that the product instance has received the ACK, enter the **show license status** command in privileged EXEC mode, and in the output, check the date for the `Last ACK received` field.

For subsequent reporting, you have the following options:

- To retrieve usage information from the product instance, you can:
  - In the SSM On-Prem UI, Smart Licensing workspace, nagivate to **Reports** > **Usage Schedules** > **Synchronize now with Cisco**.
  - Schedule periodic retrieval of information from the product instance by configuring a frequency. In the SSM On-Prem UI, Smart Licensing workspace, nagivate to **Reports** > **Usage Schedules** > **Synchronisation pull schedule with the devices**. Enter values in the following fields:

- **Days**: Refers to how *often* synchronization occurs. For example, if you enter 2, synchronization occurs once every two days.
- **Time of Day:**: Refers to the time at which synchronization occurs, in the 24-hour notation system. For example, if you enter 14 hours and 0 minutes, synchronization occurs at 2 p.m. (1400).

- Collect usage data from the product instance without being connected to CSSM. In the SSM On-Prem UI, Smart Licensing workspace, nagivate to **Inventory** > **SL Using Policy** tab. Select one or more product instances by enabling the coresponding check box. Click **Actions for Selected...** > **Collect Usage**. On-Prem connects to the selected Product Instance(s) and collects the usage reports. These usage reports are then stored in On-Prem's local library. These reports can then be transferred to Cisco if On-Prem is connected to Cisco, or (if you are not connected to Cisco) you can manually trigger usage collection by selecting **Export/Import All..** > **Export Usage to Cisco**.

- To synchronize usage information with CSSM, you can:
  - Schedule periodic synchronization with CSSM. In the SSM On-Prem UI, navigate to **Reports** > **Usage Schedules** > **Synchronization schedule with Cisco**. Enter the following frequency information and save:
    - **Days**: Refers to how *often* synchronization occurs. For example, if you enter 2, synchronization occurs once every two days.
    - **Time of Day:**: Refers to the time at which synchronization occurs, in the 24-hour notation system. For example, if you enter 14 hours and 0 minutes, synchronization occurs at 2 p.m. (1400).
  - Upload and download the required files for reporting: Exporting and Importing Usage Data (SSM On-Prem UI), on page 75).

Migrating to Smart Licensing Using Policy

To upgrade to Smart Licensing Using Policy, you must upgrade the software version (image) on the product instance to a supported version.

Before you Begin

Ensure that you have read the Upgrades, on page 23 section, to understand how Smart Licensing Using Policy handles all earlier licensing models.

Smart Licensing Using Policy is introduced in Cisco IOS XE Amsterdam 17.3.2a. This is therefore the minimum required version for Smart Licensing Using Policy.

Note that all the licenses that you are using prior to migration will be available after upgrade. This means that not only registered and authorized licenses (including reserved licenses), but also evaluation licenses will be migrated. The advantage with migrating registered and authorized licenses is that you will have fewer configuration steps to complete after migration, because your configuration is retained after upgrade (transport type configuration and configuration for connection to CSSM, all authorization codes). This ensures a smoother transition to the Smart Licensing Using Policy environment.

Device-led conversion is not supported for migration to Smart Licensing Using Policy.

Upgrading the Wireless Controller Software

For information about the upgrade procedure:

- For Cisco Embedded Wireless Controller on Cisco Catalyst 9100 Access Points, see the *Software Upgrade* section in the Cisco Embedded Wireless Controller on Catalyst Access Points Online Help
- For all other supported wireless controllers, see the *System Upgrade > Upgrading the Cisco Catalyst 9800 Wireless Controller Software* section of the Cisco Catalyst 9800 Series Wireless Controller Software Configuration Guide for the required release.

You can use the procedure to upgrade in install mode or ISSU (ISSU only on supported platforms and supported releases)

After Upgrading the Software Version

- Complete topology implementation.

  If a transport mode is available in your pre-upgrade set-up, this is retained after you upgrade. Only in some cases, like with evaluation licenses or with licensing models where the notion of a transport type does not exist, the default (**cslu**) is applied - in these cases you may have a few more steps to complete before you are set to operate in the Smart Licensing Using Policy environment.

  No matter which licensing model you upgrade from, you can change the topology after upgrade.

- Synchronize license usage with CSSM

  No matter which licensing model you are upgrading from and no matter which topology you implement, synchronize your usage information with CSSM. For this you have to follow the reporting method that applies to the topology you implement. This initial synchronization ensures that up-to-date usage information is reflected in CSSM and a custom policy (if available), is applied. The policy that is applicable after this synchronization also indicates subsequent reporting requirements. These rules are also tabled here: How Upgrade Affects Reporting for Existing Licenses, on page 24

Note After initial usage synchronization is completed, reporting is required only if the policy, or, system messages indicate that it is.

Sample Migration Scenarios

Sample migration scenarios have been provided considering the various existing licensing models and licenses. All scenarios provide sample outputs before and after migration, any CSSM Web UI changes to look out for (as an indicator of a successful migration or further action), and how to identify and complete any necessary post-migration steps.

Note For SSM On-Prem, the sequence in which you perform the various upgrade-related activities is crucial. So only for this scenario, the migration sequence has been provided - and not an example.

Example: Smart Licensing to Smart Licensing Using Policy

The following is an example of a Cisco Catalyst 9800-CL Wireless Controller migrating from Smart Licensing to Smart Licensing Using Policy.

- Table 6: Smart Licensing to Smart Licensing Using Policy: show Commands, on page 43
- The CSSM Web UI After Migration, on page 46
- Reporting After Migration, on page 49

The **show** command outputs below call-out key fields to check, before and after migration.

Table 6: Smart Licensing to Smart Licensing Using Policy: show Commands

Before Upgrade (Smart Licensing)	After Upgrade (Smart Licensing Using Policy)

show license summary
The `Status` and `License Authorization` fields show that the license is `REGISTERED` and `AUTHORIZED`.
`Device# show license summary`
`Smart Licensing is ENABLED`
`Registration:`
`  Status: REGISTERED`
`  Smart Account: SA-Eg-Company-02`
`  Virtual Account: Dept-02`
`  Export-Controlled Functionality: ALLOWED`
`  Last Renewal Attempt: None`
`  Next Renewal Attempt: May 01 08:19:02 2021 IST`
`License Authorization:`
`  Status: AUTHORIZED`
`  Last Communication Attempt: SUCCEEDED`
`  Next Communication Attempt: Dec 02 08:19:09 2020 IST`
`License Usage:`
`  License  Entitlement tag  Count Status`
`  AP Perpetual Network... (DNA_NWSTACK_E)  1 AUTHORIZED`
`  Aironet DNA Essentia... (AIR-DNA-E)  1 AUTHORIZED`
	show license summary
	The `Status` field shows that the licenses are now `IN USE` instead of registered and authorized.
	`Device# show license summary`
	`License Usage:`
	`  License  Entitlement Tag  Count Status`
	`  air-network-essentials  (DNA_NWSTACK_E)  1 IN USE`
	`  air-dna-essentials  (AIR-DNA-E)  1 IN USE`

Before Upgrade (Smart Licensing)	After Upgrade (Smart Licensing Using Policy)
show license usage One perpetual and one subscription license are being used before upgrade.	**show license usage** All licenses are migrated and the `Enforcement Type` field displays NOT ENFORCED. There are no export-controlled or enforced licenses on Cisco Catalyst Wireless Controllers.

Before Upgrade (Smart Licensing)	After Upgrade (Smart Licensing Using Policy)

Device# **show license usage**
 	
License Authorization:
  Status: AUTHORIZED on Nov 02 08:21:29 2020 IST
 	
AP Perpetual Networkstack Essentials (DNA_NWSTACK_E):
  Description: AP Perpetual Network Stack entitled with DNA-E
  Count: 1
  Version: 1.0
  Status: AUTHORIZED
  Export status: NOT RESTRICTED
 	
Aironet DNA Essentials Term Licenses (AIR-DNA-E):
  Description: DNA Essentials for Wireless
  Count: 1
  Version: 1.0
  Status: AUTHORIZED
  Export status: NOT RESTRICTED
	Device# **show license usage**
	
	License Authorization:
	  Status: Not Applicable
	
	air-network-essentials (DNA_NWSTACK_E):
	  Description: air-network-essentials
	  Count: 1
	  Version: 1.0
	  Status: IN USE
	  Export status: NOT RESTRICTED
	  Feature Name: air-network-essentials
	  Feature Description: air-network-essentials
	  Enforcement type: NOT ENFORCED
	  License type: Perpetual
	
	air-dna-essentials (AIR-DNA-E):
	  Description: air-dna-essentials
	  Count: 1
	  Version: 1.0
	  Status: IN USE
	  Export status: NOT RESTRICTED
	  Feature Name: air-dna-essentials
	  Feature Description: air-dna-essentials
	  Enforcement type: NOT ENFORCED
	  License type: Perpetual

Before Upgrade (Smart Licensing)	After Upgrade (Smart Licensing Using Policy)
show license status	**show license status** The `Transport:` field shows that the transport type, which was configured before update, is retained after upgrade. The `Policy:` header and details show that a custom policy was available in the Smart Account or Virtual Account – this has also been automatically installed on the product instance. (After establishing trust, CSSM returns a policy. The policy is then automatically installed.) The `Usage Reporting:` header: The `Next report push:` field provides information about when the product instance will send the next RUM report to CSSM. The `Trust Code Installed:` field shows that the ID token is successfully converted and a trusted connected has been established with CSSM.

Before Upgrade (Smart Licensing)	After Upgrade (Smart Licensing Using Policy)

Device# **show license status**
 	
Smart Licensing is ENABLED
 	
Utility:
  Status: DISABLED
 	
Data Privacy:
  Sending Hostname: yes
  Callhome hostname privacy: DISABLED
  Smart Licensing hostname privacy: DISABLED
  Version privacy: DISABLED
 	
Transport:
  Type: Callhome
 	
Registration:
  Status: REGISTERED
  Smart Account: SA-Eg-Company-02
  Virtual Account: Dept-02
  Export-Controlled Functionality: ALLOWED
  Initial Registration: SUCCEEDED on Nov 02 08:19:02 2020 IST
  Last Renewal Attempt: None
  Next Renewal Attempt: May 01 08:19:01 2021 IST
  Registration Expires: Nov 02 08:14:06 2021 IST
 	
License Authorization:
  Status: AUTHORIZED on Nov 02 08:21:29 2020 IST
  Last Communication Attempt: SUCCEEDED on Nov 02 08:21:29 2020 IST
  Next Communication Attempt: Dec 02 08:19:09 2020 IST
  Communication Deadline: Jan 31 08:14:15 2021 IST
 	
Export Authorization Key:
  Features Authorized:
  <none>
	Device# **show license status**
	Utility:
	  Status: DISABLED
	
	Smart Licensing Using Policy:
	  Status: ENABLED
	
	Data Privacy:
	  Sending Hostname: yes
	  Callhome hostname privacy: DISABLED
	  Smart Licensing hostname privacy: DISABLED
	  Version privacy: DISABLED
	
	Transport:
	  Type: Callhome
	
	Policy:
	  Policy in use: Installed On Nov 02 09:09:47 2020 IST
	  Policy name: **SLE Policy**
	  Reporting ACK required: yes (Customer Policy)
	  Unenforced/Non-Export Perpetual Attributes:
	  First report requirement (days): 60 (Customer Policy)
	  Reporting frequency (days): 60 (Customer Policy)
	  Report on change (days): 60 (Customer Policy)
	  Unenforced/Non-Export Subscription Attributes:
	  First report requirement (days): 30 (Customer Policy)
	  Reporting frequency (days): 30 (Customer Policy)
	  Report on change (days): 30 (Customer Policy)
	  Enforced (Perpetual/Subscription) License Attributes:
	  First report requirement (days): 0 (CISCO default)
	  Reporting frequency (days): 90 (Customer Policy)
	  Report on change (days): 90 (Customer Policy)
	  Export (Perpetual/Subscription) License Attributes:
	  First report requirement (days): 0 (CISCO default)
	  Reporting frequency (days): 90 (Customer Policy)
	  Report on change (days): 90 (Customer Policy)
	
	Miscellaneous:
	  Custom Id: <empty>
	
	Usage Reporting:
	  Last ACK received: Nov 02 09:09:47 2020 IST
	  Next ACK deadline: Jan 01 09:09:47 2021 IST
	  Reporting push interval: 30 days
	  Next ACK push check: Nov 02 09:13:54 2020 IST
	  Next report push: Dec 02 09:05:45 2020 IST
	  Last report push: Nov 02 09:05:45 2020 IST
	  Last report file write: <none>
	
	Trust Code Installed:
	  Active: PID:C9800-CL-K9,SN:93BBAH93MGS
	  INSTALLED on Nov 02 08:59:26 2020 IST
	  Standby: PID:C9800-CL-K9,SN:9XECPSUU4XN
	  INSTALLED on Nov 02 09:00:45 2020 IST

Before Upgrade (Smart Licensing)	After Upgrade (Smart Licensing Using Policy)
show license udi	**show license udi** This is a High Availability set-up and the command displays all UDIs in the set-up. There is no change in the sample output before and after migration.

`Device# show license udi`
`UDI: PID:C9800-CL-K9,SN:93BBAH93MGS`
 	
`HA UDI List:`
`Active:PID:C9800-CL-K9,SN:93BBAH93MGS`
`Standby:PID:C9800-CL-K9,SN:9XECPSUU4XN`
	`Device# show license udi`
	`UDI: PID:C9800-CL-K9,SN:93BBAH93MGS`
	
	`HA UDI List:`
	`Active:PID:C9800-CL-K9,SN:93BBAH93MGS`
	`Standby:PID:C9800-CL-K9,SN:9XECPSUU4XN`

The CSSM Web UI After Migration

Log in to the CSSM Web UI at https://software.cisco.com and click **Smart Software Licensing**. Under **Inventory** > **Product Instances**.

The product instance previously displayed with the host name (Catalyst 9800CL Cloud Wireless Controller in this example) is now displayed with the UDI instead. All migrated UDIs are displayed, that is, PID:C9800-CL-K9,SN:93BBAH93MGS, and PID:C9800-CL-K9,SN:9XECPSUU4XN.

Only the active product instance reports usage, therefore, PID:C9800-CL-K9,SN:93BBAH93MGS displays license consumption information under **License Usage**. The standby does not report usage and the **License Usage** for the standby displays No Records Found.

Figure 7: Smart Licensing to Smart Licensing Using Policy: Hostname of Product Instance on the CSSM Web UI Before Migration

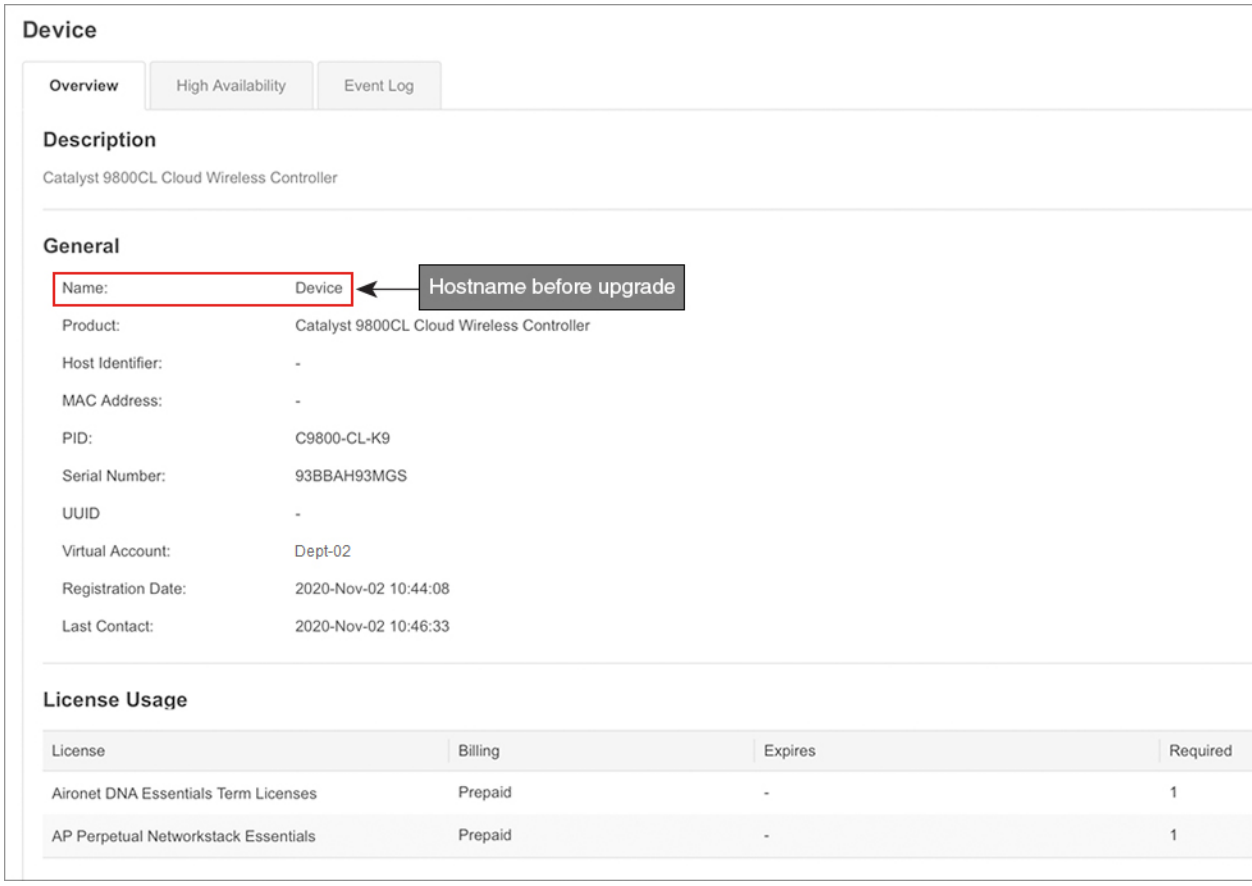


Figure 8: Smart Licensing to Smart Licensing Using Policy: UDI and License Usage Under Active Product Instance After Migration

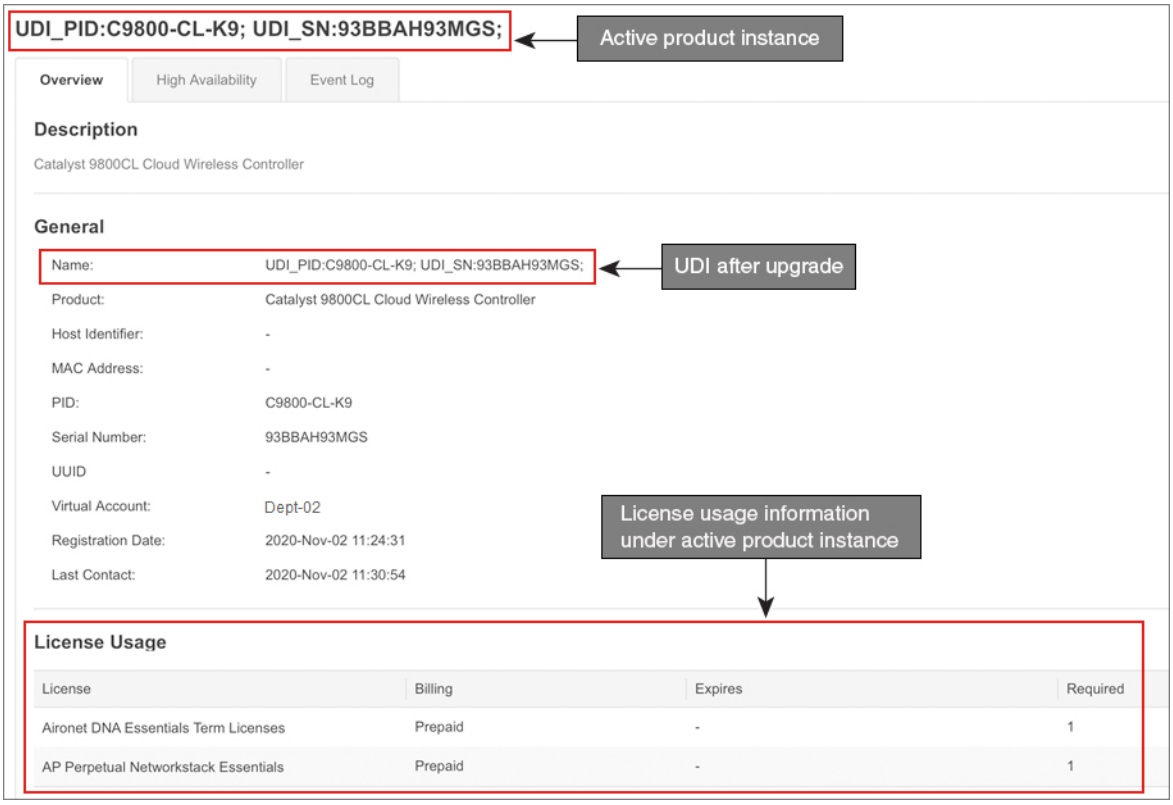
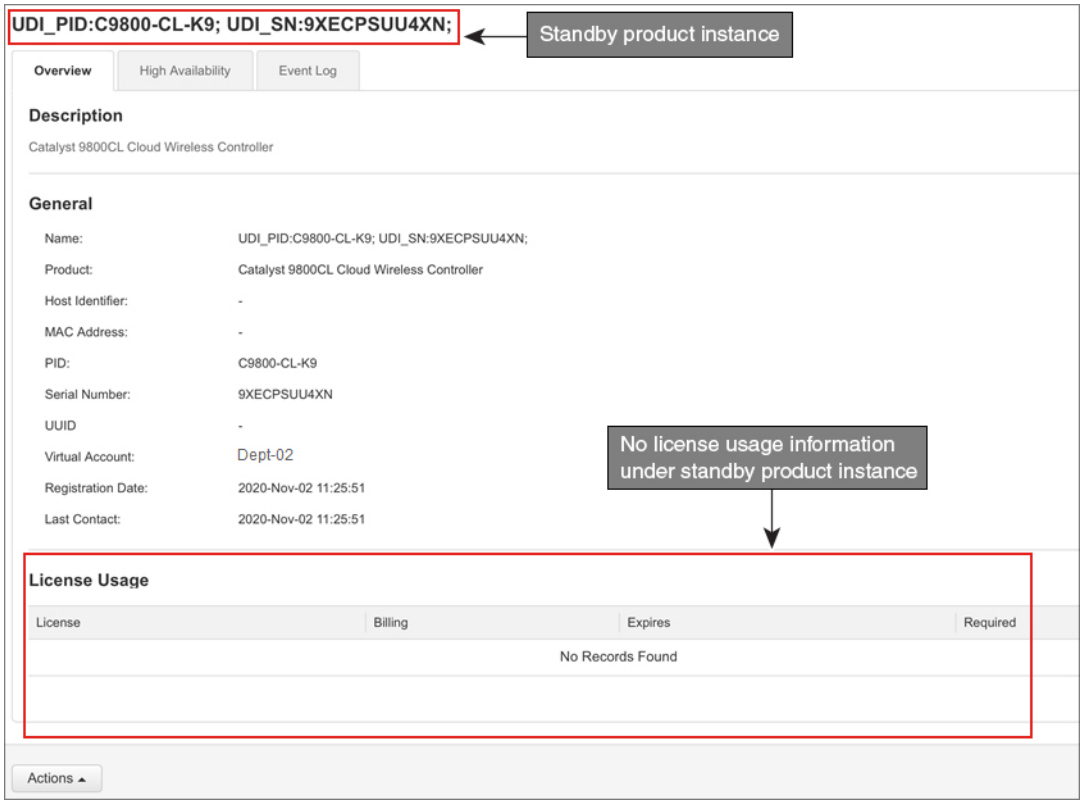


Figure 9: Smart Licensing to Smart Licensing Using Policy: Standby Product Instance After Migration



It is always the active that reports usage, so if the active in this High Availabilty set-up changes, the new active product instance will display license consumption information and report usage.

Reporting After Migration

The product instance sends the next RUM report to CSSM, based on the policy.

If you want to change your reporting interval to report more frequently: on the product instance, configure the **license smart usage interval** command in global configuration mode. For syntax details see the *license smart (global config)* command in the Command Reference for the corresponding release.

Example: SLR to Smart Licensing Using Policy

The following is an example of a Cisco Catalyst 9800-CL Wireless Controller migrating from Specific License Reservation (SLR) to Smart Licensing Using Policy. This is a High Availability set-up with an active and standby.

License conversion is automatic and authorization codes are migrated. No further action is required to complete migration. After migration the No Connectivity to CSSM and No CSLU, on page 17 topology is effective. For information about the SLR authorization code in the Smart Licensing Using Policy environment, see Authorization Code, on page 7.

- Table 7: SLR to Smart Licensing Using Policy: show Commands, on page 50
- The CSSM Web UI After Migration, on page 54

- Reporting After Migration, on page 56

The **show** command outputs below call-out key fields to check, before and after migration.

Table 7: SLR to Smart Licensing Using Policy: show Commands

Before Upgrade (SLR)	After Upgrade (Smart Licensing Using Policy)

show license summary
 	
The `Registration` and `License Authorization` status fields show that the license was `REGISTERED - SPECIFIC LICENSE RESERVATION` and `AUTHORIZED - RESERVED`.
 	
`Device# show license summary`
 	
`Smart Licensing is ENABLED`
`License Reservation is ENABLED`
 	
`Registration:`
 	
`  Status: REGISTERED - SPECIFIC LICENSE RESERVATION`
`  Export-Controlled Functionality: ALLOWED`
 	
`License Authorization:`
`  Status: AUTHORIZED - RESERVED`
 	
`License Usage:`
`  License  Entitlement tag  Count Status`
 	
`---`
 	
`  AP Perpetual Network... (DNA_NWStack)`
`1 AUTHORIZED`
`  Aironet DNA Advantag... (AIR-DNA-A)`
`1 AUTHORIZED`
	show license summary
	
	Licenses are migrated , but none of the APs have joined the controller, current consumption (Count) is therefore zero, and the `Status` field shows that the licenses are `NOT IN USE`.
	
	`Device# show license summary`
	`License Reservation is ENABLED`
	
	`License Usage:`
	`  License  Entitlement Tag  Count Status`
	
	`---`
	
	`  Aironet DNA Advantag... (AIR-DNA-A)  0 NOT IN USE`
	`  AP Perpetual Network... (DNA_NWStack)  0 NOT IN USE`

Before Upgrade (SLR)	After Upgrade (Smart Licensing Using Policy)
show license reservation	**show license authorization** The `Last Confirmation code:` field shows that the SLR authorization code is successfully migrated for the active and standby product instances in the High Availability set-up. The `Specified license reservations:` header shows that a perpetual license (AP Perpetual Networkstack Advantage) and a subscription license (Aironet DNA Advantage Term Licenses) are the migrated SLR licenses.

Before Upgrade (SLR)	After Upgrade (Smart Licensing Using Policy)

```
Device# show license reservation
License reservation: ENABLED

Overall status:
  Active: PID:C9800-CL-K9,SN:93BBAH93MGS
      Reservation status: SPECIFIC INSTALLED on Nov 02
 03:16:01 2020 IST
      Export-Controlled Functionality: ALLOWED
      Last Confirmation code: 102fc949
  Standby: PID:C9800-CL-K9,SN:9XECPSUU4XN
      Reservation status: SPECIFIC INSTALLED on Nov 02
 03:15:45 2020 IST
      Export-Controlled Functionality: ALLOWED
      Last Confirmation code: ad4382fe

Specified license reservations:
  Aironet DNA Advantage Term Licenses (AIR-DNA-A):
    Description: DNA Advantage for Wireless
    Total reserved count: 20
    Term information:
      Active: PID:C9800-CL-K9,SN:93BBAH93MGS
        License type: TERM
          Start Date: 2020-OCT-14 UTC
          End Date: 2021-APR-12 UTC
          Term Count: 5
        License type: TERM
          Start Date: 2020-JUN-18 UTC
          End Date: 2020-DEC-15 UTC
          Term Count: 5
      Standby: PID:C9800-CL-K9,SN:9XECPSUU4XN
        License type: TERM
          Start Date: 2020-OCT-14 UTC
          End Date: 2021-APR-12 UTC
          Term Count: 10
  AP Perpetual Networkstack Advantage (DNA_NWStack):
    Description: AP Perpetual Network Stack entitled
with DNA-A
    Total reserved count: 20
    Term information:
      Active: PID:C9800-CL-K9,SN:93BBAH93MGS
        License type: TERM
          Start Date: 2020-OCT-14 UTC
          End Date: 2021-APR-12 UTC
          Term Count: 5
        License type: TERM
          Start Date: 2020-JUN-18 UTC
          End Date: 2020-DEC-15 UTC
          Term Count: 5
      Standby: PID:C9800-CL-K9,SN:9XECPSUU4XN
        License type: TERM
          Start Date: 2020-OCT-14 UTC
          End Date: 2021-APR-12 UTC
          Term Count: 10
```

Before Upgrade (SLR)	After Upgrade (Smart Licensing Using Policy)

	Device# **show license authorization**
	Overall status:
	  Active: PID:C9800-CL-K9,SN:93BBAH93MGS
	  Status: SPECIFIC INSTALLED on Nov 02 03:16:01 2020 IST
	  Last Confirmation code: 102fc949
	  Standby: PID:C9800-CL-K9,SN:9XECPSUU4XN
	  Status: SPECIFIC INSTALLED on Nov 02 03:15:45 2020 IST
	  Last Confirmation code: ad4382fe
	
	Specified license reservations:
	  Aironet DNA Advantage Term Licenses (AIR-DNA-A):
	  Description: DNA Advantage for Wireless
	  Total reserved count: 20
	  Enforcement type: NOT ENFORCED
	  Term information:
	  Active: PID:C9800-CL-K9,SN:93BBAH93MGS
	  Authorization type: SPECIFIC INSTALLED on Nov 02 03:15:45 2020 IST
	  License type: TERM
	  Start Date: 2020-OCT-14 UTC
	  End Date: 2021-APR-12 UTC
	  Term Count: 5
	  Authorization type: SPECIFIC INSTALLED on Nov 02 03:15:45 2020 IST
	  License type: TERM
	  Start Date: 2020-JUN-18 UTC
	  End Date: 2020-DEC-15 UTC
	  Term Count: 5
	  Standby: PID:C9800-CL-K9,SN:9XECPSUU4XN
	  Authorization type: SPECIFIC INSTALLED on Nov 02 03:15:45 2020 IST
	  License type: TERM
	  Start Date: 2020-OCT-14 UTC
	  End Date: 2021-APR-12 UTC
	  Term Count: 10
	  AP Perpetual Networkstack Advantage (DNA_NWStack):
	  Description: AP Perpetual Network Stack entitled with DNA-A
	  Total reserved count: 20
	  Enforcement type: NOT ENFORCED
	  Term information:
	  Active: PID:C9800-CL-K9,SN:93BBAH93MGS
	  Authorization type: SPECIFIC INSTALLED on Nov 02 03:15:45 2020 IST
	  License type: TERM
	  Start Date: 2020-OCT-14 UTC
	  End Date: 2021-APR-12 UTC
	  Term Count: 5
	  Authorization type: SPECIFIC INSTALLED on Nov 02 03:15:45 2020 IST
	  License type: TERM
	  Start Date: 2020-JUN-18 UTC
	  End Date: 2020-DEC-15 UTC
	  Term Count: 5
	  Standby: PID:C9800-CL-K9,SN:9XECPSUU4XN
	  Authorization type: SPECIFIC INSTALLED on Nov 02 03:15:45 2020 IST
	  License type: TERM
	  Start Date: 2020-OCT-14 UTC
	  End Date: 2021-APR-12 UTC

Before Upgrade (SLR)	After Upgrade (Smart Licensing Using Policy)

	`Term Count: 10`
	
	`Purchased Licenses:`
	`No Purchase Information Available`

Before Upgrade (SLR)	After Upgrade (Smart Licensing Using Policy)
show license status	**show license status** Under the `Transport:` header, the `Type:` field displays that the transport type is set to off. Under the `Usage Reporting:` header, the `Next report push:` field displays if and when the next RUM report must be uploaded to CSSM.

Before Upgrade (SLR)	After Upgrade (Smart Licensing Using Policy)

-	Device# **show license status**
	
	Utility:
	  Status: DISABLED
	
	Smart Licensing Using Policy:
	  Status: ENABLED
	
	Data Privacy:
	  Sending Hostname: yes
	  Callhome hostname privacy: DISABLED
	  Smart Licensing hostname privacy: DISABLED
	  Version privacy: DISABLED
	
	Transport:
	  Type: Transport Off
	
	Policy:
	  Policy in use: Merged from multiple sources.
	  Reporting ACK required: yes (CISCO default)
	  Unenforced/Non-Export Perpetual Attributes:
	  First report requirement (days): 365 (CISCO default)
	
	  Reporting frequency (days): 0 (CISCO default)
	  Report on change (days): 90 (CISCO default)
	  Unenforced/Non-Export Subscription Attributes:
	  First report requirement (days): 90 (CISCO default)
	
	  Reporting frequency (days): 90 (CISCO default)
	  Report on change (days): 90 (CISCO default)
	  Enforced (Perpetual/Subscription) License Attributes:
	
	  First report requirement (days): 0 (CISCO default)
	  Reporting frequency (days): 0 (CISCO default)
	  Report on change (days): 0 (CISCO default)
	  Export (Perpetual/Subscription) License Attributes:
	  First report requirement (days): 0 (CISCO default)
	  Reporting frequency (days): 0 (CISCO default)
	  Report on change (days): 0 (CISCO default)
	
	Miscellaneous:
	  Custom Id: <empty>
	
	Usage Reporting:
	  Last ACK received: <none>
	  Next ACK deadline: <none>
	  Reporting push interval: 0 (no reporting)
	  Next ACK push check: Nov 01 20:31:46 2020 IST
	  Next report push: <none>
	  Last report push: <none>
	  Last report file write: <none>
	
	Trust Code Installed: <none>

The CSSM Web UI After Migration

Log in to the CSSM Web UI at https://software.cisco.com and click **Smart Software Licensing**. Under **Inventory** > **Product Instances**.

There are no changes in the **Product Instances** tab. The Last Contact column displays "Reserved Licenses" since there has been no usage reporting yet. After the requisite RUM report is uploaded and acknowledged "Reserved Licenses" is no longer displayed and license usage is displayed only in the active product instance.

Figure 10: SLR to Smart Licensing Using Policy: Active Product Instance Before Upgrade

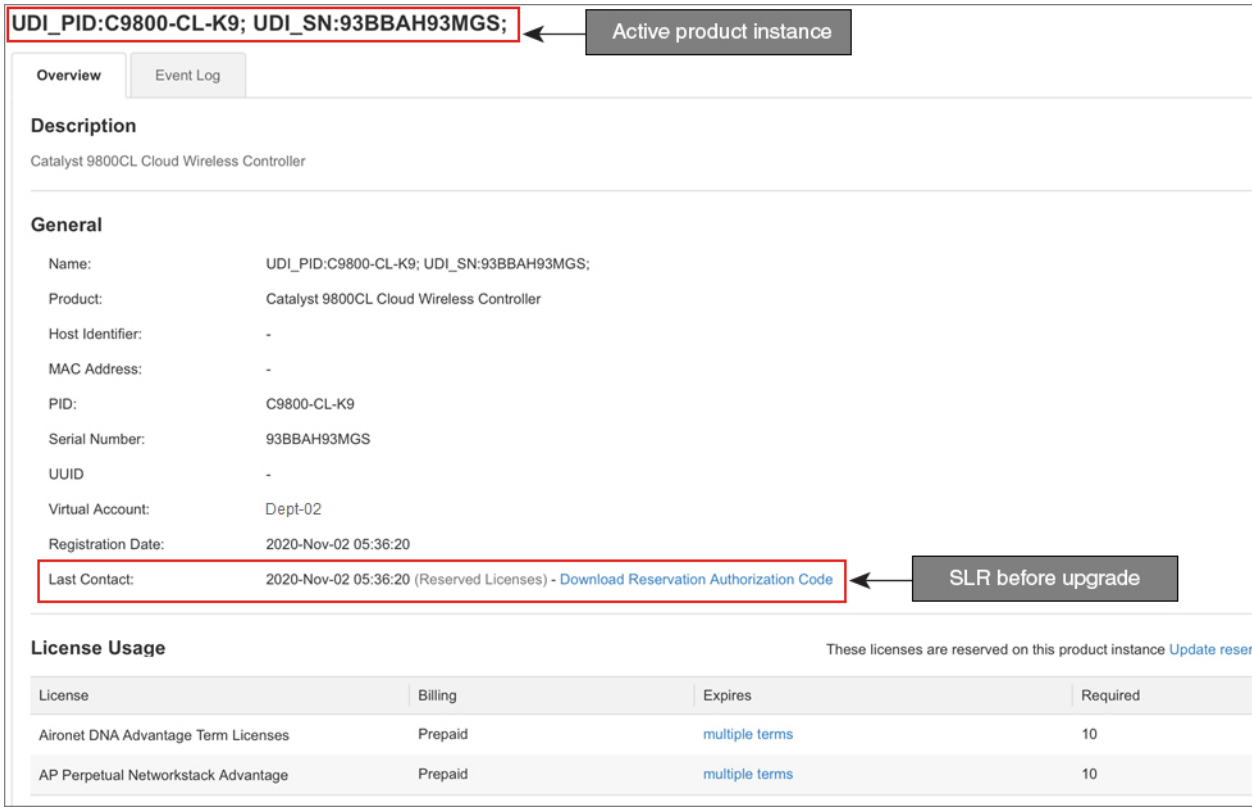
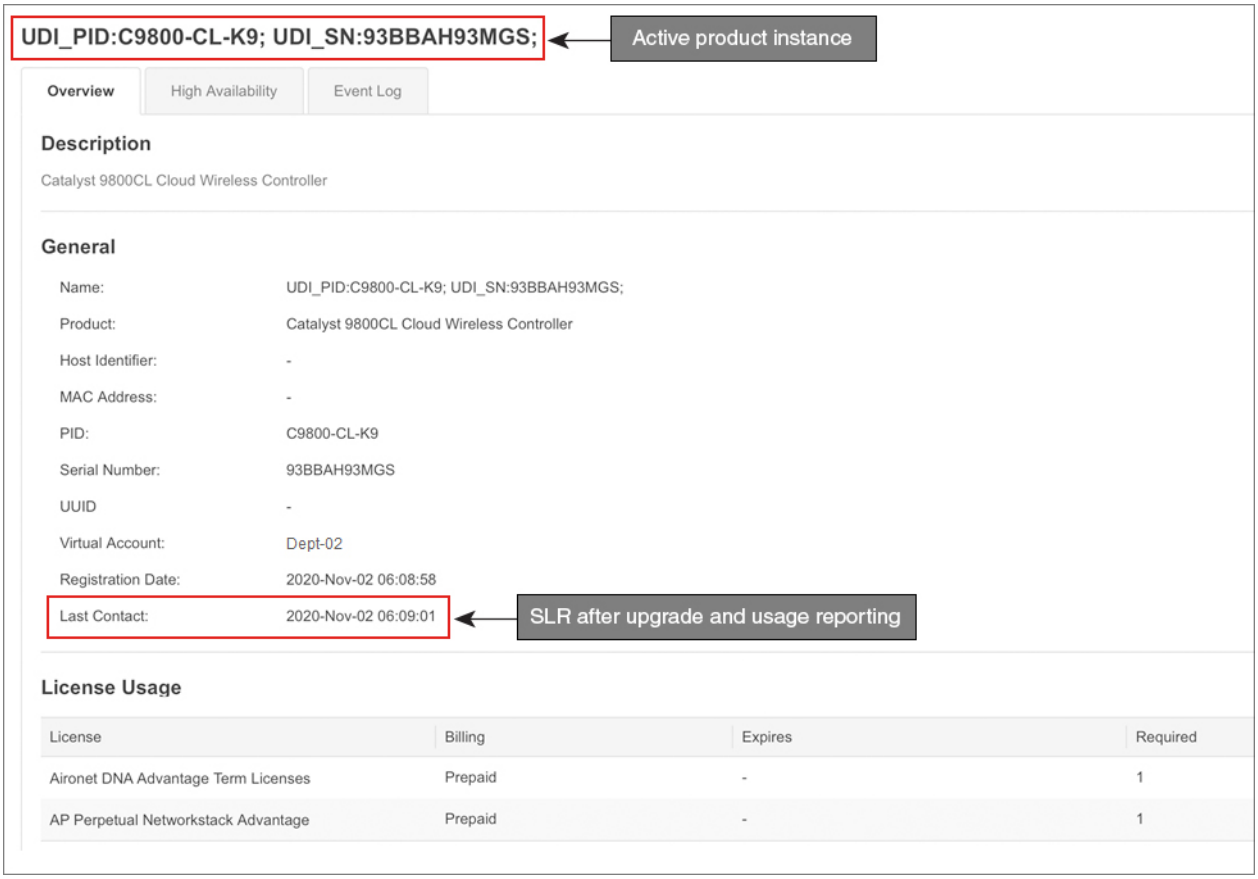


Figure 11: SLR to Smart Licensing Using Policy: Active Product Instance After Upgrade



Reporting After Migration

SLR licenses require reporting only when there is a change in license consumption (For example, when using a subscription license which is for specified term).

In an air-gapped network, use the `Next report push:` date in the **show license status** output to know when the next usage report must be sent. This ensures that the product instance and CSSM are synchronized.

Since all communication to and from the product instance is disabled, to report license usage you must save RUM reports to a file and upload it to CSSM (from a workstation that has connectivity to the internet, and Cisco):

1. Generate and save RUM reports

   Enter the **license smart save usage** command in provileged EXEC mode. In the example below, all RUM reports are saved to the flash memory of the product instance, in file `all_rum.txt`. For syntax details see the *license smart (privileged EXEC)* command in the Command Reference. In the example, the file is first saved to bootflash and then copied to a TFTP location:

   ```
   Device# license smart save usage all bootflash:all_rum.txt
   Device# copy bootflash:all_rum.txt tftp://10.8.0.6/all_rum.txt
   ```

2. Upload usage data to CSSM: Uploading Data or Requests to CSSM and Downloading a File, on page 95

3. Install the ACK on the product instance: Installing a File on the Product Instance, on page 96

Example: Evaluation or Expired to Smart Licensing Using Policy

The following is an example of a Cisco Catalyst 9800-CL Wireless Controller with evaluation expired licenses (Smart Licensing) that are migrated to Smart Licensing Using Policy.

The notion of evaluation licenses does not apply to Smart Licensing Using Policy. When the software version is upgraded to one that supports Smart Licensing Using Policy, all licenses are displayed as IN USE and the Cisco default policy is applied to the product instance. Since all licenses on Cisco Catalyst Wireless Controllers are unenforced (enforcement type), no functionality is lost.

- Table 8: Evaluation or Expired to Smart Licensing Using Policy: show Commands, on page 57
- The CSSM Web UI After Migration, on page 60
- Reporting After Migration, on page 60

The table below calls out key changes or new fields to check for in the **show** command outputs, after upgrade to Smart Licensing Using Policy

Table 8: Evaluation or Expired to Smart Licensing Using Policy: show Commands

Before Upgrade (Smart Licensing, Evaluation Mode)	After Upgrade (Smart Licensing Using Policy)

show license summary
Licenses are UNREGISTERED and in `EVAL MODE`.
 	
`Device# show license summary`
`Smart Licensing is ENABLED`
 	
`Registration:`
`  Status: UNREGISTERED`
`  Export-Controlled Functionality: NOT ALLOWED`
 	
`License Authorization:`
`  Status: EVAL EXPIRED`
 	
`License Usage:`
`  License  Entitlement tag  Count Status`
 	
`----------`
 	
`  (DNA_NWStack)  1 EVAL EXPIRED`
`  (AIR-DNA-A)  1 EVAL EXPIRED`
	show license summary
	All licenses are migrated and `IN USE`. There are no EVAL MODE licenses.
	
	`Device# show license summary`
	`License Usage:`
	`  License  Entitlement Tag  Count Status`
	
	`----------`
	
	`  air-network-advantage  (DNA_NWStack)  1 IN USE`
	`  air-dna-advantage  (AIR-DNA-A)  1 IN USE`

Before Upgrade (Smart Licensing, Evaluation Mode)	After Upgrade (Smart Licensing Using Policy)
show license usage	**show license usage** The `Enforcement Type` field displays NOT ENFORCED. (There are no export-controlled or enforced licenses on Cisco Catalyst Wireless Controllers).

Before Upgrade (Smart Licensing, Evaluation Mode)	After Upgrade (Smart Licensing Using Policy)

`Device# show license usage`
`License Authorization:`
`  Status: EVAL EXPIRED on Apr 14 18:20:46 2020 UTC`
 	
`(DNA_NWStack):`
`  Description:`
`  Count: 1`
`  Version: 1.0`
`  Status: EVAL EXPIRED`
`  Export status: NOT RESTRICTED`
 	
`(AIR-DNA-A):`
`  Description:`
`  Count: 1`
`  Version: 1.0`
`  Status: EVAL EXPIRED`
`  Export status: NOT RESTRICTED`
	`Device# show license usage`
	`License Authorization:`
	`  Status: Not Applicable`
	
	`air-network-advantage (DNA_NWStack):`
	`  Description: air-network-advantage`
	`  Count: 1`
	`  Version: 1.0`
	`  Status: IN USE`
	`  Export status: NOT RESTRICTED`
	`  Feature Name: air-network-advantage`
	`  Feature Description: air-network-advantage`
	`  Enforcement type: NOT ENFORCED`
	`  License type: Perpetual`
	
	`air-dna-advantage (AIR-DNA-A):`
	`  Description: air-dna-advantage`
	`  Count: 1`
	`  Version: 1.0`
	`  Status: IN USE`
	`  Export status: NOT RESTRICTED`
	`  Feature Name: air-dna-advantage`
	`  Feature Description: air-dna-advantage`
	`  Enforcement type: NOT ENFORCED`
	`  License type: Perpetual`

Before Upgrade (Smart Licensing, Evaluation Mode)	After Upgrade (Smart Licensing Using Policy)
show license status	**show license status** The `Transport:` field displays that the default type is set, but a URL or a method for the product instance to discover CSLU is not specified. The `Trust Code Installed:` field displays that a trust code is not installed. The `Policy:` header and details show that the `Cisco default` policy is applied. Under the `Usage Reporting:` header, the `Next report push:` field provides information about when the next RUM report must be sent to CSSM.

Before Upgrade (Smart Licensing, Evaluation Mode)	After Upgrade (Smart Licensing Using Policy)

`Device# show license status`
 	
`Smart Licensing is ENABLED`
 	
`Utility:`
`  Status: DISABLED`
 	
`Data Privacy:`
`  Sending Hostname: yes`
`    Callhome hostname privacy: DISABLED`
`    Smart Licensing hostname privacy: DISABLED`
`  Version privacy: DISABLED`
 	
`Transport:`
`  Type: Callhome`
 	
`Registration:`
`  Status: UNREGISTERED`
`  Export-Controlled Functionality: NOT ALLOWED`
 	
`License Authorization:`
`  Status: EVAL EXPIRED on Apr 14 18:20:46 2020 UTC`
 	
`Export Authorization Key:`
`  Features Authorized:`
`    <none>`
	`Device# show license status`
	`Utility:`
	`  Status: DISABLED`
	
	`Smart Licensing Using Policy:`
	`  Status: ENABLED`
	
	`Data Privacy:`
	`  Sending Hostname: yes`
	`    Callhome hostname privacy: DISABLED`
	`    Smart Licensing hostname privacy: DISABLED`
	`  Version privacy: DISABLED`
	
	`Transport:`
	`  Type: cslu`
	`  Cslu address: <empty>`
	`  Proxy:`
	`    Not Configured`
	
	`Policy:`
	`  Policy in use: Merged from multiple sources.`
	`  Reporting ACK required: yes (CISCO default)`
	`  Unenforced/Non-Export Perpetual Attributes:`
	`    First report requirement (days): 365 (CISCO default)`
	
	`    Reporting frequency (days): 0 (CISCO default)`
	`    Report on change (days): 90 (CISCO default)`
	`  Unenforced/Non-Export Subscription Attributes:`
	`    First report requirement (days): 90 (CISCO default)`
	
	`    Reporting frequency (days): 90 (CISCO default)`
	`    Report on change (days): 90 (CISCO default)`
	`  Enforced (Perpetual/Subscription) License Attributes:`
	
	`    First report requirement (days): 0 (CISCO default)`
	`    Reporting frequency (days): 0 (CISCO default)`
	`    Report on change (days): 0 (CISCO default)`
	`  Export (Perpetual/Subscription) License Attributes:`
	`    First report requirement (days): 0 (CISCO default)`
	`    Reporting frequency (days): 0 (CISCO default)`
	`    Report on change (days): 0 (CISCO default)`
	
	`Miscellaneous:`
	`  Custom Id: <empty>`
	
	`Usage Reporting:`
	`  Last ACK received: <none>`
	`  Next ACK deadline: <none>`
	`  Reporting push interval: 0 (no reporting)`
	`  Next ACK push check: <none>`
	`  Next report push: <none>`
	`  Last report push: <none>`
	`  Last report file write: <none>`
	
	`Trust Code Installed: <none>`

The CSSM Web UI After Migration

Log in to the CSSM Web UI at https://software.cisco.com and click **Smart Software Licensing**. Under **Inventory** > **Product Instances**, the Last Contact field for the migrated product instances display an updated timestamp after migration.

Reporting After Migration

Implement any one of the supported topologies, and fulfil reporting requirements. See Supported Topologies, on page 11 and How to Configure Smart Licensing Using Policy: Workflows by Topology , on page 28. The reporting method you can use depends on the topology you implement.

Migrating to a Version of SSM On-Prem That Supports Smart Licensing Using Policy

If you are using a version of SSM On-Prem that is earlier than the minimum required version (See SSM On-Prem, on page 5), you can use this section as an outline of the process and sequence you have to follow to migrate the SSM On-Prem version and the product instance.

1. Upgrade SSM On-Prem.

   Upgrade to the minimum required Version 8, Release 202102 or a later version.

   Refer to the Cisco Smart Software Manager On-Prem Migration Guide.

2. Upgrade the product instance.

   For information about the minimum required software version, see SSM On-Prem, on page 5.

   For information about the upgrade procedure, see Upgrading the Wireless Controller Software, on page 42.

3. Re-Register a local account with CSSM

   Online and Offline options are available. Refer to the Cisco Smart Software Manager On-Prem Migration Guide > *Re-Registering a local Account (Online Mode)* or *Manually Re-Registering a Local Account (Offline Mode)* .

   Once re-registration is complete, the following events occur automatically:

   - SSM On-Prem responds with new transport URL that points to the tenant in SSM On-Prem.
   - The transport type configuration on the product instance changes from from **call-home** or **smart**, to **cslu**. The transport URL is also updated automatically.

4. Save configuration changes on the product instance, by entering the **copy running-config startup-config** command in privileged EXEC mode.

5. Clear older On-Prem Smart Licensing certificates on the product instance and reload the product instance. Do not save configuration changes after this.

Note This step is required only if the software version running on the product instance is Cisco IOS XE Amsterdam 17.3.x or Cisco IOS XE Bengaluru 17.4.x.

Enter the **licence smart factory reset** and then the **reload** commands in privileged EXEC mode.

```
Device# licence smart factory reset
Device# reload
```

6. Perform usage synchronization

   a. On the product instance, enter the **license smart sync** {**all**|**local**} command, in privileged EXEC mode. This synchronizes the product instance with SSM On-Prem, to send and receive any pending data.

      ```
      Device(config)# license smart sync local
      ```

      You can verify this in the SSM On-Prem UI. Go to **Inventory** > **SL Using Policy**. In the **Alerts** column, the following message is displayed: Usage report from product instance.

   b. Synchronize usage information with CSSM (*choose one*)

      - Option 1:

        SSM On-Prem is connected to CSSM: In the SSM On-Prem UI, Smart Licensing workspace, nagivate to **Reports** > **Usage Schedules** > **Synchronize now with Cisco**.

      - Option 2:

        SSM On-Prem is not connected to CSSM. See Exporting and Importing Usage Data (SSM On-Prem UI), on page 75.

Result:

You have completed migration and initial usage synchronization. Product instance and license usage information is now displayed in SSM On-Prem.

For subsequent reporting, you have the following options:

- To synchronize data between the product instance and SSM On-Prem:
  - Schedule periodic synchronization between the product instance and SSM On-Prem, by configuring the reporting interval. Enter the **license smart usage interval** *interval_in_days* command in global configuration mode.

    To know when the product instance will be sending the next RUM report, enter the **show license all** command in privileged EXEC mode and in the output, check the `Next report push:` field.

  - Enter the **license smart sync** privileged EXEC command, for ad hoc or on-demand synchronization between the product instance and SSM On-Prem.

- To synchronize usage information with CSSM:
  - Schedule periodic synchronization with CSSM. In the SSM On-Prem UI, navigate to **Reports** > **Usage Schedules** > **Synchronization schedule with Cisco**. Enter the following frequency information and save:
    - **Days**: Refers to how *often* synchronization occurs. For example, if you enter 2, synchronization occurs once every two days.
    - **Time of Day:**: Refers to the time at which synchronization occurs, in the 24-hour notation system. For example, if you enter 14 hours and 0 minutes, synchronization occurs at 2 p.m. (1400) in your local time zone.

- Upload and download the required files for reporting. See Exporting and Importing Usage Data (SSM On-Prem UI), on page 75.

Task Library for Smart Licensing Using Policy

This section is a grouping of tasks that apply to Smart Licensing Using Policy. It includes tasks performed on a product instance, on the CSLU interface, and on the CSSM Web UI.

To implement a particular topology, refer to the corresponding workflow to know the sequential order of tasks that apply. See How to Configure Smart Licensing Using Policy: Workflows by Topology , on page 28.

To perform any additional configuration tasks, for instance, to configure a different license, or use an add-on license, or to configure a narrower reporting interval, refer to the corresponding task here. Check the "Supported Topologies" where provided, before you proceed.

Logging into Cisco (CSLU Interface)

Depending on your needs, when working in CSLU, you can either be in connected or disconnected mode. To work in the connected mode, complete these steps to connect with Cisco.

Procedure

Step 1 From the CSLU Main screen, click **Login to Cisco** (located at the top right corner of the screen).

Step 2 Enter: **CCO User Name** and **CCO Password**.

Step 3 In the CSLU Preferences tab, check that the Cisco connectivity toggle displays “Cisco Is Available”.

Configuring a Smart Account and a Virtual Account (CSLU Interface)

Both the Smart Account and Virtual Account are configured through the Preferences tab. Complete the following steps to configure both Smart and Virtual Accounts for connecting to Cisco.

Procedure

Step 1 Select the **Preferences Tab** from the CSLU home screen.

Step 2 Perform these steps for adding both a Smart Account and Virtual Account:

a) In the Preferences screen navigate to the **Smart Account** field and add the **Smart Account Name**.

b) Next, navigate to the **Virtual Account** field and add the **Virtual Account Name**.

If you are connected to CSSM (In the Preferences tab, **Cisco is Available**), you can select from the list of available SA/VAs.

If you are not connected to CSSM (In the Preferences tab, **Cisco Is Not Available**), enter the SA/VAs manually.

Note SA/VA names are case sensitive.

Step 3 Click **Save**. The SA/VA accounts are saved to the system

Only one SA/VA pair can reside on CSLU at a time. You cannot add multiple accounts. To change to another SA/VA pair, repeat Steps 2a and 2b then Save. A new SA/VA account pair replaces the previous saved pair

Adding a Product-Initiated Product Instance in CSLU (CSLU Interface)

Complete these steps to add a device-created Product Instance using the Preferences tab.

Procedure

Step 1 Select the **Preferences** tab.

Step 2 In the Preferences screen, de-select the **Validate Device** check box.

Step 3 Set the **Default Connect Method** to **Product Instance Initiated** and then click **Save**.

Ensuring Network Reachability for Product Instance-Initiated Communication

This task provides *possible* configurations that may be required to ensure network reachability for product instance-initiated communication. Steps marked as "(Required)" are required for all product instances, all other steps my be required or optional, depending the kind of product instance and network requirements. Configure the applicable commands:

Before you begin

Supported topologies: Connected to CSSM Through CSLU (product instance-initiated communication).

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. Enter your password, if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**interface** *interface-type-number* **Example:** `Device (config)# interface gigabitethernet0/0`	Enters interface configuration mode and specifies the Ethernet interface, subinterface, or VLAN to be associated with the VRF.

	Command or Action	Purpose
Step 4	**vrf forwarding** *vrf-name* **Example:** `Device(config-if)# vrf forwarding Mgmt-vrf`	Associates the VRF with the Layer 3 interface. This command activates multiprotocol VRF on an interface
Step 5	**ip address** *ip-address mask* **Example:** `Device(config-if)# ip address 192.168.0.1 255.255.0.0`	Defines the IP address for the VRF.
Step 6	**negotiation auto** **Example:** `Device(config-if)# negotiation auto`	Enables auto-negotiation operation for the speed and duplex parameters of an interface. **Note** Cisco Catalyst 9800-L-F Wireless Controller 10G Ports do not support in an auto-negotiation operation.
Step 7	**end** **Example:** `Device(config-if)# end`	Exits the interface configuration mode and enters global configuration mode.
Step 8	**ip http client source-interface** *interface-type-number* **Example:** `Device(config)# ip http client source-interface gigabitethernet0/0`	Configures a source interface for the HTTP client.
Step 9	**ip route** *ip-address ip-mask subnet mask* **Example:** `Device(config)# ip route vrf mgmt-vrf 192.168.0.1 255.255.0.0 192.168.255.1`	(Required) Configures a route and gateway on the product instance. You can configure either a static route or a dynamic route.
Step 10	{**ip** | **ipv6**} **name-server** *server-address 1 ...server-address 6*] **Example:** `Device(config)# Device(config)# ip name-server vrf mgmt-vrf 173.37.137.85`	Configures Domain Name System (DNS) on the VRF interface.
Step 11	**ip domain lookup source-interface** *interface-type-number* **Example:** `Device(config)# ip domain lookup source-interface gigabitethernet0/0`	Configures the source interface for the DNS domain lookup.

	Command or Action	Purpose
Step 12	**ip domain name** *domain-name* **Example:** `Device(config)# ip domain name example.com`	Configure DNS discovery of your domain. In accompanying example, the name-server creates entry `cslu-local.example.com`.

Adding a CSLU-Initiated Product Instance in CSLU (CSLU Interface)

Using the CSLU interface, you can configure the connect method to be CSLU Initiated. This connect method (mode) enables CSLU to retrieve Product Instance information from the Product Instance.

Note The default Connect Method is set in the **Preferences** tab.

Complete these steps to add a Product Instance from the Inventory tab

Procedure

Step 1 Go to the **Inventory** tab and from the Product Instances table, select **Add Single Product**.

Step 2 Enter the **Host** (IP address of the Host).

Step 3 Select the **Connect Method** and select one of the CSLU Initiated connect methods.

Step 4 In the right panel, click **Product Instance Login Credentials**. The left panel of the screen changes to show the User Name and Password fields.

Step 5 Enter the product instance **User Name** and **Password**.

Step 6 Click **Save**.

The information is saved to the system and the device is listed in the Product Instances table with the Last Contact listed as never.

Collecting Usage Reports: CSLU Initiated (CSLU Interface)

CSLU also allows you to manually trigger the gathering of usage reports from devices.

After configuring and selecting a product instance (selecting **Add Single Product**, filling in the **Host** name and selecting a CSLU-initiated connect method), click **Actions for Selected** > **Collect Usage**. CSLU connects to the selected product instances and collects the usage reports. These usage reports are stored in CSLU's local library. These reports can then be transferred to Cisco if CSLU is connected to Cisco, or (if you are not connected to Cisco) you can manually trigger usage collection by selecting **Data** > **Export to CSSM**.

If you are working in CSLU-initiated mode, complete these steps to configure CSLU to collect RUM reports from Product Instances.

Procedure

Step 1 Click the **Preference** tab and enter a valid **Smart Account** and **Virtual Account**, and then selectan appropriate CSLU-initiated collect method. (If there have been any changes in Preferences, make sure you click **Save**).

Step 2 Click the **Inventory** tab and select one or more product instances.

Step 3 Click **Actions for Selected** > **Collect Usage**.

RUM reports are retrieved from each selected device and stored in the CSLU local library. The Last Contacted column is updated to show the time the report was received, and the Alerts column shows the status.

If CSLU is currently logged into Cisco the reports will be automatically sent to the associated Smart Account and Virtual Account in Cisco and Cisco will send an acknowledgement to CSLU as well as to the product instance. The acknowledgement will be listed in the alerts column of the Product Instance table. To manually transfer usage reports Cisco, from the CSLU main screen select **Data** > **Export to CSSM**.

Step 4 From the **Export to CSSM** modal, select the local directory where the reports are to be stored. (<CSLU_WORKING_Directory>/data/default/rum/unsent)

At this point, the usage reports are saved in your local directory (library). To upload these usage reports to Cisco, follow the steps described in Uploading Data or Requests to CSSM and Downloading a File, on page 95.

Note The Windows operating system can change the behavior of a usage report file properties by dropping the extension when that file is renamed. The behavior change happens when you rename the downloaded file and the renamed file drops the extension. For example, the downloaded default file named `UD_xxx.tar` is renamed to `UD_yyy`. The file loses its TAR extension and cannot function. To enable the usage file to function normally, after re-naming a usage report file, you must also add the TAR extension back to the file name, for example `UD_yyy.tar`.

Export to CSSM (CSLU Interface)

The Download All for Cisco menu option is a manual process used for offline purposes. Complete these steps to use the Download For Cisco menu option

Procedure

Step 1 Go to the **Preferences** tab, and turn off the **Cisco Connectivity** toggle switch.

The field switches to “Cisco Is Not Available”.

Step 2 From the main menu in the CSLU home screen navigate to **Data** > **Export to CSSM**.

Step 3 Select the file from the modal that opens and click **Save**. You now have the file saved.

Note At this point you have a DLC file, RUM file, or both.

Step 4 Go to a station that has connectivity to Cisco, and complete the following: Uploading Data or Requests to CSSM and Downloading a File, on page 95

Once the file is downloaded, you can import it into CSLU, see Import from CSSM (CSLU Interface), on page 67.

Import from CSSM (CSLU Interface)

Once you have received the ACK or other file (such as an authorization code) from Cisco, you are ready to Upload that file to your system. This procedure can be used for workstations that are offline. Complete these steps to select and upload files from Cisco.

Procedure

Step 1 Ensure that you have downloaded the file to a location that is accessible to CSLU.

Step 2 From the main menu in the CSLU home screen, navigate to **Data** > **Import from CSSM**.

Step 3 An Import from CSSM modal open for you to either:

- Drag and Drop a file that resides on your local drive, or
- Browse for the appropriate *.xml file, select the file and click **Open**.

If the upload is successful, you will get message indicating that the file was successfully sent to the server. If the upload is not successful, you will get an import error.

Step 4 When you have finished uploading, click the **x** at the top right corner of the modal to close it.

Ensuring Network Reachability for CSLU-Initiated Communication

This task provides *possible* configurations that may be required to ensure network reachability for CSLU-initiated communication. Steps marked as "(Required)" are required for all product instances, all other steps may be required or optional, depending the kind of product instance and network requirements. Configure the applicable commands:

Before you begin

Supported topologies: Connected to CSSM Through CSLU (CSLU-initiated communication).

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. Enter your password, if prompted.
Step 2	**configure terminal** **Example:**	Enters global configuration mode.

	Command or Action	Purpose
	`Device# configure terminal`	
Step 3	**aaa new model** **Example:** `Device(config)# aaa new model`	(Required) Enable the authentication, authorization, and accounting (AAA) access control model.
Step 4	**aaa authentication login default local** **Example:** `Device(config)# aaa authentication login default local`	(Required) Sets AAA authentication to use the local username database for authentication.
Step 5	**aaa authorization exec default local** **Example:** `Device(config)# aaa authorization exec default local`	Sets the parameters that restrict user access to a network. The user is allowed to run an EXEC shell.
Step 6	ip routing **Example:** `Device(config)# ip routing`	Enables IP routing.
Step 7	{**ip** | **ipv6**} **name-server** *server-address 1 ...server-address 6*] **Example:** `Device(config)# ip name-server vrf Mgmt-vrf 192.168.1.100 192.168.1.200 192.168.1.300`	(Optional) Specifies the address of one or more name servers to use for name and address resolution. You can specify up to six name servers. Separate each server address with a space. The first server specified is the primary server. The device sends DNS queries to the primary server first. If that query fails, the backup servers are queried.
Step 8	**ip domain lookup source-interface** *interface-type-number* **Example:** `Device(config)# ip domain lookup source-interface gigabitethernet0/0`	Enables DNS-based hostname-to-address translation on your device. This feature is enabled by default. If your network devices require connectivity with devices in networks for which you do not control name assignment, you can dynamically assign device names that uniquely identify your devices by using the global Internet naming scheme (DNS).
Step 9	**ip domain name** *name* **Example:** `Device(config)# ip domain name vrf Mgmt-vrf cisco.com`	Defines a default domain name that the software uses to complete unqualified hostnames (names without a dotted-decimal domain name).
Step 10	**no username** *name* **Example:**	(Required) Clears the specified username, if it exists. For *name* , enter the same username you will create in the next step. This ensures

	Command or Action	Purpose
	`Device(config)# no username admin`	that a duplicate of the username you are going to create in the next step does not exist. If you plan to use REST APIs for CSLU-initiated retrieval of RUM reports, you have to log in to CSLU. Duplicate usernames may cause the feature to work incorrectly if there are duplicate usernames in the system.

Step 11	**username** *name* **privilege** *level* **password** *password*
	Example:
	`Device(config)# username admin privilege 15`
	`password 0 lab`
		(Required) Establishes a username-based authentication system.
		The **privilege** keyword sets the privilege level for the user. A number between 0 and 15 that specifies the privilege level for the user.
		The password allows access to the name argument. A password must be from 1 to 25 characters, can contain embedded spaces, and must be the last option specified in the **username** command.
		This enables CSLU to use the product instance native REST.
		Note Enter this username and password in CSLU (Collecting Usage Reports: CSLU Initiated (CSLU Interface), on page 65 → *Step 4. f.* CSLU can then collect RUM reports from the product instance.

Step 12	**interface** *interface-type-number* **Example:** `Device (config)# interface gigabitethernet0/0`	Enters interface configuration mode and specifies the Ethernet interface, subinterface, or VLAN to be associated with the VRF.
Step 13	**vrf forwarding** *vrf-name* **Example:** `Device(config-if)# vrf forwarding Mgmt-vrf`	Associates the VRF with the Layer 3 interface. This command activates multiprotocol VRF on an interface
Step 14	**ip address** *ip-address mask* **Example:** `Device(config-if)# ip address 192.168.0.1 255.255.0.0`	Defines the IP address for the VRF.
Step 15	**negotiation auto** **Example:** `Device(config-if)# negotiation auto`	Enables auto-negotiation operation for the speed and duplex parameters of an interface.

	Command or Action	Purpose
Step 16	**no shutdown** **Example:** `Device(config-if)# no shutdown`	Restarts a disabled interface.
Step 17	**end** **Example:** `Device(config-if)# end`	Exits the interface configuration mode and enters global configuration mode.
Step 18	**ip http server** **Example:** `Device(config)# ip http server`	(Required) Enables the HTTP server on your IP or IPv6 system, including a Cisco web browser user interface. The HTTP server uses the standard port 80, by default.

Step 19	**ip http authentication local**
	Example:
	`ip http authentication local`
	`Device(config)#`
		(Required) Specifies a particular authentication method for HTTP server users.
		The **local** keyword means that the login user name, password and privilege level access combination specified in the local system configuration (by the username global configuration command) should be used for authentication and authorization.

Step 20	**ip http secure-server** **Example:** `Device(config)# ip http server`	(Required) Enables a secure HTTP (HTTPS) server. The HTTPS server uses the Secure Sockets Layer (SSL) version 3.0 protocol.
Step 21	**ip http max-connections** **Example:** `Device(config)# ip http max-connections 16`	(Required) Configures the maximum number of concurrent connections allowed for the HTTP server. Enter an integer in the range from 1 to 16. The default is 5.
Step 22	**ip tftp source-interface** *interface-type-number* **Example:** `Device(config)# ip tftp source-interface GigabitEthernet0/0`	Specifies the IP address of an interface as the source address for TFTP connections.
Step 23	**ip route** *ip-address ip-mask subnet mask* **Example:** `Device(config)# ip route vrf mgmt-vrf 192.168.0.1 255.255.0.0 192.168.255.1`	Configures a route and gateway on the product instance. You can configure either a static route or a dynamic route.

Step 24	**logging host**
	Example:
	`Device(config)# logging host 172.25.33.20`
	`vrf Mgmt-vrf`
		Logs system messages and debug output to a remote host.

	Command or Action	Purpose
Step 25	**end** **Example:** `Device(config)# end`	Exits the global configuration mode and enters priveleged EXEC mode.
Step 26	**show ip http server session-module** **Example:** `Device# show ip http server session-module`	(Required) Verifies HTTP connectivity. In the output, check that `SL_HTTP` is active. Additionally, you can also perform the following checks : • From device where CSLU is installed, verify that you can ping the product instance. A successful ping confirms that the product instance is reachable. • From a Web browser on the device where CSLU is installed verify `https://<product-instance-ip>/`. This ensures that the REST API from CSLU to the product instance works as expected.

Assigning a Smart Account and Virtual Account (SSM On-Prem UI)

You can use this procedure to import one or more product instances along with corresponding Smart Account and Virtual Account information, into the SSM On-Prem database. This enables SSM On-Prem to map product instances that are part of local virtual accounts (other than the default local virtual account), to the correct license pool in CSSM:

Before you begin

Supported topologies: SSM On-Prem Deployment (product instance-initiated communication).

Procedure

Step 1 Log into the SSM On-Prem and select the **Smart Licensing** workspace.

Step 2 Navigate to **Inventory** > **SL Using Policy** > **Export/Import All** > **Import Product Instances List**

The **Upload Product Instances** window is displayed.

Step 3 Click **Download** to download the .csv template file and enter the required information for all the product instances in the template.

Step 4 Once you have filled-out the template, click **Inventory** > **SL Using Policy** > **Export/Import All** > **Import Product Instances List**.

The **Upload Product Instances** window is displayed.

Step 5 Now, click **Browse** and upload the filled-out .csv template.

Smart Account and Virtual Account information for all uploaded product instances is now available in SSM On-Prem.

Validating Devices (SSM On-Prem UI)

When device validation is enabled, RUM reports from an unknown product instance (not in the SSM On-Prem database) are rejected.

By default, devices are not validated. Complete the following steps to enable it:

Before you begin

Supported topologies: SSM On-Prem Deployment (product instance-initiated communication).

Procedure

Step 1 In the **On-Prem License Workspace** window, click **Admin Workspace** and log in, if prompted.

The **On-Prem Admin Workspace** window is displayed.

Step 2 Click the **Settings** widget.

The **Settings** window is displayed.

Step 3 Navigate to the **CSLU** tab and turn-on the **Validate Device** toggle switch.

RUM reports from an unknown product instance will now be rejected. If you haven't already, you must now add the required product instances to the SSM On-Prem database before sending RUM reports. See Assigning a Smart Account and Virtual Account (SSM On-Prem UI), on page 71

Ensuring Network Reachability for Product Instance-Initiated Communication

This task provides *possible* configurations that may be required to ensure network reachability for product instance-initiated communication. Steps marked as "(Required)" are required for all product instances, all other steps my be required or optional, depending the kind of product instance and network requirements. Configure the applicable commands:

Note Ensure that you configure steps 13, 14, and 15 exactly as shown below. These commands must be configured to ensure that the correct trustpoint is used and that the necessary certificates are accepted for network reachability.

Before you begin

Supported topologies: SSM On-Prem Deployment(product instance-initiated communication).

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. Enter your password, if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**interface** *interface-type-number* **Example:** `Device (config)# interface gigabitethernet0/0`	Enters interface configuration mode and specifies the Ethernet interface, subinterface, or VLAN to be associated with the VRF.
Step 4	**vrf forwarding** *vrf-name* **Example:** `Device(config-if)# vrf forwarding Mgmt-vrf`	Associates the VRF with the Layer 3 interface. This command activates multiprotocol VRF on an interface
Step 5	**ip address** *ip-address mask* **Example:** `Device(config-if)# ip address 192.168.0.1 255.255.0.0`	Defines the IP address for the VRF.
Step 6	**negotiation auto** **Example:** `Device(config-if)# negotiation auto`	Enables auto-negotiation operation for the speed and duplex parameters of an interface.
Step 7	**end** **Example:** `Device(config-if)# end`	Exits the interface configuration mode and enters global configuration mode.
Step 8	**ip http client source-interface** *interface-type-number* **Example:** `Device(config)# ip http client source-interface gigabitethernet0/0`	Configures a source interface for the HTTP client.
Step 9	**ip route** *ip-address ip-mask subnet mask* **Example:** `Device(config)# ip route vrf mgmt-vrf 192.168.0.1 255.255.0.0 192.168.255.1`	(Required) Configures a route and gateway on the product instance. You can configure either a static route or a dynamic route.

	Command or Action	Purpose
Step 10	{**ip** | **ipv6**} **name-server** *server-address 1 ...server-address 6*] **Example:** `Device(config)# Device(config)# ip name-server vrf mgmt-vrf 198.51.100.1`	Configures Domain Name System (DNS) on the VRF interface.
Step 11	**ip domain lookup source-interface** *interface-type-number* **Example:** `Device(config)# ip domain lookup source-interface gigabitethernet0/0`	Configures the source interface for the DNS domain lookup.
Step 12	**ip domain name** *domain-name* **Example:** `Device(config)# ip domain name example.com`	Configure DNS discovery of your domain. In the accompanying example, the name-server creates entry `cslu-local.example.com`.

Step 13	**crypto pki trustpoint SLA-TrustPoint**
	Example:
	`Device(config)# crypto pki trustpoint SLA-TrustPoint`
	`Device(ca-trustpoint)#`
		(Required) Declares that the product instance should use trustpoint "SLA-TrustPoint" and enters the ca-trustpoint configuration mode. The product instance does not recognize any trustpoints until you declare a trustpoint using this command.

Step 14	enrollment terminal **Example:** `Device(ca-trustpoint)# enrollment terminal`	Required) Specifies the certificate enrollment method.
Step 15	**revocation-check none** **Example:** `Device(ca-trustpoint)# revocation-check none`	(Required) Specifes a method that is to be used to ensure that the certificate of a peer is not revoked. For the SSM On-Prem Deployment topology, enter the **none** keyword. This means that a revocation check will not be performed and the certificate will always be accepted.

Step 16	**exit**
	Example:
	`Device(ca-trustpoint)# exit`
	`Device(config)# exit`
		Exits the ca-trustpoint configuration mode and then the global configuration mode and returns to privileged EXEC mode.

Step 17	**copy running-config startup-config** **Example:** `Device# copy running-config startup-config`	Saves your entries in the configuration file.

Retrieving the Transport URL (SSM On-Prem UI)

You must configure the transport URL on the product instance when you deploy the product instance-initiated communication with SSM On-Prem deployment. This task show you how to easily copy the complete URL including the tenant ID from SSM On-Prem.

Before you begin

Supported topologies: SSM On-Prem Deployment (product instance-initiated communication).

Procedure

Step 1 Log into SSM On-Prem and select the **Smart Licensing** workspace.

Step 2 Navigate to the **Inventory** tab and from the dropdown list of local virtual accounts (top right corner), select the *default local virtual account*. When you do, the area under the **Inventory** tab displays **Local Virtual Account: Default**.

Step 3 Navigate to the **General** tab.

The **Product Instance Registration Tokens** area is displayed.

Step 4 In the **Product Instance Registration Tokens** area click **CSLU Transport URL**.

The **Product Registration URL** pop-window is displayed.

Step 5 Copy the entire URL and save it in an accessible place.

You will require the URL when you configure the transport type and URL on the product instance.

Step 6 Configure the transport type and URL. See: Setting the Transport Type, URL, and Reporting Interval, on page 97.

Exporting and Importing Usage Data (SSM On-Prem UI)

You can use this procedure to complete usage synchronization between SSM On-Prem and CSSM when SSM On-Prem is disconnected from CSSM.

Before you begin

Supported topologies:

- SSM On-Prem Deployment (SSM On-Prem-initiated communication)
- SSM On-Prem Deployment (product instance-initiated communication).

Reporting data must be available in SSM On-Prem. You must have either pushed the nessary reporting data from the product instance to SSM On-Prem (product instance-initiated communication) or retrieved the necessary reporting data from the product instance (SSM On-Prem-initiated communication).

Procedure

Step 1 Log into SSM On-Prem and select **Smart Licensing**.

Step 2 Navigate to **Inventory** > **SL Using Policy** tab.

Step 3 In the **SL Using Policy** tab area, click **Export/Import All...** > **Export Usage to Cisco**.

This generates one .tar file with *all* the usage reports available in the SSM On-Prem server.

Step 4 Complete this task in CSSM: Uploading Data or Requests to CSSM and Downloading a File, on page 95.

At the end of this task you will have an ACK file to import into SSM On-Prem.

Step 5 Again navigate to the **Inventory** > **SL Using Policy** tab.

Step 6 In the **SL Using Policy** tab area, click **Export/Import All...** > **Import From Cisco** . Upload the .tar ACK file.

To verify ACK import, in the **SL Using Policy** tab area check the **Alerts** column of the corresponding product instance. The following message is displayed: Acknowledgement received from CSSM.

Adding One or More Product Instances (SSM On-Prem UI)

You can use this procedure to add one product instance or to import and add multiple product instances. It enables SSM On-Prem to retrieve information from the product instance.

Before you begin

Supported topologies: SSM On-Prem Deployment (SSM On-Prem-initiated communication).

Procedure

Step 1 Log into the SSM On-Prem UI and click **Smart Licensing**.

Step 2 Navigate to **Inventory** tab. Select a local virtual account from the drop-down list in the top right corner.

Step 3 Navigate to the **SL Using Policy** tab.

Step 4 Add a single product or import multiple product instances (*choose one*).

- **To add a single product instance**:
  - **a.** In the **SL Using Policy** tab area, click **Add Single Product**.
  - **b.** In the **Host** field, enter the IP address of the host (product instance).
  - **c.** From the **Connect Method** dropdown list, select an appropriate SSM On-Prem-initiated connect method.

    The available connect methods for SSM On-Prem-initiated communication are: NETCONF, RESTCONF, and REST API.
  - **d.** In the right panel, click **Product Instance Login Credentials**.

    The **Product Instance Login Credentials** window is displayed

Note You need the login credentials only if a product instance requires a SLAC.

e. Enter the **User ID** and **Password**, and click **Save**.

This is the same user ID and password that you configured as part of commands required to establish network reachability (Ensuring Network Reachability for SSM On-Prem-Initiated Communication, on page 77).

Once validated, the product instance is displayed in the listing in the **SL Using Policy** tab area.

- **To import multiple product instances:**

a. In **SL Using Policy** tab, click **Export/Import All...** > **Import Product Instances List**.

The **Upload Product Instances** window is displayed.

b. Click **Download** to download the predefined .csv template.

c. Enter the required information for all the product instances in the .csv template.

In the template, ensure that you provide **Host**, **Connect Method** and **Login Credentials** for all product instances.

The available connect methods for SSM On-Prem-initiated communication are: NETCONF, RESTCONF, and REST API.

Login credentials refer to the user ID and password that you configured as part of commands required to establish network reachability (Ensuring Network Reachability for SSM On-Prem-Initiated Communication, on page 77).

d. Again navigate to **Inventory** > **SL Using Policy** tab. Click **Export/Import All....** > **Import Product Instances List**.

The **Upload Product Instances** window is displayed.

e. Now upload the filled-out .csv template.

Once validated, the product instances are displayed in the listing in the **SL Using Policy** tab.

Ensuring Network Reachability for SSM On-Prem-Initiated Communication

This task provides *possible* configurations that may be required to ensure network reachability for SSM On-Prem-initiated communication. Steps marked as "(Required)" are required for all product instances, all other steps may be required or optional, depending the kind of product instance and network requirements. Configure the applicable commands:

Note Ensure that you configure steps 25, 26, and 27 exactly as shown below. These commands must be configured to ensure that the correct trustpoint is used and that the necessary certificates are accepted for network reachability.

Before you begin

Supported topologies: SSM On-Prem Deployment (SSM On-Prem-initiated communication).

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. Enter your password, if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**aaa new model** **Example:** `Device(config)# aaa new model`	(Required) Enable the authentication, authorization, and accounting (AAA) access control model.
Step 4	**aaa authentication login default local** **Example:** `Device(config)# aaa authentication login default local`	(Required) Sets AAA authentication to use the local username database for authentication.
Step 5	**aaa authorization exec default local** **Example:** `Device(config)# aaa authorization exec default local`	Sets the parameters that restrict user access to a network. The user is allowed to run an EXEC shell.
Step 6	ip routing **Example:** `Device(config)# ip routing`	Enables IP routing.
Step 7	{**ip** | **ipv6**} **name-server** *server-address 1 ...server-address 6*] **Example:** `Device(config)# ip name-server vrf Mgmt-vrf 192.168.1.100 192.168.1.200 192.168.1.300`	(Optional) Specifies the address of one or more name servers to use for name and address resolution. You can specify up to six name servers. Separate each server address with a space. The first server specified is the primary server. The device sends DNS queries to the primary server first. If that query fails, the backup servers are queried.
Step 8	**ip domain lookup source-interface** *interface-type-number* **Example:** `Device(config)# ip domain lookup source-interface gigabitethernet0/0`	Enables DNS-based hostname-to-address translation on your device. This feature is enabled by default. If your network devices require connectivity with devices in networks for which you do not

	Command or Action	Purpose
		control name assignment, you can dynamically assign device names that uniquely identify your devices by using the global Internet naming scheme (DNS).
Step 9	**ip domain name** *name* **Example:** `Device(config)# ip domain name vrf Mgmt-vrf cisco.com`	Defines a default domain name that the software uses to complete unqualified hostnames (names without a dotted-decimal domain name).
Step 10	**no username** *name* **Example:** `Device(config)# no username admin`	(Required) Clears the specified username, if it exists. For *name* , enter the same username you will create in the next step. This ensures that a duplicate of the username you are going to create in the next step does not exist. If you plan to use REST APIs for SSM On-Prem-initiated retrieval of RUM reports, you have to log in to SSM On-Prem. Duplicate usernames may cause the feature to work incorrectly if there are present in the system.

Step 11	**username** *name* **privilege** *level* **password** *password*
	Example:
	`Device(config)# username admin privilege 15`
	`password 0 lab`
		(Required) Establishes a username-based authentication system.
		The **privilege** keyword sets the privilege level for the user. A number between 0 and 15 that specifies the privilege level for the user.
		The password allows access to the name argument. A password must be from 1 to 25 characters, can contain embedded spaces, and must be the last option specified in the **username** command.
		This enables SSM On-Prem to use the product instance native REST.
		Note Enter this username and password in SSM On-Prem (Adding One or More Product Instances (SSM On-Prem UI), on page 76). This enables SSM On-Prem to collect RUM reports from the product instance.

Step 12	**interface** *interface-type-number* **Example:** `Device (config)# interface gigabitethernet0/0`	Enters interface configuration mode and specifies the Ethernet interface, subinterface, or VLAN to be associated with the VRF.

	Command or Action	Purpose
Step 13	**vrf forwarding** *vrf-name* **Example:** `Device(config-if)# vrf forwarding Mgmt-vrf`	Associates the VRF with the Layer 3 interface. This command activates multiprotocol VRF on an interface
Step 14	**ip address** *ip-address mask* **Example:** `Device(config-if)# ip address 192.168.0.1 255.255.0.0`	Defines the IP address for the VRF.
Step 15	**negotiation auto** **Example:** `Device(config-if)# negotiation auto`	Enables auto-negotiation operation for the speed and duplex parameters of an interface.
Step 16	**no shutdown** **Example:** `Device(config-if)# no shutdown`	Restarts a disabled interface.
Step 17	**end** **Example:** `Device(config-if)# end`	Exits the interface configuration mode and enters global configuration mode.
Step 18	**ip http server** **Example:** `Device(config)# ip http server`	(Required) Enables the HTTP server on your IP or IPv6 system, including a Cisco web browser user interface. The HTTP server uses the standard port 80, by default.

Step 19	**ip http authentication local**
	Example:
	`ip http authentication local`
	`Device(config)#`
		(Required) Specifies a particular authentication method for HTTP server users.
		The **local** keyword means that the login user name, password and privilege level access combination specified in the local system configuration (by the username global configuration command) should be used for authentication and authorization.

Step 20	**ip http secure-server** **Example:** `Device(config)# ip http server`	(Required) Enables a secure HTTP (HTTPS) server. The HTTPS server uses the Secure Sockets Layer (SSL) version 3.0 protocol.
Step 21	**ip http max-connections** **Example:** `Device(config)# ip http max-connections 16`	(Required) Configures the maximum number of concurrent connections allowed for the HTTP server. Enter an integer in the range from 1 to 16. The default is 5.

	Command or Action	Purpose
Step 22	**ip tftp source-interface** *interface-type-number* **Example:** `Device(config)# ip tftp source-interface GigabitEthernet0/0`	Specifies the IP address of an interface as the source address for TFTP connections.
Step 23	**ip route** *ip-address ip-mask subnet mask* **Example:** `Device(config)# ip route vrf mgmt-vrf 192.168.0.1 255.255.0.0 192.168.255.1`	Configures a route and gateway on the product instance. You can configure either a static route or a dynamic route.
Step 24	**logging host** **Example:** `Device(config)# logging host 172.25.33.20 vrf Mgmt-vrf`	Logs system messages and debug output to a remote host.

Step 25	**crypto pki trustpoint SLA-TrustPoint**
	Example:
	`Device(config)# crypto pki trustpoint SLA-TrustPoint`
	`Device(ca-trustpoint)#`
		(Required) Declares that the product instance should use trustpoint "SLA-TrustPoint" and enters the ca-trustpoint configuration mode. The product instance does not recognize any trustpoints until you declare a trustpoint using this command.

Step 26	enrollment terminal **Example:** `Device(ca-trustpoint)# enrollment terminal`	Required) Specifies the certificate enrollment method.
Step 27	**revocation-check none** **Example:** `Device(ca-trustpoint)# revocation-check none`	(Required) Specifes a method that is to be used to ensure that the certificate of a peer is not revoked. For the SSM On-Prem Deployment topology, enter the **none** keyword. This means that a revocation check will not be performed and the certificate will always be accepted.

Step 28	**end**
	Example:
	`Device(ca-trustpoint)# exit`
	`Device(config)# end`
		Exits the ca-trustpoint configuration mode and then the global configuration mode and returns to privileged EXEC mode.

Step 29	**show ip http server session-module** **Example:** `Device# show ip http server session-module`	(Required) Verifies HTTP connectivity. In the output, check that `SL_HTTP` is active. Additionally, you can also perform the following checks : • From device where SSM On-Prem is installed, verify that you can ping the product instance. A successful ping

	Command or Action	Purpose
		confirms that the product instance is reachable. • From a Web browser on the device where SSM On-Prem is installed verify `https://<product-instance-ip>/`. This ensures that the REST API from SSM On-Prem to the product instance works as expected.
Step 30	**copy running-config startup-config** **Example:** `Device# copy running-config startup-config`	Saves your entries in the configuration file.

Setting Up a Connection to CSSM

The following steps show how to set up a Layer 3 connection to CSSM to verify network reachability. Steps marked as "(Required)" are required for all product instances, all other steps may be required or optional, depending the kind of product instance and network requirements. Configure the applicable commands:

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. Enter your password, if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	{**ip** | **ipv6**} **name-server** *server-address 1 ...server-address 6*] **Example:** `Device(config)# ip name-server 209.165.201.1 209.165.200.225 209.165.201.14 209.165.200.230`	Specifies the address of one or more name servers to use for name and address resolution. You can specify up to six name servers. Separate each server address with a space. The first server specified is the primary server. The device sends DNS queries to the primary server first. If that query fails, the backup servers are queried.
Step 4	**ip name-server vrf Mgmt-vrf** *server-address 1...server-address 6* **Example:** `Device(config)# ip name-server vrf Mgmt-vrf`	(Optional) Configures DNS on the VRF interface. You can specify up to six name servers. Separate each server address with a space.

	Command or Action	Purpose
	`209.165.201.1 209.165.200.225 209.165.201.14 209.165.200.230`	**Note** This command is an alternative to the **ip name-server** command.
Step 5	**ip domain lookup source-interface** *interface-type interface-number* **Example:** `Device(config)# ip domain lookup source-interface Vlan100`	Configures the source interface for the DNS domain lookup.
Step 6	**ip domain name** *domain-name* **Example:** `Device(config)# ip domain name example.com`	Configures the domain name.
Step 7	**ip host tools.cisco.com** *ip-address* **Example:** `Device(config)# ip host tools.cisco.com 209.165.201.30`	Configures static hostname-to-address mappings in the DNS hostname cache if automatic DNS mapping is not available.

Step 8	**interface** *interface-type-number*
	Example:
	`Device(config)# interface Vlan100`
	`Device(config-if)# ip address 192.0.2.10 255.255.255.0`
	`Device(config-if)# exit`
		Configures a Layer 3 interface. Enter an interface type and number or a VLAN.

Step 9	**ntp server** *ip-address* [**version** *number*] [**key** *key-id*] [**prefer**] **Example:** `Device(config)# ntp server 198.51.100.100 version 2 prefer`	(Required) Activates the NTP service (if it has not already been activated) and enables the system to synchronize the system software clock with the specified NTP server. This ensures that the device time is synchronized with CSSM. Use the **prefer** keyword if you need to use this command multiple times and you want to set a preferred server. Using this keyword reduces switching between servers.

Step 10	**switchport access vlan** *vlan_id*
	Example:
	`Device(config)# interface GigabitEthernet1/0/1`
	`Device(config-if)# switchport access`
		Enables the VLAN for which this access port carries traffic and sets the interface as a nontrunking nontagged single-VLAN Ethernet interface.

	Command or Action	Purpose

	`vlan 100`
	`Device(config-if)# switchport mode access`
	`Device(config-if)# exit`
	OR
	`Device(config)#`
		Note This step is to be configured only if the switchport access mode is required. The **switchport access vlan** command may apply to Catalyst switching product instances, for example, and for routing product instances you may want to configure the **ip address** *ip-address mask* command instead.

Step 11	**ip route** *ip-address ip-mask subnet mask* **Example:** `Device(config)# ip route 192.0.2.0 255.255.255.255 192.0.2.1`	Configures a route on the device. You can configure either a static route or a dynamic route.
Step 12	**ip http client source-interface** *interface-type-number* **Example:** `Device(config)# ip http client source-interface Vlan100`	(Required) Configures a source interface for the HTTP client. Enter an interface type and number or a VLAN.
Step 13	**exit** **Example:** `Device(config)# exit`	Exits global configuration mode and returns to privileged EXEC mode.
Step 14	**copy running-config startup-config** **Example:** `Device# copy running-config startup-config`	Saves your entries in the configuration file.

Configuring Smart Transport Through an HTTPs Proxy

To use a proxy server to communicate with CSSM when using the Smart transport mode, complete the following steps:

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. Enter your password, if prompted.
Step 2	**configure terminal** **Example:**	Enters global configuration mode.

	Command or Action	Purpose
	`Device# configure terminal`	
Step 3	**license smart transport smart** **Example:** `Device(config)# license smart transport smart`	Enables Smart transport mode.
Step 4	**license smart url default** **Example:** `Device(config)# license smart transport default`	Automatically configures the Smart URL (https://smartreceiver.cisco.com/licservice/license). For this option to work as expected, the transport mode in the previous step must be configured as **smart**.

Step 5	**license smart proxy** {**address** *address_hostname* | **port** *port_num*}
	Example:
	`Device(config)# license smart proxy address 192.168.0.1`
	`Device(config)# license smart proxy port 3128`
		Configures a proxy for the Smart transport mode. When a proxy is configured, licensing messages are sent to the proxy along with the final destination URL (CSSM). The proxy sends the message on to CSSM. Configure the proxy address and port number separately:
		• **address** *address_hostname*: Specifies the proxy address. Enter the IP address or hostname of the proxy server.
		• **port** *port_num*: Specifies the proxy port. Enter the proxy port number.
		Note the change in the criteria for the acceptance of proxy servers, starting with Cisco IOS XE Bengaluru 17.6.1: only the status code of the proxy server response is verified by the system and not the reason phrase. The RFC format is `status-line = HTTP-version SP status-code SP reason-phrase CRLF`. For more information about the status line, see section 3.1.2 of RFC 7230.

Configuring the Call Home Service for Direct Cloud Access

The Call Home service provides email-based and web-based notification of critical system events to CSSM. To configure the transport mode, enable the Call Home service, and configure a destination profile (A destination profile contains the required delivery information for an alert notification. At least one destination profile is required.), complete the following steps:

Note All steps are required unless specifically called-out as "(Optional)".

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. Enter your password, if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**license smart transport callhome** **Example:** `Device(config)# license smart transport callhome`	Enables Call Home as the transport mode.
Step 4	**license smart url** *url* **Example:** `Device(config)# license smart url https://tools.cisco.com/its/service/oddce/services/DDCEService`	For the **callhome** transport mode, configure the CSSM URL exactly as shown in the example.
Step 5	**service call-home** **Example:** `Device(config)# service call-home`	Enables the Call Home feature.
Step 6	**call-home** **Example:** `Device(config)# call-home`	Enters Call Home configuration mode.
Step 7	**no http secure server-identity-check** **Example:** `Device(config-call-home)# no http secure server-identity-check`	Disables server identity check when HTTP connection is established.
Step 8	**contact-email-address** *email-address* **Example:** `Device(config-call-home)# contact-email-addr username@example.com`	Assigns customer's email address and enables Smart Call Home service full reporting capability and sends a full inventory message from Call-Home TAC profile to Smart Call Home server to start full registration process. You can enter up to 200 characters in email address format with no spaces.

Step 9	**profile** *name*
	Example:
	`Device(config-call-home)# profile CiscoTAC-1`
	`Device(config-call-home-profile)#`
		Enters the Call Home destination profile configuration submode for the specified destination profile.
		By default:

	Command or Action	Purpose
		• The CiscoTAC-1 profile is inactive. To use this profile with the Call Home service, you must enable the profile. • The CiscoTAC-1 profile sends a full report of all types of events subscribed in the profile. The alternative is to additionally configure `Device(cfg-call-home-profile)# anonymous-reporting-only` anonymous-reporting-only. When this is set, only crash, inventory, and test messages will be sent. Use the **show call-home profile all** command to check the profile status.
Step 10	**active** **Example:** `Device(config-call-home-profile)# active`	Enables the destination profile.

Step 11	**destination transport-method http** {**email** |**http**}
	Example:
	`Device(config-call-home-profile)# destination transport-method http`
	AND
	`Device(config-call-home-profile)# no destination transport-method email`
		Enables the message transport method. In the example, Call Home service is enabled via HTTP and transport via email is disabled.
		The **no** form of the command disables the method.

Step 12	**destination address** { **email** *email_address* |**http** *url*}
	Example:
	`Device(config-call-home-profile)# destination address http https://tools.cisco.com/its/service/oddce/services/DDCEService`
	AND
	`Device(config-call-home-profile)# no destination address http https://tools.cisco.com/its/service/oddce/services/DDCEService`
		Configures the destination e-mail address or URL to which Call Home messages are sent. When entering a destination URL, include either **http://** (default) or **https://**, depending on whether the server is a secure server.
		In the example provided here, a **http://** destination URL is configured; and the **no** form of the command is configured for **https://**.

Step 13	**exit** **Example:** `Device(config-call-home-profile)# exit`	Exits Call Home destination profile configuration mode and returns to Call Home configuration mode.
Step 14	**exit** **Example:** `Device(config-call-home)# end`	Exits Call Home configuration mode and returns to privileged EXEC mode.

	Command or Action	Purpose
Step 15	**copy running-config startup-config** **Example:** `Device# copy running-config startup-config`	Saves your entries in the configuration file.
Step 16	**show call-home profile** {*name* |**all**}	Displays the destination profile configuration for the specified profile or all configured profiles.

Configuring the Call Home Service for Direct Cloud Access through an HTTPs Proxy Server

The Call Home service can be configured through an HTTPs proxy server. This configuration requires no user authentication to connect to CSSM.

Note Authenticated HTTPs proxy configurations are not supported.

To configure and enable the Call Home service through an HTTPs proxy, complete the following steps:

Note All steps are required unless specifically called-out as "(Optional)".

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. Enter your password, if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**license smart transport callhome** **Example:** `Device(config)# license smart transport callhome`	Enables Call Home as the transport mode.
Step 4	**service call-home** **Example:** `Device(config)# service call-home`	Enables the Call Home feature.

	Command or Action	Purpose
Step 5	**call-home** **Example:** `Device(config)# call-home`	Enters Call Home configuration mode.
Step 6	**http-proxy** *proxy-address* **proxy-port** *port-number* **Example:** `Device(config-call-home)# http-proxy 198.51.100.10 port 5000`	Configures the proxy server information to the Call Home service. Note the change in the criteria for the acceptance of proxy servers, starting with Cisco IOS XE Bengaluru 17.6.1: only the status code of the proxy server response is verified by the system and not the reason phrase. The RFC format is `status-line = HTTP-version SP status-code SP reason-phrase CRLF`. For more information about the status line, see section 3.1.2 of RFC 7230.
Step 7	**exit** **Example:** `Device(config-call-home)# exit`	Exits Call Home configuration mode and enters global configuration mode.
Step 8	**exit** **Example:** `Device(config)# exit`	Exits global configuration mode and enters privileged EXEC mode.
Step 9	**copy running-config startup-config** **Example:** `Device# copy running-config startup-config`	Saves your entries in the configuration file.

Removing and Returning an Authorization Code

To remove and return an SLR authorization code, complete the following steps.

Before you begin

Supported topologies: all

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. Enter your password, if prompted.

	Command or Action	Purpose
Step 2	**show license summary** **Example:** `Device# show license summary`	Ensure that the license that you want to remove and return is not in-use. If it is in-use, you must first disable the feature.

Step 3	**license smart authorization return** {**all** | **local**} {**offline** [*path*] | **online**}
	Example:
	`Device# license smart authorization return all online`
	
	`Enter this return code in Cisco Smart Software Manager portal:`
	`UDI: PID:C9800-CL-K9,SN:93BBAH93MGS`
	`Return code: CqaUPW-WSPYiq-ZNU2ci-SnWydS-hBCXHP-MuyPqy-PJ1GiG-tPTGQj-S2h`
	`UDI: PID:C9800-CL-K9,SN:9XECPSUU4XN`
	`Return code: CNLwxR-eWiAEJ-XaTEQg-j4rrYW-dSRz9j-37VpcP-imjuLD-mNeA4k-TXA`
	
	`OR`
	
	`Device# license smart authorization return local offline`
	`Enter this return code in Cisco Smart Software Manager portal:`
	`UDI: PID:C9800-CL-K9,SN:93BBAH93MGS`
	`Return code: CqaUPW-WSPYiq-ZNU2ci-SnWydS-hBCXHP-MuyPqy-PJ1GiG-tPTGQj-S2h`
	`UDI: PID:C9800-CL-K9,SN:9XECPSUU4XN`
	`Return code: CNLwxR-eWiAEJ-XaTEQg-j4rrYW-dSRz9j-37VpcP-imjuLD-mNeA4k-TXA`
	
	`OR`
	
	`Device# license smart authorization return local offline bootflash:return-code.txt`
		Returns an authorization code back to the license pool in CSSM. A return code is displayed after you enter this command.
		
		Specify the product instance:
		• **all**: Performs the action for all connected product instances in a High Availability set-up.
		• **local**: Performs the action for the active product instance. This is the default option.
		
		Specify if you are connected to CSSM or not:
		• If connected to CSSM, enter **online**. The code is automatically returned to CSSM and a confirmation is returned and installed on the product instance. If you choose this option, the return code is automatically submitted to CSSM.
		• If not connected to CSSM, enter **offline**[*path*].
		If you enter only the **offline** keyword, you must copy the return code that is displayed on the CLI and enter it in CSSM.
		If you specify a file name and path, the return code is saved in the specified location. The file format can be any readable format. For example: `Device# license smart authorization return local offline bootflash:return-code.txt`.
		For software versions Cisco IOS XE Cupertino 17.7.1 and later only: After you save the return request in a file, you can upload the file to CSSM in the same location and in the same way as you upload a RUM report: Uploading Data or Requests to CSSM and Downloading a File, on page 95.
		To enter the return code in CSSM, complete this task: Removing the Product Instance from CSSM, on page 91. Proceed

	Command or Action	Purpose
		with the next step only after you complete this step.
Step 4	**configure terminal** **Example:** `Device# configure terminal`	Enters the global configuration mode.
Step 5	**no license smart reservation** **Example:** `Device(config)# no license smart reservation`	Disables SLR configuration on the product instance. You must complete the authorization code return process in Step 3 above - whether online or offline, before you enter the no license smart reservation command in this step. Otherwise, the return may not be reflected in CSSM or in the show command, and you will have to contact your Cisco technical support representative to rectify the problem.
Step 6	**exit** **Example:** `Device(config)# exit`	Returns to privileged EXEC mode.

Step 7	**show license all**
	Example:
	`Device# show license all`
	`<output truncated>`
	`License Authorizations`
	`=====================`
	`Overall status:`
	`Active: PID:C9800-CL-K9,SN:93BBAH93MGS`
	`Status: NOT INSTALLED`
	`Last return code:`
	`CopUPW-WSPYiq-ZNU2ci-SnWydS-hBCXHP-MuyPqy-PJ1GiG-tPTGQj-S2h`
	`Standby: PID:C9800-CL-K9,SN:9XECPSUU4XN`
	`Status: NOT INSTALLED`
	`Last return code:`
	`CNLwxR-eWiAEJ-XaIEQg-j4rrYW-dSRz9j-37VpcP-imjuLD-mNeA4k-IXA`
	`<output truncated>`
		Displays licensing information. Check the `License Authorizations` header in the output. If the return process is completed correctly, the `Last return code:` field displays the return code.

Removing the Product Instance from CSSM

To remove a product instance and return all licenses to the license pool, complete the following task:

Before you begin

Supported topologies: No Connectivity to CSSM and No CSLU

If you are removing a product instance that is using reserved licenses (SLR) ensure that you have generated a return code as shown in Removing and Returning an Authorization Code, on page 89. (Enter it in Step 7 in this task).

Procedure

Step 1 Log in to the CSSM Web UI at https://software.cisco.com and click **Smart Software Licensing**.

Log in using the username and password provided by Cisco.

Step 2 Click the **Inventory** tab.

Step 3 From the **Virtual Account** drop-down list, choose your Virtual Account.

Step 4 Click the **Product Instances** tab.

The list of product instances that are available is displayed.

Step 5 Locate the required product instance from the product instances list. Optionally, you can enter a name or product type string in the search tab to locate the product instance.

Step 6 In the **Actions** column of the product instance you want to remove, click the **Remove** link.

- If the product instance is *not* using a license with an SLR authorization code then the **Confirm Remove Product Instance** window is displayed.
- If the product instance *is* using a license with an SLR authorization code, then the **Remove Product Instance** window, with a field for return code entry is displayed.

Step 7 In the **Reservation Return Code** field, enter the return code you generated.

Note This step applies only if the product instance is using a license with an SLR authorization code.

Step 8 Click **Remove Product Instance**.

The license is returned to the license pool and the product instance is removed.

Generating a New Token for a Trust Code from CSSM

To generate a token to request a trust code, complete the following steps.

Generate one token for each *Virtual Account* you have. You can use same token for all the product instances that are part of one Virtual Account.

Before you begin

Supported topologies: Connected Directly to CSSM

Procedure

Step 1 Log in to the CSSM Web UI at https://software.cisco.com and click **Smart Software Licensing**.

Log in using the username and password provided by Cisco.

Step 2 Click the **Inventory** tab.

Step 3 From the **Virtual Account** drop-down list, choose the required virtual account

Step 4 Click 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

Step 7 In the **Expire After** field, enter the number of days the token must be active.

Step 8 (Optional) **In the Max. Number of Uses** field, enter the maximum number of uses allowed after which the token expires.

Step 9 Click **Create Token**.

Note If you enter a value here, ensure that you stagger the installation of the trust code on the product instances, which is the next part of the process. If you want to simultaneously install the trust code on a large number of product instances, we recommend that you leave this field blank. Entering a limit here and simultaneously installing it on a large number of devices causes a bottleneck in the processing of these requests in CSSM and installation on some devices may fail, with the following error: `Failure Reason: Server error occurred: LS_LICENGINE_FAIL_TO_CONNECT`.

Step 10 You will see your new token in the list. Click **Actions** and download the token as a `.txt` file.

Installing a Trust Code

To manually install a trust code, complete the following steps

Before you begin

Supported topologies:

- Connected Directly to CSSM

Procedure

	Command or Action	Purpose
Step 1	Generating a New Token for a Trust Code from CSSM, on page 92	In case you have not completed this already, generate and download a trust code file from CSSM.
Step 2	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. Enter your password, if prompted
Step 3	**license smart trust idtoken** *id_token_value* {**local** | **all**} [**force**] **Example:** `Device# license smart trust idtoken NGMwMjk5mYtNZaxMS00NzMZmtgWm all force`	Enables you to establish a trusted connection with CSSM. For *id_token_value*, enter the token you generated in CSSM. Enter one of following options:

	Command or Action	Purpose
		• **local**: Submits the trust request only for the active device in a High Availability set-up. This is the default option. • **all**: Submits the trust request for all devices in a High Availability set-up. Enter the **force** keyword to submit the trust code request in spite of an existing trust code on the product instance. Trust codes are node-locked to the UDI of the product instance. If a UDI is already registered, CSSM does not allow a new registration for the same UDI. Entering the **force** keyword sets a force flag in the message sent to CSSM to create a new trust code even if one already exists.

Step 4	**show license status**
	
	Example:
	`<output truncated>`
	`Trust Code Installed:`
	`  Active: PID:C9800-CL-K9,SN:93BBAH93MGS`
	
	`    INSTALLED on Nov 02 08:59:26 2020 IST`
	`  Standby: PID:C9800-CL-K9,SN:9XECPSUU4XN`
	
	`    INSTALLED on Nov 02 09:00:45 2020 IST`
		Displays date and time if trust code is installed. Date and time are in the local time zone. See field `Trust Code Installed:`.

Downloading a Policy File from CSSM

If you have requested a custom policy or if you want to apply a policy that is different from the default that is applied to the product instance, complete the following task:

Before you begin

Supported topologies:

- No Connectivity to CSSM and No CSLU
- CSLU Disconnected from CSSM

Procedure

Step 1 Log in to the CSSM Web UI at https://software.cisco.com and click **Smart Software Licensing**.

Log in using the username and password provided by Cisco.

Step 2 Follow this directory path: **Reports** > **Reporting Policy**.

Step 3 Click **Download**, to save the `.xml` policy file.

You can now install the file on the product instance. See Installing a File on the Product Instance, on page 96

Uploading Data or Requests to CSSM and Downloading a File

You can use this task to:

- To upload a RUM report to CSSM and download an ACK.
- To upload a SLAC or SLR authorization code return request.

  This applies only to the *No Connectivity to CSSM and No CSLU* topology and is supported starting with Cisco IOS XE Cupertino 17.7.1.

To upload a RUM report to CSSM and download an ACK *when the product instance is not connected to CSSM or CSLU*, complete the following task:

Before you begin

Supported topologies:

- No Connectivity to CSSM and No CSLU
- CSLU Disconnected from CSSM
- SSM On-Prem Deployment (Product instance-initiated communication and SSM On-Prem-initiated communication)

Procedure

Step 1 Log in to the CSSM Web UI at https://software.cisco.com.

Log in using the username and password provided by Cisco.

Step 2 Select the **Smart Account** (upper left-hand corner of the screen) that will receive the report.

Step 3 Select **Smart Software Licensing** → **Reports** → **Usage Data Files**.

Step 4 Click **Upload Usage Data**. Browse to the file location (RUM report in tar format), select, and click **Upload Data**.

Upload a RUM report (`.tar` format), or a SLAC return request file (`.txt` format).

You cannot delete a usage report in CSSM, after it has been uploaded.

Step 5 From the Select Virtual Accounts pop-up, select the **Virtual Account** that will receive the uploaded file. The file is uploaded to Cisco and is listed in the Usage Data Files table in the Reports screen showing the File Name, time is was Reported, which Virtual Account it was uploaded to, the Reporting Status, Number of Product Instances reported, and the Acknowledgement status.

Step 6 In the Acknowledgement column, click **Download** to save the `.txt` ACK file for the report you uploaded.

Wait for the ACK to appear in the Acknowledgement column. If there many RUM reports or requests to process, CSSM may take a few minutes.

Depending on the topology you have implemented, you can now install the file on the product instance, or transfer it to CSLU, or import it into SSM On-Prem.

Installing a File on the Product Instance

To install a SLAC, or policy, or ACK, on the product instance *when the product instance is not connected to CSSM or CSLU*, complete the following task:

Before you begin

Supported topologies: No Connectivity to CSSM and No CSLU

You must have the corresponding file saved in a location that is accessible to the product instance.

- For a policy, see Downloading a Policy File from CSSM, on page 94
- For an ACK, see Uploading Data or Requests to CSSM and Downloading a File, on page 95

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. Enter your password, if prompted
Step 2	**copy** *source* **bootflash:***file-name* **Example:** `Device# copy tftp://10.8.0.6/example.txt bootflash:`	Copies the file from its source location or directory to the flash memory of the product instance. • *source*: This is the location of the source file or directory to be copied. The source can be either local or remote • **bootflash:**: This is the destination for boot flash memory.
Step 3	**license smart import bootflash:** *file-name* **Example:** `Device# license smart import bootflash:example.txt`	Imports and installs the file on the product instance. After installation, a system message displays the type of file you just installed.
Step 4	**show license all** **Example:** `Device# show license all`	Displays license authorization, policy and reporting information for the product instance.

Setting the Transport Type, URL, and Reporting Interval

To configure the mode of transport for a product instance, complete the following task:

Before you begin

Supported topologies: all

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. Enter your password, if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	
Step 3	**license smart transport** {**automatic** | **callhome** | **cslu** | **off** | **smart**} **Example:** `Device(config)# license smart transport cslu`	Configures a mode of transport for the product instance to use. Choose from the following options: • **automatic**: Sets the transport mode **cslu**. • **callhome**: Enables Call Home as the transport mode. • **cslu**: This is the default transport mode. Enter this keyword if you are using CSLU *or* SSM On-Prem, with product instance-initiated communication. While the transport mode keyword is the same for CSLU and SSM On-Prem, the transport URLs are different. See **license smart url cslu** *cslu_or_on-prem_url* in the next step. • **off**: Disables all communication from the product instance. • **smart**: Enables Smart transport.
Step 4	**license smart url** {*url* | **cslu** *cslu_or_on-prem_url* | **default** | **smart** *smart_url* | **utility** *smart_url*} **Example:** `Device(config)# license smart url cslu http://192.168.0.1:8182/cslu/v1/pi`	Sets a URL for the configured transport mode. Depending on the transport mode you've chosen in the previous step, configure the corresponding URL here: • *url*: If you have configured the transport mode as **callhome**, configure this option. Enter the CSSM URL exactly as follows:

	Command or Action	Purpose

		https://tools.cisco.com/its/service/oddce/services/DDCEService
		
		The **no license smart url***url* command reverts to the default URL.
		
		• **cslu** *cslu_or_on-prem_url*: If you have configured the transport mode as **cslu**, configure this option with the URL for CSLU or SSM On-Prem, as applicable.
		
		• If you are using CSLU, enter the URL as follows:
		
		`http://<cslu_ip_or_host>:8182/cslu/v1/pi`
		
		For `<cslu_ip_or_host>`, enter the hostname or the IP address of the windows host where you have installed CSLU. 8182 is the port number and it is the only port number that CSLU uses.
		
		The **no license smart url cslu** *cslu_url* command reverts to `http://cslu-local:8182/cslu/v1/pi`
		
		• If you are using SSM On-Prem, enter the URL as follows:
		
		`http://<ip>/cslu/v1/pi/<tenant ID>`
		
		For <ip>, enter the hostname or the IP address of the server where you have installed SSM On-Prem. The <tenantID> must be the default local virtual account ID.
		
		Tip You can retrieve the entire URL from SSM On-Prem. See Retrieving the Transport URL (SSM On-Prem UI), on page 75
		
		The **no license smart url cslu** *cslu_url* command reverts to `http://cslu-local:8182/cslu/v1/pi`
		
		• **default**: Depends on the configured transport mode. Only the **smart** and **cslu** transport modes are supported with this option.

	Command or Action	Purpose
		If the transport mode is set to **cslu**, and you configure **license smart url default**, the CSLU URL is configured automatically (`https://cslu-local:8182/cslu/v1/pi`). If the transport mode is set to **smart**, and you configure **license smart url default**, the Smart URL is configured automatically (`https://smartreceiver.cisco.com/licservice/license`). • **smart** *smart_url*: If you have configured the transport type as **smart**, configure this option. Enter the URL exactly as follows: `https://smartreceiver.cisco.com/licservice/license` When you configure this option, the system automatically creates a duplicate of the URL in **license smart url** *url*. You can ignore the duplicate entry, no further action is required. The **no license smart url smart***smart_url* command reverts to the default URL. • **utility** *smart_url*: Although available on the CLI, this option is not supported.
Step 5	**license smart usage interval** *interval_in_days* **Example:** `Device(config)# license smart usage interval 40`	(Optional) Sets the reporting interval in days. By default the RUM report is sent every 30 days. The valid value range is 1 to 3650. If you do not configure an interval, the reporting interval is determined entirely by the policy value.
Step 6	**exit** **Example:** `Device(config)# exit`	Exits global configuration mode and returns to privileged EXEC mode.
Step 7	**copy running-config startup-config** **Example:** `Device# copy running-config startup-config`	Saves your entries in the configuration file.

Configuring an AIR License

In the Smart Licensing Using Policy environment, you can use this task to configure a license, or change the license being used on the product instance, or configure an add-on license on the product instance. For example, if you are currently using AIR Network Advantage and you also want to use features available with a corresponding Digital Networking Architecture (DNA) Advantage license, you can configure the same using

this task. Or for example, if you do not want to use an add-on license any more, reconfigure this command to use only the AIR Network Advantage license.

Information about available licenses can be found Smart Account or Virtual Account. The available licenses may be one of the following:

- AIR Network Essential
- AIR Network Advantage
- AIR DNA Essential
- AIR DNA Advantage

Starting with Cisco IOS XE Bengaluru 17.4.1, *only for EWC-APs*, you can opt-out of purchasing an AIR DNA license. The option to opt-out of AIR DNA licenses is available only through the Cisco Commerce portal. When you opt-out, Smart Licensing Using Policy functionality is disabled.

For a new product instance, this means:

Condition	Required Action	Outcome or Result
You opt-out of AIR DNA licenses	None.	Use only AIR Network Essentials. Smart Licensing Using Policy functionality is disabled on the product instance and for your Smart Account and Virtual Account in CSSM. License usage is not recorded, and no reporting requirements apply.
You purchase AIR DNA licenses	Enter the **license air level** command in global configuration mode and configure the corresponding AIR DNA license. Reload to use the corresponding license. Implement one of the supported topologies and fulfill reporting requirements. For information about implementing a topology, see the Supported Topologies section in this document.	Use the purchased AIR DNA and AIR Network license. Smart Licensing Using Policy functionality is enabled on the product instance and for your Smart Account and Virtual Account in CSSM.

For an existing product instance, this means:

Condition	Required Action	Outcome or Result
You are using an AIR DNA license	None.	No change. You are already in the Smart Licensing Using Policy environment.

Condition	Required Action	Outcome or Result
You do not want to renew the DNA license on term expiry	On term expiry, enter the **license air level** command in global configuration mode and configure AIR Network Essentials or AIR Network Advantage. Reload to use the corresponding license.	If you had AIR DNA Essentials, you now use AIR Network Essentials. If you had AIR DNA Advantage, you now use AIR Network Advantage. Smart Licensing Using Policy functionality is disabled on the product instance and for your Smart Account and Virtual Account in CSSM. License usage is not recorded, and no reporting requirements apply.

To configure or change the license in-use, follow this procedure:

Before you begin

Supported topologies: all

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables the privileged EXEC mode. Enter your password, if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters the global configuration mode.
Step 3	**license air level** {**air-network-advantage** [**addon air-dna-advantage**] | **air-network-essentials** [**addon air-dna-essentials**] } **Example:** `Device(config)# license air level air-network-essentials addon air-dna-essentials`	Activates the configured license on the product instance. In the accompanying example, the product instance activates the AIR DNA Essentials (along with the AIR Network Essential) license after reload. **Note** Prior to Cisco IOS XE Bengaluru 17.4.1, the default for EWC-APs was AIR DNA Essentials. Starting with 17.4.1, the default is AIR Network Essentials.
Step 4	**exit** **Example:** `Device(config)# exit`	Returns to the privileged EXEC mode.
Step 5	**copy running-config startup-config** **Example:**	Saves configuration changes.

	Command or Action	Purpose
	`Device# copy running-config startup-config`	
Step 6	**reload** **Example:** `Device# reload`	Reloads the device.

Step 7	**show version**
	Example:
	`Device# show version`
	`Cisco IOS XE Software, Version 17.03.02`
	`Cisco IOS Software [Amsterdam], C9800-CL Software (C9800-CL-K9_IOSXE), Version 17.3.2, RELEASE SOFTWARE`
	`<output truncated>`
	`AIR License Level: AIR DNA Essentials`
	`Next reload AIR license Level: AIR DNA Essentials`
	
	`Smart Licensing Status: Registration Not Applicable/Not Applicable`
	`<output truncated>`
		Displays currently used license and the license that is effective at the next reload information.

What to do next

After you configure a license level, the change is effective after a reload. To know if reporting is required, refer to the output of the **show license status** privileged EXEC command and check the `Next ACK deadline:` and `Next report push:` fields.

Note The change in license usage is recorded on the product instance. The next steps relating to reporting - if required - depend on your current topology.

- Connected to CSSM Through CSLU
  - Product Instance-initiated communication: The product instance triggers reporting and installs the returning ACK. CSLU sends the RUM report to CSSM and collects the ACK from CSSM.
  - CSLU-initiated communication: You have to collect usage from the CSLU interface: Collecting Usage Reports: CSLU Initiated (CSLU Interface), on page 65. CSLU sends the RUM report to CSSM and collects the ACK from CSSM.
- Connected Directly to CSSM: The product instance triggers reporting and installs the returning ACK.
- CSLU Disconnected from CSSM:
  - Product Instance-initiated communication: The product instance triggers reporting. You then have to report usage in the disconnected mode: Export to CSSM (CSLU Interface), on page 66 > Uploading Data or Requests to CSSM and Downloading a File, on page 95 > Import from CSSM (CSLU Interface), on page 67.

- CSLU-initiated communication: You have to collect usage from the CSLU interface and report usage in the disconnected mode: Collecting Usage Reports: CSLU Initiated (CSLU Interface), on page 65> Export to CSSM (CSLU Interface), on page 66 > Uploading Data or Requests to CSSM and Downloading a File, on page 95 > Import from CSSM (CSLU Interface), on page 67.

- No Connectivity to CSSM and No CSLU: License usage is recorded on the product instance. You must save RUM reports to a file on the product instance, and from a workstation that has connectivity to the internet, and Cisco, upload it to CSSM: Enter **license smart save usage** privileged EXEC command to save usage > Uploading Data or Requests to CSSM and Downloading a File, on page 95 > Installing a File on the Product Instance, on page 96.

Sample Resource Utilization Measurement Report

The following is a sample Resource Utilization Measurement (RUM) report, in XML format (See RUM Report and Report Acknowledgement, on page 9). Several such reports may be concatenated to form one report.

```
<?xml version="1.0" encoding="UTF-8"?>
  <smartLicense>
```

```
  </smartLicense>
```

Troubleshooting Smart Licensing Using Policy

This section provides the list of Smart Licensing Using Policy-related system messages you may encounter, possible reasons for failure, and recommended action.

System Message Overview

The system software sends system messages to the console (and, optionally, to a logging server on another system). Not all system messages mean problems with your system. Some messages are informational, and others can help diagnose problems with communications lines, internal hardware, or the system software.

How to Read System Messages

System log messages can contain up to 80 characters. Each system message begins with a percent sign (%) and is structured as follows:

```
%FACILITY-SEVERITY-MNEMONIC: Message-text
```

%FACILITY

Two or more uppercase letters that show the facility to which the message refers. A facility can be a hardware device, a protocol, or a module of the system software

SEVERITY

A single-digit code from 0 to 7 that reflects the severity of the condition. The lower the number, the more serious the situation.

Table 9: Message Severity Levels

Severity Level	Description
0 - emergency	System is unusable.
1 - alert	Immediate action required.
2 - critical	Critical condition.
3 - error	Error condition.
4 - warning	Warning condition.
5 - notification	Normal but significant condition.
6 - informational	Informational message only.
7 - debugging	Message that appears during debugging only.

MNEMONIC

A code that uniquely identifies the message.

Message-text

Message-text is a text string describing the condition. This portion of the message sometimes contains detailed information about the event, including terminal port numbers, network addresses, or addresses that correspond to locations in the system memory address space. Because the information in these variable fields changes from message to message, it is represented here by short strings enclosed in square brackets ([ ]). A decimal number, for example, is represented as [dec].

Table 10: Variable Fields in Messages

Severity Level	Description
[char]	Single character
[chars]	Character string
[dec]	Decimal number
[enet]	Ethernet address (for example, 0000.FEED.00C0)
[hex]	Hexadecimal number
[inet]	Internet address (for example, 10.0.2.16)
[int]	Integer
[node]	Address or node name
[t-line]	Terminal line number in octal (or in decimal if the decimal-TTY service is enabled)
[clock]	Clock (for example, 01:20:08 UTC Tue Mar 2 1993

System Messages

This section provides the list of Smart Licensing Using Policy-related system messages you may encounter, possible reasons for failure (incase it is a failure message), and recommended action (if action is required).

For all error messages, if you are not able to solve the problem, contact your Cisco technical support representative with the following information:

The message, exactly as it appears on the console or in the system log.

The output from the **show license tech support**, **show license history message**, and the **show platform software sl-infra** privileged EXEC commands.

- %SMART_LIC-3-POLICY_INSTALL_FAILED
- %SMART_LIC-3-AUTHORIZATION_INSTALL_FAILED
- %SMART_LIC-3-COMM_FAILED
- %SMART_LIC-3-COMM_RESTORED
- %SMART_LIC-3-POLICY_REMOVED
- %SMART_LIC-3-TRUST_CODE_INSTALL_FAILED
- %SMART_LIC-4-REPORTING_NOT_SUPPORTED
- %SMART_LIC-6-POLICY_INSTALL_SUCCESS
- %SMART_LIC-6-AUTHORIZATION_INSTALL_SUCCESS
- %SMART_LIC-6-AUTHORIZATION_REMOVED
- %SMART_LIC-6-REPORTING_REQUIRED
- %SMART_LIC-6-TRUST_CODE_INSTALL_SUCCESS
- %IOSXE_RP_EWLC_NOT-2-MSGDEVICENOTREG
- %CAPWAPAC_TRACE_MSG-3-MAX_LICENSE_AP_LIMIT_REACHED

```
Error Message %SMART_LIC-3-POLICY_INSTALL_FAILED: The installation of a new
licensing policy has failed: [chars].
```

Explanation: A policy was installed, but an error was detected while parsing the policy code, and installation failed. [chars] is the error string with details of the failure.

Possible reasons for failure include:

- A signature mismatch: This means that the system clock is not accurate.
- A timestamp mismatch: This means the system clock on the product instance is not synchronized with CSSM.

Note The device should have a valid clock and the NTP configuration.

Recommended Action:

For both possible failure reasons, ensure that the system clock is accurate and synchronized with CSSM. Configure the **ntp server** command in global configuration mode. For example:

```
Device(config)# ntp server 198.51.100.100 version 2 prefer
```

If the above does not work and policy installation still fails, and contact your Cisco technical support representative.

```
Error Message %SMART_LIC-3-AUTHORIZATION_INSTALL_FAILED: The install of a new
licensing authorization code has failed on [chars]: [chars].
```

This message is not applicable to Cisco Catalyst Access, Core, and Aggregation Switches, because there are no enforced or export-controlled licenses on these product instances.

```
Error Message %SMART_LIC-3-COMM_FAILED: Communications failure with the [chars] :
[chars]
```

Explanation: Smart Licensing communication either with CSSM, or CSLU, or SSM On-Prem failed. The first [chars] is the currently configured transport type, and the second [chars] is the error string with details of the failure. This message appears for every communication attempt that fails.

Possible reasons for failure include:

- CSSM, CSLU, SSM On-Prem is not reachable: This means that there is a network reachability problem.
- 404 host not found: This means the CSSM server is down.
- A TLS or SSL handshake failure caused by a missing client certificate. The certificate is required for TLS authentication of the two communicating sides. A recent server upgrade may have cause the certificate to be removed. This reason applies only to a topology where the product instance is directly connected to CSSM.

Note If the error message is displayed for this reason, there is no actual configuration error or disruption in the communication with CSSM.

For topologies where the product instance initiates the sending of RUM reports (Connected to CSSM Through CSLU: Product Instance-Initiated Communication, Connected Directly to CSSM, CSLU Disconnected from CSSM: Product Instance-Initiated Communication, and SSM On-Prem Deployment: Product Instance-Initiated Communication) if this communication failure message coincides with scheduled reporting (**license smart usage interval** *interval_in_days* global configuration command), the product instance attempts to send out the RUM report for up to four hours after the scheduled time has expired. If it is still unable to send out the report (because the communication failure persists), the system resets the interval to 15 minutes. Once the communication failure is resolved, the system reverts the reporting interval to last configured value.

Recommended Action:

Troubleshooting steps are provided for when CSSM is not reachable or there is a missing client certificate, when CSLU is not reachable, and when SSM On-Prem is not reachable.

- If a client certificate is missing and there is no actual configuration error or disruption in the communication with CSSM:

  To resolve the error, configure the **ip http client secure-trustpoint** *trustpoint-name* command in global configuration mode. For *trustpoint-name*, enter only `SLA-TrustPoint`. This command specifies that the secure HTTP client should use the certificate associated with the trustpoint indicated by the trustpoint-name argument.

- If CSSM is not reachable and the configured transport type is **smart**:

  1. Check if the smart URL is configured correctly. Use the **show license status** command in privileged EXEC mode, to check if the URL is exactly as follows: https://smartreceiver.cisco.com/licservice/license. If it is not, reconfigure the **license smart url smart** *smar_URL* command in global configuration mode.
  2. Check DNS resolution. Verify that the product instance can ping `smartreceiver.cisco.com` or the nslookup translated IP. The following example shows how to ping the translated IP

     ```
     Device# ping 171.70.168.183
     Type escape sequence to abort.
     Sending 5, 100-byte ICMP Echos to 171.70.168.183, timeout is 2 seconds:
     !!!!!
     Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/2 ms
     ```

- If CSSM is not reachable and the configured transport type is **callhome**:

  1. Check if the URL is entered correctly. Use the **show license status** command in privileged EXEC mode, to check if the URL is exactly as follows: https://tools.cisco.com/its/service/oddce/services/DDCEService.
  2. Check if Call Home profile `CiscoTAC-1` is active and destination URL is correct. Use the **show call-home profile all** command in privileged EXEC mode:

     ```
     Current smart-licensing transport settings:
      Smart-license messages: enabled
      Profile: CiscoTAC-1 (status: ACTIVE)
      Destination  URL(s):  https://tools.cisco.com/its/service/oddce/services/DDCEService
     ```

  3. Check DNS Resolution. Verify that the product instance can ping `tools.cisco.com`, or the nslookup translated IP.

     ```
     Device# ping tools.cisco.com
     Type escape sequence to abort.
     Sending 5, 100-byte ICMP Echos to 173.37.145.8, timeout is 2 seconds:
     !!!!!
     Success rate is 100 percent (5/5), round-trip min/avg/max = 41/41/42 ms
     ```

     If the above does not work check the following: if the product instance is set, if the product instance IP network is up. To ensure that the network is up, configure the **no shutdown** command in interface configuration mode.

     Check if the device is subnet masked with a subnet IP, and if the DNS IP is confgured.

  4. Verify that the HTTPs client source interface is correct.

     Use the **show ip http client** command in privileged EXEC mode to display current configuration. Use **ip http client source-interface** command in global configuration mode to reconfigure it.

     In case the above does not work, double-check your routing rules, and firewall settings.

- If CSLU is not reachable:

  1. Check if CSLU discovery works.

     - Zero-touch DNS discovery of `cslu-local` or DNS discovery of your domain..

       In the **show license all** command output, check if the `Last ACK received:` field. If this has a recent timestamp it means that the product instance has connectivity with CSLU. If it is not, proceed with the following checks:

       Check if the product instance is able to ping `cslu-local`. A successful ping confirms that the product instance is reachable.

       If the above does not work, configure the name server with an entry where hostname `cslu-local` is mapped to the CSLU IP address (the windows host where you installed CSLU). Configure the **ip domain name** *domain-name* and **ip name-server** *server-address* commands in global configuration mode. Here the CSLU IP is 192.168.0.1 and name-server creates entry `cslu-local.example.com`:

       ```
       Device(config)# ip domain name example.com
       Device(config)# ip name-server 192.168.0.1
       ```

     - CSLU URL is configured.

       In the **show license all** command output, under the `Transport:` header check the following: The `Type:` must be `cslu`and `Cslu address:` must have the hostname or the IP address of the windows host where you have installed CSLU. Check if the rest of the address is configured as shown below and check if the port number is 8182.

       ```
       Transport:
         Type: cslu
         Cslu address: http://192.168.0.1:8182/cslu/v1/pi
       ```

       If it is not, configure the **license smart transport cslu** and **license smart url cslu** *http://<cslu_ip_or_host>:8182/cslu/v1/pi* commands in global configuration mode

  2. For CSLU-initiated communication, in addition to the CSLU discovery checks listed above, check the following:

     Verify HTTP connectivity. Use the **show ip http server session-module** command in privileged EXEC mode. In the output, under header `HTTP server current connections:`, check that `SL_HTTP` is active. If it is not re-configure the **ip http** commands as mentioned in Ensuring Network Reachability for CSLU-Initiated Communication, on page 67

     From a Web browser on the device where CSLU is installed, verify `https://<product-instance-ip>/`. This ensures that the REST API from CSLU to the product instance works as expected.

- If SSM On-Prem is not reachable:

  1. For product instance-initiated communication, check if the SSM On-Prem transport type and URL are configured correctly.

     In the **show license all** command output, under the `Transport:` header check the following: The `Type:` must be `cslu`and `Cslu address:` must have the hostname or the IP address of the server where you have installed SSM On-Prem and <tenantID> of the *default* local virtual account. See the example below:

```
Transport:
  Type: cslu
  Cslu address: https://192.168.0.1/cslu/v1/pi/on-prem-default
```

Check if you have the correct URL from SSM On-Prem (Retrieving the Transport URL (SSM On-Prem UI), on page 75) and then configure **license smart transport cslu** and **license smart url cslu** *http://<ip>/cslu/v1/pi/<tenant ID>* commands in global configuration mode.

Check that you have configured any other required commands for your network as mentioned in Ensuring Network Reachability for Product Instance-Initiated Communication, on page 72.

2. For SSM On-Prem-initiated communication, check HTTPs connectivity.

   Use the **show ip http server session-module** command in privileged EXEC mode. In the output, under header `HTTP server current connections:`, check that `SL_HTTP` is active. If it is not re-configure the **ip http** commands as mentioned in Ensuring Network Reachability for SSM On-Prem-Initiated Communication, on page 77.

3. Check trustpoint and that certificates are accepted.

   For both forms of communication in an SSM On-Prem Deployment, ensure that the correct trustpoint is used and that the necessary certificates are accepted:

```
Device(config)# crypto pki trustpoint SLA-TrustPoint
Device(ca-trustpoint)#
Device(ca-trustpoint)# enrollment terminal
Device(ca-trustpoint)# revocation-check none
Device(ca-trustpoint)# end
Device# copy running-config startup-config
```

If the above does not work and policy installation still fails, contact your Cisco technical support representative.

```
Error Message  %SMART_LIC-3-COMM_RESTORED: Communications with the [chars] restored.
[chars] - depends on the transport type
        - Cisco Smart Software Manager (CSSM)
        - Cisco Smart License utility (CSLU)
Smart Agent communication with either the Cisco Smart Software Manager (CSSM) or the Cisco
 Smart License
utility (CSLU) has been restored. No action required.
```

Explanation: Product instance communication with either the CSSM, or CSLU, or SSM On-Prem is restored.

Recommended Action: No action required.

```
Error Message %SMART_LIC-3-POLICY_REMOVED: The licensing policy has been removed.
```

Explanation: A previously installed *custom* licensing policy has been removed. The `Cisco default` policy is then automatically effective. This may cause a change in the behavior of smart licensing.

Possible reasons for failure include:

If you have entered the **license smart factory reset** command in privileged EXEC mode all licensing information including the policy is removed.

Recommended Action:

If the policy was removed intentionally, then no further action is required.

If the policy was removed inadvertantly, you can reapply the policy. Depending on the topology you have implemented, follow the corresponding method to retrieve the policy:

- Connected Directly to CSSM:

  Enter **show license status**, and check field `Trust Code Installed:`. If trust is established, then CSSM will automatically return the policy again. The policy is automatically re-installed on product instances of the corresponding Virtual Account.

  If trust has not been established, complete these tasks: Generating a New Token for a Trust Code from CSSM, on page 92 and Installing a Trust Code, on page 93. When you have completed these tasks, CSSM will automatically return the policy again. The policy is then automatically installed on all product instances of that Virtual Account.

- Connected to CSSM Through CSLU:

  - For product instance-initiatied communication), enter the **license smart sync** command in privileged EXEC mode. The synchronization request causes CSLU to push the missing information (a policy or authurization code) to the product instance.
  - For CSLU-initiated communication, complete this task: Collecting Usage Reports: CSLU Initiated (CSLU Interface), on page 65. This causes CSLU to detect and re-furnish the missing policy in an ACK response.

- CSLU Disconnected from CSSM:

  - For product instance-initiatied communication), enter the **license smart sync** command in privileged EXEC mode. The synchronization request causes CSLU to push the missing information (a policy or authurization code) to the product instance. Then complete these tasks in the given order:Export to CSSM (CSLU Interface), on page 66 > Uploading Data or Requests to CSSM and Downloading a File, on page 95 > Import from CSSM (CSLU Interface), on page 67.
  - For CSLU-initiated communication, complete this task: Collecting Usage Reports: CSLU Initiated (CSLU Interface), on page 65. This causes CSLU to detect and re-furnish the missing policy in an ACK response. Then complete these tasks in the given order: Export to CSSM (CSLU Interface), on page 66 > Uploading Data or Requests to CSSM and Downloading a File, on page 95 > Import from CSSM (CSLU Interface), on page 67.

- No Connectivity to CSSM and No CSLU

  If you are in an entirely air-gapped network, from a workstation that has connectivity to the internet and CSSM complete this task: Downloading a Policy File from CSSM, on page 94.

  Then complete this task on the product instance: Installing a File on the Product Instance, on page 96.

- SSM On-Prem Deployment

  - For product instance-initiatied communication), enter the **license smart sync** command in privileged EXEC mode. The causes the product instance to synchronize with SSM On-Prem and restore any required or missing information. Then synchronize SSM On-Prem with CSSM if required:
  - For SSM On-Prem-initiated communication: In the SSM On-Prem UI, navigate to **Reports** > **Synchronisation pull schedule with the devices** > **Synchronise now with the device**.

For both forms of communication in an SSM On-Prem Deployment, synchronize with CSSM using either option:

- SSM On-Prem is connected to CSSM: In the SSM On-Prem UI, Smart Licensing workspace, nagivate to **Reports** > **Usage Schedules** > **Synchronize now with Cisco**.
- SSM On-Prem is not connected to CSSM: Exporting and Importing Usage Data (SSM On-Prem UI), on page 75.

```
Error Message %SMART_LIC-3-TRUST_CODE_INSTALL_FAILED: The install of a new licensing
trust code has failed on [chars]: [chars].
```

Explanation: Trust code installation has failed. The first [chars] is the UDI where trust code installation was attempted. The second [chars] is the error string with details of the failure.

Possible reasons for failure include:

- A trust code is already installed: Trust codes are node-locked to the UDI of the product instance. If the UDI is already registered, and you try to install another one, installation fails.
- Smart Account-Virtual Account mismatch: This means the Smart Account or Virtual Account (for which the token ID was generated) does not include the product instance on which you installed the trust code. The token generated in CSSM, applies at the Smart Account or Virtual Account level and applies only to all product instances in that account.
- A signature mismatch: This means that the system clock is not accurate.
- Timestamp mismatch: This means the product instance time is not synchronized with CSSM, and can cause installation to fail.

Recommended Action:

- A trust code is already installed: If you want to install a trust code inspite of an existing trust code on the product instance, re-configure the **license smart trust idtoken** *id_token_value* {**local** | **all**} [**force**] command in privileged EXEC mode, and be sure to include the **force** keyword this time. Entering the **force** keyword sets a force flag in the message sent to CSSM to create a new trust code even if one already exists.
- Smart Account-Virtual Account mismatch:

  Log in to the CSSM Web UI at https://software.cisco.com and click **Smart Software Licensing**>**Inventory** > **Product Instances**.

  Check if the product instance on which you want to generate the token is listed in the selected Virtual Account. If it is, proceed to the next step. If not, check and select the correct Smart Account and Virtual Account. Then complete these tasks again: Generating a New Token for a Trust Code from CSSM, on page 92 and Installing a Trust Code, on page 93.
- Timestamp mismatch and signature mismatch: Configure the **ntp server** command in global configuration mode. For example:

  ```
  Device(config)# ntp server 198.51.100.100 version 2 prefer
  ```

```
Error Message    %SMART_LIC-4-REPORTING_NOT_SUPPORTED: The CSSM OnPrem that this
product instance is connected to is down rev and does not support the enhanced policy and
usage
reporting mode.
```

Explanation: Cisco Smart Software Manager On-Prem (formerly known as Cisco Smart Software Manager satellite) is supported in the Smart Licensing Using Policy environment starting with Cisco IOS XE Amsterdam 17.3.3 only (See SSM On-Prem, on page 5). In *unsupported* releases, the product instance will behave as follows:

- Stop sending registration renewals and authorization renewals.
- Start recording usage and saving RUM reports locally.

Recommended Action:

You have the following options:

- Refer to and implement one of the supported topologies instead. See: Supported Topologies, on page 11.
- Upgrade to a release where SSM On-Prem is supported with Smart Licensing Using Policy. See Migrating to a Version of SSM On-Prem That Supports Smart Licensing Using Policy, on page 60.

```
Error Message %SMART_LIC-6-POLICY_INSTALL_SUCCESS: A new licensing policy
was successfully installed.
```

Explanation: A policy was installed in one of the following ways:

- Using Cisco IOS commands.
- CSLU-initiated communication.
- As part of an ACK response.

Recommended Action: No action is required. If you want to know which policy is applied (the policy in-use) and its reporting requirements, enter the **show license all** command in privileged EXEC mode.

```
Error Message %SMART_LIC-6-AUTHORIZATION_INSTALL_SUCCESS: A new licensing
authorization code was successfully installed on: [chars].
```

This message is not applicable to Cisco Catalyst Access, Core, and Aggregation Switches, because there are no enforced or export-controlled licenses on these product instances.

```
Error Message %SMART_LIC-6-AUTHORIZATION_REMOVED: A licensing authorization code has
 been removed from [chars]
```

Explanation: [chars] is the UDI where the authorization code was installed. The authorization code has been removed. This removes the licenses from the product instance and may cause a change in the behavior of smart licensing and the features using licenses.

Recommended Action: No action is required. If you want to see the current state of the license, enter the **show license all** command in privileged EXEC mode.


```
Error Message %SMART_LIC-6-REPORTING_REQUIRED: A Usage report acknowledgement
will be required in [dec] days.
```

Explanation: This is an alert which means that RUM reporting to Cisco is required. [dec] is the amount of time (in days) left to meet this reporting requirements.

Recommended Action: Ensure that RUM reports are sent within the requested time. The topology you have implemented determines the reporting method.

- Connected to CSSM Through CSLU
  - For product instance-initiatied communication: Enter the **license smart sync** command in privileged EXEC mode. If CSLU is currently logged into CSSM the reports will be automatically sent to the associated Smart Account and Virtual Account in CSSM.
  - For CSLU-initiated communication, complete this task: Collecting Usage Reports: CSLU Initiated (CSLU Interface), on page 65.
- Connected Directly to CSSM: Enter the **license smart sync** command in privileged EXEC mode.
- Connected to CSSM Through a Controller: If the product instance is managed by a controller, the controller will send the RUM report at the scheduled time.

  If you are using Cisco DNA Center as the controller, you have the option of ad-hoc reporting. See the *Cisco DNA Center Administrator Guide* of the required release (Release 2.2.2 onwards) > *Manage Licenses* > *Upload Resource Utilization Details to CSSM*.
- CSLU Disconnected from CSSM: If the product instance is connected to CSLU, synchronize with the product instance as shown for "Connected to CSSM Through CSLU"above, then complete these tasks: Export to CSSM (CSLU Interface), on page 66, Uploading Data or Requests to CSSM and Downloading a File, on page 95, and Import from CSSM (CSLU Interface), on page 67.
- No Connectivity to CSSM and No CSLU: Enter the **license smart save usage** command in privileged EXEC mode, to save the required usage information in a file. Then, from a workstation where you have connectivity to CSSM, complete these tasks: Uploading Data or Requests to CSSM and Downloading a File, on page 95 > Installing a File on the Product Instance, on page 96.
- SSM On-Prem Deployment:

  Synchronize the product instance with SSM On-Prem:
  - For product instance-initiatied communication: Enter the **license smart sync** command in privileged EXEC mode. If CSLU is currently logged into CSSM the reports will be automatically sent to the associated Smart Account and Virtual Account in CSSM.

- For SSM On-Prem-initiated communication, complete this task: In the SSM On-Prem UI, navigate to **Reports** > **Synchronisation pull schedule with the devices** > **Synchronise now with the device**.

Synchronize usage information with CSSM (*choose one*)

- SSM On-Prem is connected to CSSM: In the SSM On-Prem UI, Smart Licensing workspace, nagivate to **Reports** > **Usage Schedules** > **Synchronize now with Cisco**.
- SSM On-Prem is not connected to CSSM: Exporting and Importing Usage Data (SSM On-Prem UI), on page 75.

```
Error Message %SMART_LIC-6-TRUST_CODE_INSTALL_SUCCESS: A new licensing trust code
 was successfully installed on [chars].
```

Explanation:[chars] is the UDI where the trust code was successfully installed.

Recommended Action: No action is required. If you want to verify that the trust code is installed, enter the **show license status** command in privileged EXEC mode. Look for the updated timestamp under header `Trust Code Installed:` in the output.

```
Error Message %IOSXE_RP_EWLC_NOT-2-MSGDEVICENOTREG: Unregistered 9800-CL can only
be used in lab. For production usage, please register this device in [int] days. Failure
to do so
will result in a limited number [50] of Access Points being allowed post this.
```

Explanation: An ACK is required on this product instance. [int] is the amount of time left to install an ACK on the product instance.

This system message is displayed once everyday, until the first ACK is made available on the product instance.

Recommended Action:

Implement one of the supported topologies and complete usage reporting. The method you can use to send the RUM report to CSSM and ACK installation depends on the topology you implement. See: Supported Topologies, on page 11 and How to Configure Smart Licensing Using Policy: Workflows by Topology , on page 28.

```
Error Message %CAPWAPAC_TRACE_MSG-3-MAX_LICENSE_AP_LIMIT_REACHED: Chassis 1 R0/0:
wncmgrd: Ap MAC: [enet] is not allowed to join. Please start reporting licensing to Cisco
to get the
 ACK for resumption of usual operation.
```

Explanation: The ACK deadline for this product instance has passed and an ACK has still not been installed. [enet] is the MAC address of the AP that is trying to join the Cisco Catalyst 9800-CL Wireless Controller but is not allowed because the requisite ACK is not installed.

Recommended Action:

Implement one of the supported topologies and complete usage reporting. The method you can use to send the RUM report to CSSM and ACK installation depends on the topology you implement. See: Supported Topologies, on page 11 and How to Configure Smart Licensing Using Policy: Workflows by Topology , on page 28.

Additional References for Smart Licensing Using Policy

Topic	Document Title
For complete syntax and usage information for the commands used in this chapter, see the Command Reference of the corresponding release.	Cisco Catalyst 9800 Series Wireless Controller Command Reference
Cisco Smart Software Manager Help	Smart Software Manager Help
Cisco Smart License Utility (CSLU) installation and user guides	Cisco Smart License Utility Quick Start Setup Guide Cisco Smart License Utility User Guide

Feature History for Smart Licensing Using Policy

This table provides release and related information for features explained in this module.

These features are available on all releases subsequent to the one they were introduced in, unless noted otherwise.

Release	Feature	Feature Information
Cisco IOS XE Gibraltar 16.10.1	Smart Licensing	A cloud-based, software license management solution that allows you to manage and track the status of your license, hardware, and software usage trends.

Release	Feature	Feature Information
Cisco IOS XE Amsterdam 17.3.2a	Smart Licensing Using Policy	An enhanced version of Smart Licensing, with the overarching objective of providing a licensing solution that does not interrupt the operations of your network, rather, one that enables a compliance relationship to account for the hardware and software licenses you purchase and use. Starting with this release, Smart Licensing Using Policy is automatically enabled on the device. This is also the case when you upgrade to this release. By default, your Smart Account and Virtual Account in CSSM is enabled for Smart Licensing Using Policy.
	Cisco DNA Center Support for Smart Licensing Using Policy	Cisco DNA Center supports Smart Licensing Using Policy functionality starting with Cisco DNA Center Release 2.2.2. When you use Cisco DNA Center to manage a product instance, Cisco DNA Center connects to CSSM, and is the interface for all communication to and from CSSM. For information about the comptabile controller and product instance versions, see Controller, on page 4. For information about this topology, see Connected to CSSM Through a Controller, on page 16 and Workflow for Topology: Connected to CSSM Through a Controller, on page 35.
Cisco IOS XE Amsterdam 17.3.3	Smart Software Manager On-Prem (SSM On-Prem) Support for Smart Licensing Using Policy	SSM On-Prem is an asset manager, which works in conjunction with CSSM. It enables you to administer products and licenses on your premises instead of having to directly connect to CSSM. For information about the comptabile SSM On-Prem and product instance versions, see: SSM On-Prem, on page 5. For an overview of this topology, and to know how to implement it see SSM On-Prem Deployment, on page 19 and Workflow for Topology: SSM On-Prem Deployment, on page 37. For information about migrating from an exisiting version of SSM On-Prem, to one that supports Smart Licensing Using Policy, see Migrating to a Version of SSM On-Prem That Supports Smart Licensing Using Policy, on page 60.

Release	Feature	Feature Information
Cisco IOS XE Bengaluru 17.4.1	Option to opt-out of AIR DNA licenses and change in default license level for EWC-APs.	The option to opt-out of purchasing an AIR DNA license was introduced. This option is available only through the Cisco Commerce portal. When you opt-out, you use only the AIR Network Essentials license, and Smart Licensing Using Policy functionality is disabled on the product instance. For more information, see the *Configuring an AIR License* section in this guide. Starting with this release, the default license on an EWC-AP was also changed to AIR Network Essentials.

Release	Feature	Feature Information
Cisco IOS XE Cupertino 17.7.1	RUM Reporting and Acknowledgment Requirement for Cisco Catalyst 9800-CL Wireless Controller	If you are using a Cisco Catalyst 9800-CL Wireless Controller, you must complete RUM reporting and ensure that the Acknowledgment (ACK) is made available on the product instance - at least once. This is to ensure that correct and up-to-date usage information is reflected in CSSM.
	Factory-installed trust code	For new hardware orders, a trust code is now installed at the time of manufacturing. Note: You cannot use a factory-installed trust code to communicate with CSSM. See: Overview, on page 2 and Trust Code, on page 10.
	Support for trust code in additional topologies	A trust code is automatically obtained in topologies where the product instance initiates the sending of data to *CSLU* and in topologies where the product instance is in an air-gapped network. See: • Trust Code, on page 10 • Connected to CSSM Through CSLU, on page 11, Tasks for Product Instance-Initiated Communication, on page 28. • CSLU Disconnected from CSSM, on page 15, Tasks for Product Instance-Initiated Communication, on page 32. • No Connectivity to CSSM and No CSLU, on page 17, Workflow for Topology: No Connectivity to CSSM and No CSLU, on page 36.
	RUM Report optimization and availability of statistics	RUM report generation and related processes have been optimized. This includes a reduction in the time it takes to process RUM reports, better memory and disk space utilization, and visibility into the RUM reports on the product instance (how many there are, the processing state each one is in, if there are errors in any of them, and so on). See RUM Report and Report Acknowledgement, on page 9. Also see the **show license rum**, **show license all**, and **show license tech** commands in the command reference of the applicable release.

Release	Feature	Feature Information
	Support to collect software version in a RUM report	If version privacy is disabled (**no license smart privacy version** global configuration command), the Cisco IOS-XE software version running on the product instance and Smart Agent version information is *included* in the RUM report. See the **license smart** global configuration command in the command reference of the applicable release.
	Account information included in the ACK and **show** command outputs	A RUM acknowledgement (ACK) includes the Smart Account and Virtual Account that was reported to, in CSSM. You can then display account information using various **show** commands. The account information that is displayed is always as per the latest available ACK on the product instance. See the **show license all**, **show license summary**, **show license status**, and **show license tech** commands in the command reference of the applicable release.
	CSLU support for Linux	CSLU can now be deployed on a machine (laptop or desktop) running Linux. See CSLU, on page 3, Workflow for Topology: Connected to CSSM Through CSLU, on page 28, and CSLU Disconnected from CSSM, on page 15.

Release	Feature	Feature Information
Cisco IOS XE Cupertino 17.9.1	RUM Report Throttling	For all topologies where the product instance initiates communication, the minimum reporting frequency is throttled to one day. This means the product instance does not send more than one RUM report a day. The affected topologies are: *Connected Directly to CSSM*, *Connected to CSSM Through CSLU* (product instance-initiated communication), *CSLU Disconnected from CSSM* (product instance-initiated communication), and *SSM On-Prem Deployment* (product instance-initiated communication). You can override the reporting frequency throttling, by entering the **license smart sync** command in privileged EXEC mode. This triggers an on-demand synchronization with CSSM or CSLU, or SSM On-Prem, to send and receive any pending data. RUM report throttling also applies to the Cisco IOS XE Amsterdam 17.3.6 and later releases of the 17.3.x train, and Cisco IOS XE Bengaluru 17.6.4 and later releases of the 17.6.x train. From Cisco IOS XE Cupertino 17.9.1, RUM report throttling is applicable to *all* subsequent releases. See: Connected to CSSM Through CSLU, on page 11, Connected to CSSM Through CSLU, on page 11, CSLU Disconnected from CSSM, on page 15, and SSM On-Prem Deployment, on page 19.