



How to Buy

Cisco ASR 9000 Series Aggregation Services Router Software License Operations White Paper



Executive Summary

This document focuses on license operations on ASR9000 product families. For general information on ASR9000 software license, please reference Cisco IOS XR Software User Document, Software entitlement section.

Feature History for Software Entitlement on the ASR9K	
Release	Modification
Release 3.9.0	The software entitlement feature was introduced.
Release 4.3.1	NV Satellite license was supported.
Release 5.2.0	Smart Licensing was introduced.
Release 5.3.1	Support for Smart Licensing was introduced on Tomahawk Line Cards. General availability release for Smart Licensing on ASR 9000.

For more on the Software Entitlement on the ASR9K, do look up:

http://www.cisco.com/c/en/us/td/docs/routers/asr9000/software/asr9k_r5-3/sysman/configuration/guide/b-sysman-cg-53xasr9k/b-sysman-cg-53xasr9k_chapter_0110.html

ASR9K Licensing Models:

1. [Traditional XR licensing](#) – Existing licensing scheme
2. [Smart Licensing](#) – The way forward, for all that the Smart licensing brings to the table
3. [PAYG \(Consumption Model\)](#) - Pay as you grow, use what you want, when you want

****Move towards Smart licensing and Consumption based models**:**

- The **Smart licensing and the Consumption based models offer a lot of additional benefits when it comes to ease of purchasing, management and reporting.**
- **Smart licensing** is a cloud-based software license management solution that enables you to automate time-consuming, manual licensing tasks. The solution allows you to easily track the status of your license and software usage trends.
- **Consumption model** brings in the much needed PAYG mode of licensing enabling customers to use what they want when they want. Smart licensing is the base requirement to move towards the Consumption model.

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1. Traditional XR Licensing:

1.1 General Information

An ASR9k license is chassis-locked to a unique device identifier (UDI) which is like a chassis ID. The UDI is comprised of the chassis serial number and product ID. A license key is generated with CSL tool when a license purchase order or PAK is registered on <http://www.cisco.com/go/license>. The license can only be installed and activated on the router to which the chassis product ID and serial number match.

An ASR9k license has a scope of either slot (“slot-based license”) or chassis (“chassis based license”). “Slot-based license” is “floating” type license within a chassis, i.e. any suitable slot may take a license from a pool of available licenses, until all the available licenses of the required type are taken. For complete information of ASR9k licenses, please reference Table 2 at the end of the document.

Most feature functionality can be enabled without licenses, except L3VPN, G.709, Video Monitoring and Cluster. In other words the above feature licenses should be installed onto the routers before enabling these features.

There are other features that also require licenses, but software checking has not been implemented yet. These features include but not limited to nV satellite, mobile, BNG, CGN and V6-INLN.

When a feature is disabled, the licenses that are in use will be released back to the shared available license pool.

2. License CLI Commands

Table 1 Frequently Used License CLI Commands

CLI Name	Parameters	Comments
Administration commands		
license add	[tar] <license file name>	<p>Adds licenses to the system.</p> <p>The license file may be local to the system or a remote file on a TFTP server.</p> <p>The tar is optional; it indicates that the license</p>

		file is contained in a tar file.
license remove	<feature-ID> id <license-ID>	<p>This command permanently removes licenses from the system. The license-IDs are automatically generated identifiers which specify a count of licenses for the given feature which are tied to a single chassis serial number, and which were added in one license file. The number of licenses to remove cannot be specified by the user, but is fixed based on the number of licenses added by the original license file. In order to be able to remove a subset of licenses, the licenses must be added in stages using separate license files.</p> <p>This command simply removes the licenses and provides no re-host ticket or other proof of removal. It is provided as a manual method to remove licenses when permissions tickets are not available.</p> <p>Licenses can be removed only if they are in the available state. In other words, you have to clear the feature configuration before that the license can be released back to the license pool.</p>
clear license		All licenses are removed from the router's persistent storage.
clear license log	{operational administrative }	Remove either the operational or administrative logs for the

		license system. The license log does not persist between reloads.
license move	<feature-ID> slot [count] from { <node-ID> allocated } to { <node-ID> available } [evaluation permanent]	<p>Move licenses manually from allocated to available or from one slot to another slot. By default one license is moved. The command can only be applied to slot-based licenses.</p> <p>If no other licenses are available on the specified source slot, the command will revoke active licenses to satisfy the request.</p> <p>Because this command may make licensed features stop working on the “source” card, the command will give a warning prompt to the user.</p> <p>The keyword “allocated” can be used to move all allocated licenses into available state. This will not cause active licenses to be moved to available state. The “from allocated” option can only be used with the “to available” option.</p> <p>If no count is specified, the default is to move one license.</p>
license backup	<backup file name>	<p>Back up the licenses stored in the router’s persistent storage.</p> <p>Backup file can be local to the system or a remote file on a TFTP server.</p> <p>If the file already exists the</p>

		<p>user will be asked to confirm before it is overwritten.</p> <p>The backup stores all the same information as the license database: licenses, slot allocations and the current license operation identifier.</p>
license restore	<backup file name>	<p>The licenses are restored on the router using an earlier backup copy that was created using the license backup command from the same chassis. Backup file can be a local file on the system or a remote file on a TFTP server.</p> <p>The operation will be successful if between the previous backup and this restore, there has been no new license installation or license removal happened.</p>
Administration Configuration Commands		
license	<feature-ID> location <location all>]	<p>Configure license feature ID to bind to a location or all locations.</p> <p>Prior to 4.3.1, we suggest to configure the license to location all.</p> <p>For release 4.3.1 and later, no configuration is needed – you may safely skip this requirement.</p>
Show commands		
show license	[<feature-ID> location <location>]	Shows all license information. Optionally limit the displayed licenses to a

		specific feature ID or those allocated to a specific slot.
show license	active [<feature-ID> location <location>]	Shows license information for licenses currently checked-out/being used by applications. Optionally limit the displayed licenses to a specific feature ID or a specific slot.
show license	allocated [<feature-ID> location <location>]	Shows license information for licenses allocated to a slot but not used. Optionally limit the displayed licenses to a specific feature ID or those allocated to a specific slot.
show license	available [<feature-ID>]	List the licenses not currently in use or allocated to slots. Optionally limit the displayed licenses to a specific feature ID.
show license	evaluation [<feature-ID> location <location>]	Display the evaluation licenses currently allocated, available or in use, including the number of days left until they expire. Optionally, limit the displayed licenses to a specific feature ID or those allocated to a specific slot.
show license	expired [<feature-ID> location <location>]	Show evaluation licenses which have expired. Optionally, display only a given feature ID license, or the licenses allocated to a specific slot or LR/SDR.
show license	log { operational administration } [<request-ID> <feature-ID> location <location>]	Show the operational or administrative logs for the license system. Optionally, display a specific request, or the logs for a specific slot or a specific feature ID.
show license	UDI	This will display the complete UDI to which the license will be tied.

		In cluster, the command also displays the UDI information for other racks.
show license	backup <file-name>	Display the UDI information and license summary of a backup database, so that the user can confirm the contents of a particular backup file before restoring it.

More CLI commands and their detailed usage related to license can be found in User Document, Software Entitlement Section, see links below:

http://www.cisco.com/en/US/docs/routers/asr9000/software/asr9k_r4.0/system_management/command/reference/b_yr40asr9k_chapter_01101.html

3. License Key Generation

After a license purchase order is placed, a PAK or PAK(s) will be mailed to the customers. Once received the PAK(s) the customer should login to Cisco license portal <http://www.cisco.com/go/license> and perform product license registration. The portal is an easy-to-use self-service tool (during registration, you will be asked for chassis UDI for which the license to be installed, so please have it ready beforehand). Upon completion of license registration, the user can either download the license keys or request the license keys to be sent by email. Then we can proceed to the next step.

4. License Installation

Before enabling licensed features, you need to install the licenses applicable to the feature (please see Table 2 for reference).

Note: The act of installing a license will not cause any interruption to the control or data plane forwarding.

4.1 Installing licenses

Below is the procedures on license installation, applies to all ASR9000 product families.

1. Copy the license file received from CCO to your TFTP server (or a local disk such as a USB drive).
2. Go to router admin mode and enter (admin)#license add cli command

Now you should have license installed, "show license" will display the status of the installed licenses.

Here are some examples for license add and show output:

```
Router(admin)#license add tftp://203.0.113.245/auto/tftplic/  
FOX1602GSK3_201301150924430090.lic
```

```
Info: License add successful for feature(s): "A9K-36X10G-AIP-SE"
```

```
License command "license add  
tftp://203.0.113.245/auto/tftplic/FOX1602GSK3_201301150924430090.lic sdr Owner"  
completed successfully.
```

```
Router(admin)#show license  
FeatureID: A9K-36X10G-AIP-TR (Slot based, Permanent)  
Total licenses 1  
Available for use 1  
Allocated to location 0  
Active 0  
Store name Permanent  
Store index 4  
Pool: Owner  
Total licenses in pool: 1  
Status: Available 1 Operational: 0
```

Note: Please keep license files you get from Cisco in a safe place. We also suggest you keep a copy under the harddisk: of both RSP(s) to be on the safer side.

Once a license is installed, it is available to any slot where the corresponding feature runs. Prior to 4.3.1 you must configure the license to bind to a slot where you will enable the feature, or configure the license to bind to all slots in which case, the available licenses serve as a pool – the slot with the feature configured first takes the first available license, and so on so forth until all the available licenses are taken.

3. (admin-config)#license feature-ID location <node_loc> | <all>

Below is a configuration example:

```
Router(admin-config)#license A9K-36X10G-AIP-SE location 0/3/CPU0  
Router(admin-config)#commit
```

Or

```
Router(admin-config)#license A9K-36X10G-AIP-SE location all
```

```
Router(admin-config)#commit
```

Note: configuring a license (type) to location all is equivalent to configuring a license to all locations internally (see illustration below). By doing so you leave it to software to decide where the license to be allocated and it is particular meaningful if the license is a chassis/system license.

```
Router(admin-config)#license A9K-36X10G-AIP-SE location 0/0/CPU0
Router(admin-config)#license A9K-36X10G-AIP-SE location 0/1/CPU0
Router(admin-config)#license A9K-36X10G-AIP-SE location 0/2/CPU0
.....
Router(admin-config)#license A9K-36X10G-AIP-SE location 0/RSP0/CPU0
.....
```

Note: For release 4.3.1 and later, you do not need to configure the license to bind to a slot or to all slots. By default the licenses are available to all slots.

Now you may continue and enable the feature via feature configuration, see an example below:

```
Router(config)# interface tenGigE 0/3/0/0
Router(config-if)#vrf license
Router(config-if)#commit
```

After interface configured, “show license” should reflect the license state as below:

```
Router(admin)#show license
```

```
FeatureID: A9K-36X10G-AIP-TR (Slot based, Permanent)
  Total licenses 1
  Available for use 0
  Allocated to location 0
  Active 1
  Store name Permanent
  Store index 4
  Pool: Owner
    Total licenses in pool: 1
    Status: Available 0 Operational: 1
    Locations with licenses: (Active/Allocated) [SDR]
      0/3/CPU0 (1/0) [Owner]
```

4.2 Operation ID

License operation ID is used to record license operations on a router. It is incremented after every successful license addition and removal operation. Prior to release 3.9 when adding license to the chassis, license manager will check if the operation ID on the chassis matches with the operation ID in the license file to ensure that license is not re-added. Starting in release 4.0, we implemented other mechanisms to prevent license from re-adding hence the restriction on the matching is taken out.

There has been much confusion in the field with the operation ID. In fact most issues are not really about operation ID, rather license keys, counts, versions and so on. Please reference Troubleshooting section for further information.

4.3 Installing Licenses for Cluster

Effective in 4.2.1 release, to enable “cluster” functionality, each rack of a cluster is required to install a license key of type “A9K-NV-CLUSTR-LIC”, generated specifically for that rack.

In addition basic licensed feature requirement still applies to all the racks in the cluster. That is if a licensed feature is enabled on any chassis in the cluster, the license needs to be generated for the chassis and installed in the cluster.

You may install license from either primary rack or backup rack using license add CLI. The licmgr knows to which rack the license belongs and will activate the right one when the feature is enabled.

Below is an example of show license output on cluster setup – 2 NV-Cluster licenses, one per rack; 3 iVRF licenses, 2 for slot 1 and 3 on rack 0 and 1 for slot 1 on rack 1.

```
RP/0/RSP0/CPU0:cluster(admin)#show license chassis
```

```
FeatureID: A9K-NV-CLUSTR-LIC (Slot based, Permanent)
```

```
  Total licenses 2
```

```
  Available for use 2
```

```
  Allocated to location 0
```

```
  Active 0
```

```
  Store name Permanent
```

```
  Store index 1
```

```
    Pool: Owner
```

```
      Total licenses in pool: 2
```

```
      Status: Available 2 Operational: 0
```

```
S/N Information:
```

```
  S/N FOX1435GV1C: 1 licenses [Valid]
```

S/N FOX1429GJSV: 1 licenses [Valid]

FeatureID: A9K-iVRF-LIC (Slot based, Permanent)

Total licenses 3

Available for use 0

Allocated to location 0

Active 3

Store name Permanent

Store index 2

Pool: Owner

Total licenses in pool: 3

Status: Available 0 Operational: 1

Locations with licenses: (Active/Allocated) [SDR]

0/1/CPU0 (1/0) [Owner]

0/3/CPU0 (1/0) [Owner]

1/1/CPU0 (1/0) [Owner]

S/N Information:

S/N FOX1435GV1C: 2 licenses [Valid]

S/N FOX1429GJSV: 1 licenses [Valid]

Note: the software check for A9K-NV-CLUSTR-LIC is available in 5.2.1 release. Prior to the release, the nV cluster license status is “operational: 0” after installed on the cluster.

If you are converting two single chassis to a cluster, you don't need to uninstall any licenses that are previously installed. The license will work automatically once conversion is complete.

5. License Operations

Below are the use cases on license operations that customers may experience in the field. The detailed steps on each operation are listed.

5.1 Migration/upgrade from RSP2 to RSP440

When you upgrade RSP2 to RSP440, ensure that you have your original license file copies that you got from Cisco and install them as if you are doing this for the very first time.

5.1.1 RSP440 to be installed are newly shipped from manufacturing

1. Save the original license files that Cisco sent to a USB drive or TFTP server

2. Save the running configure file and admin-running-configure file
3. Replace RSP2 with RSP440
4. Re-install the license
5. Load the running configure file in step 2

5.1.2 RSP440 to be installed are relocated from another chassis

1. Save the original license files that Cisco sent to a USB drive or TFTP server
2. On target chassis save the running configure file and admin-running configure file
3. Clear license before unplugging the RSP440 from the source chassis using following command
(admin)#clear license
4. Replace RSP2 with RSP440
5. Re-install the license
6. Load the running configure file in step 2

5.2 Swapping RSPs

It is recommended to swap the Standby RSP to allow license file and configuration to be synchronized. This method avoids the need to re-install and re-configure licenses.

If both RSPs have to be swapped, before swapping, ensure that you have your original license file copies that you got from Cisco and install them as if you are using it for the very first time, and follow the steps described in 5.1.2.

5.3 Migration/Upgrade to Enhanced Ethernet based Line Cards

Prior to the upgrade, please make sure that you have your Enhanced Ethernet based line card feature license ready. Please check the license type that you need from the Table 2. Then follow these steps.

1. Use **(admin)#license add** command to add the Enhanced Ethernet based line card license(s) to router
2. If software version is 4.3.0 or earlier, configure license using the **(admin config)# license feature-ID location all** command
3. Swap the Ethernet based line card with the Enhanced Ethernet based line card
4. Wait until the Enhanced Ethernet based line card boots up, then check the license state using the **#show license** command

Note: There is no impact retaining Ethernet-based license in the system

5.4 Migration from A9K-IVRF-LIC to A9K-AIP-LIC/A9K-(Enhanced Ethernet PID)-AIP

If you were using A9K-IVRF-LIC, and configured up to eight VRFs to the line card interfaces, and would now like to increase the VRFs configuration on the same line card, you need to install an AIP license to comply with feature licensing requirement. Please complete the following steps:

1. Obtain an A9K-AIP-LIC for Ethernet or, A9K-Enhanced EthernetPID-AIP license depending on the type of cards on which the VRF interface to be added
2. Add the A9K-AIP license to the router
3. If software version is 4.3.0 or earlier, configure the license.

5.5 Moving Line Card from One Slot to Another

Complete the following steps:

Prior to 4.3.1 releases:

1. Unplug a line card from one slot and insert it to destination slot; license that is activated in the previous slot will change to **allocated state**
2. Configure the license binding to the destination slot. If you previously configured the license with “**location all**” (refer to section 4.1), this step can be skipped
3. Use CLI command **(admin)#license move feature-ID slot from <previous-nodeloc> to <current-node-loc>** to move license to destination slot
4. Configure the licensed feature on the destination slot

Post 4.3.1 releases, you may ignore step 2 and 3 above, just follow:

1. Unplug a line card from one slot and insert it to destination slot; license that is activated in the previous slot will change to **available state**
2. Configure the licensed feature on the destination slot

5.6 RMA Cases

5.6.1 RSP RMA

See 5.2.

5.6.2 Line Card RMA

No impact to license. Proceed when ready.

5.6.3 Chassis RMA

Require re-hosting of licenses. Please contact SWIFT support team @ <https://tools.cisco.com/SWIFT/LicensingUI/html/contact.html>

For a quick peek at the licensing tools and resources, do look up <http://www.cisco.com/go/license>

6. Smart Licensing – An Introduction:

6.1 What is Smart Licensing:

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

Smart Licensing helps simplify three core functions:

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

6.2 Supported Features on ASR9000

The table below lists all the supported license features, their license type, the line card type the corresponding license applicable to, software version when introduced and additional notes.

Table 2 Supported Licenses on ASR9K

License Feature ID	Line Card License	Chassis License	Card Type	Version	Note	Equivalent Smart Licensing PID	Equivalent Smart Licensing e-delivered Spare PID
--------------------	-------------------	-----------------	-----------	---------	------	--------------------------------	--

TRIDENT LICENSES							
A9K-ADV-OPTIC-LIC	✓		Trident	3.9		S-A9K-ADVOPT-LIC	L-SA9K-ADVOPT-LIC=
A9K-ADV-VIDEO-LIC		✓	Trident	3.9	License applies to Trident line cards only. If you have Typhoon line cards, please install the "A9K-SYS-VID-LIC" license	S-A9K-ADVVID-LIC	L-SA9K-ADVVID-LIC=
A9K-IVRF-LIC	✓		Trident / Typhoon	3.9	Infra VRF license to enable up to 8 unique VRFs. This is per slot license, therefore with n number of the license, it can scale up to n*8 unique VRFs per system	S-A9K-IVRF-LIC	L-SA9K-IVRF-LIC=
A9K-AIP-LIC-B	✓		Trident	3.9	AIP license to enable the full-scale VRF instances per type of card*	S-A9K-AIP-LIC-B	L-SA9K-AIP-LIC-B=
A9K-AIP-LIC-E	✓		Trident	3.9	AIP license to enable the full-scale VRF instances per type of card	S-A9K-AIP-LIC-E	L-SA9K-AIP-LIC-E=
MOD80 LICENSES							
A9K-MOD80-AIP-TR	✓		A9K-MOD80-TR	4.2	AIP license to enable the full-scale VRF instances per type of card	S-A9K-MD80AIPTR	L-SA9K-MD80AIPTR=
A9K-MOD80-AIP-SE	✓		A9K-MOD80-SE	4.2	AIP license to enable the full-scale VRF instances per type of card	S-A9K-MD80AIPSE	L-SA9K-MD80AIPSE=
A9K-MOD80-VID-LIC	✓		A9K-MOD80-TR/SE	4.2	Advanced Video license for the Typhoon based line cards, provides inline video monitoring per-LC.	S-A9K-MD80VIDLIC	L-SA9KMD80VIDLIC=
A9K-MOD80-OPT-LIC	✓		A9K-MOD80-TR/SE	4.2	Advanced Optics license for Typhoon based line cards, to enable OTN/G.709/FEC formatting for optical transceivers.	S-A9K-MD80OPTLIC	L-SA9KMD80OPTLIC=
A9K-M80-V6-INLN	✓		A9K-MOD80-TR/SE		License for Inline CGv6 Transformation features on the MOD80	S-A9K-M80-V6INLN	L-SA9K-M80-V6INLN=
MOD160 LICENSES							
A9K-MOD160-AIP-TR	✓		A9K-MOD160-TR	4.2	AIP license to enable the full-scale VRF instances per	S-A9K-MD160AIPTR	L-SA9KMOD160AIPTR=

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					type of card		
A9K-MOD160-AIP-SE	✓		A9K-MOD160-SE	4.2	AIP license to enable the full-scale VRF instances per type of card	S-A9K-MD160AIPSE	L-SA9KMOD160AIPSE=
A9K-MOD160-VID-LIC	✓		A9K-MOD160-TR/SE	4.2	Advanced Video license for the Typhoon based line cards, provides inline video monitoring per-LC.	S-A9K-MD160VIDLIC	L-SA9KMD160VIDLIC=
A9K-MOD160-OPT-LIC	✓		A9K-MOD160-TR/SE	4.2	Advanced Optics license for Typhoon based line cards, to enable OTN/G.709/FEC formatting for optical transceivers.	S-A9K-MD160OPTLIC	L-SA9KMD160OPTLIC=
A9K-M160-V6-INLN	✓		A9K-MOD160-TR/SE		License for Inline CGv6 Transformation features on the MOD160	S-A9K-M160-V6INLN	L-SA9K-M160-INLN=
A9K-2X100G LINE CARD LICENSES							
A9K-2X100G-AIP-TR	✓		A9K-2X100G-TR	4.2	AIP license to enable the full-scale VRF instances per type of card	S-A9K-2X100-AIPTR	L-SA9K-2X100AIPTR=
A9K-2X100G-AIP-SE	✓		A9K-2X100G-SE	4.2	AIP license to enable the full-scale VRF instances per type of card	S-A9K-2X100-AIPSE	L-SA9K-2X100AIPSE=
A9K-2X100-VID-LIC	✓		A9K-2X100G-TR/SE	4.2	Advanced Video license for the Typhoon based line cards, provides inline video monitoring per-LC.	S-A9K-2X100VIDLIC	L-SA9K2X100VIDLIC=
A9K-2X100-OPT-LIC	✓		A9K-2X100G-TR/SE	4.2	Advanced Optics license for Typhoon based line cards, to enable OTN/G.709/FEC formatting for optical transceivers.	S-A9K-2X100OPTLIC	L-SA9K2X100OPTLIC=
A9K-2X100-V6-INLN	✓		A9K-2X100G-TR/SE		Inline License for CGv6 Transformation features on 2x100 LC	S-A9K-2X100V6INLN	L-SA9K-2X100INLN=
A9K-24X10G LINE CARD LICENSES							
A9K-24X10G-AIP-TR	✓		A9K-24X10G-TR	4.2	AIP license to enable the full-scale VRF instances per type of card	S-A9K-24TGAIPTR	L-SA9K24TGAIPTR=
A9K-24X10G-AIP-SE	✓		A9K-24X10G-SE	4.2	AIP license to enable the full-scale VRF instances per	S-A9K-24TGAIPSE	L-SA9K24TGAIPSE=

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					type of card		
A9K-24X10-VID-LIC	✓		A9K-24X10G-TR/SE	4.2	Advanced Video license for the Typhoon based line cards, provides inline video monitoring per-LC.	S-A9K-24TGVID-LIC	L-SA9K24TG-VID=
A9K-24X10-OPT-LIC	✓		A9K-24X10G-TR/SE	4.2	Advanced Optics license for Typhoon based line cards, to enable OTN/G.709/FEC formatting for optical transceivers.	S-A9K-24TGOPT-LIC	L-SA9K24TG-OPT=
A9K-24XT-V6-INLN	✓		A9K-24X10G-TR/SE		Inline License for CGv6 Transformation features on 24X10 LC	S-A9K-24TG-V6INLN	L-SA9K-24TG-INLN=
A9K-1X100G LINE CARD LICENSES							
A9K-1X100G-AIP-TR	✓		A9K-1X100G-TR	4.2	AIP license to enable the full-scale VRF instances per type of card	S-A9K-1X100-AIPTR	L-SA9K-1X100AIPTR=
A9K-1X100G-AIP-SE	✓		A9K-1X100G-SE	4.2	AIP license to enable the full-scale VRF instances per type of card	S-A9K-1X100-AIPSE	L-SA9K-1X100AIPSE=
A9K-1X100-VID-LIC	✓		A9K-1X100G-TR/SE	4.2	Advanced Video license for the Typhoon based line cards, provides inline video monitoring per-LC.	S-A9K-1X100VIDLIC	L-SA9K-1X100VID=
A9K-1X100-OPT-LIC	✓		A9K-1X100G-TR/SE	4.2	Advanced Optics license for Typhoon based line cards, to enable OTN/G.709/FEC formatting for optical transceivers.	S-A9K-1X100OPTLIC	L-SA9K-1X100OPT=
A9K-1X100-V6-INLN	✓		A9K-1X100G-TR/SE		Inline License for CGv6 Transformation features on 1X100 LC	S-A9K-1X100V6INLN	L-SA9K-1X100INLN=
A9K-36X10G LINE CARD LICENSES							
A9K-36X10G-AIP-TR	✓		A9K-36X10G-TR	4.2	AIP license to enable the full-scale VRF instances per type of card	S-A9K-36TGAIPTR	L-SA9K-36XT-AIPTR=
A9K-36X10G-AIP-SE	✓		A9K-36X100G-SE	4.2	AIP license to enable the full-scale VRF instances per type of card	S-A9K-36TGAIPSE	L-SA9K-36XT-AIPSE=
A9K-36X10-VID-LIC	✓		A9K-36X10G-TR/SE	4.2	Advanced Video license for the Typhoon based line cards,	S-A9K-36TGVID-LIC	L-SA9K-36XT-VID=

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					provides inline video monitoring per-LC.		
A9K-36X10-OPT-LIC	✓		A9K-36X10G-TR/SE	4.2	Advanced Optics license for Typhoon based line cards, to enable OTN/G.709/FEC formatting for optical transceivers.	S-A9K-36TGOPT-LIC	L-SA9K-36XT-OPT=
A9K-36XT-V6-INLN	✓		A9K-36X10G-TR/SE		Inline License for CGv6 Transformation features on 36X10 LC	S-A9K-36TG-V6INLN	L-SA9K-36XT-INLN=
ASR9001 LICENSES							
A9K-9001-AIP-LIC	✓		ASR9001	4.2	Only for ASR9001 chassis	S-A9K-9001-AIPLIC	L-SA9K-9001AIPLIC=
A9K-9001-OPT-LIC	✓		ASR9001	4.2	Only for ASR9001 chassis	S-A9K-9001-OPTLIC	L-SA9K-9001OPTLIC=
A9K-9001-VID-LIC	✓		ASR9001	4.2	Only for ASR9001 chassis	S-A9K-9001-VIDLIC	L-SA9K-9001VIDLIC=
A9K-9001-MOB-LIC	✓		ASR9001	4.2	Only for ASR9001 chassis	S-A9K-9001-MOBLIC	L-SA9K-9001MOBLIC=
A9K-9001-120G-LIC	✓		ASR9001-S	4.3.1	Only for ASR9001-S chassis	S-A9K-9001120GLIC	L-SA9K9001-120GUP=
SATELLITE LICENSES							
A9K-NVSAT1-LIC A9K-NVSAT5-LIC A9K-NVSAT20-LIC		✓		4.2	ASR 9000 NV Satellite License for up to 1/5/20 ASR 9000v clients per host.	S-A9K-NVSAT1-LIC S-A9K-NVSAT5-LIC S-A9K-NVSAT20-LIC	L-SA9K-NVSAT1-LIC= L-SA9K-NVSAT5-LIC= L-SA9K-NVSAT20LIC=
BNG LICENSES							
A9K-BNG-LIC-8K		✓		4.2	License that works only on system with Typhoon –SE cards. 1 unit enables 8,000 subscribers. 4.2 release supports up to 8 units for up to 64,000 subscribers	S-A9K-BNG-LIC-8K	L-SA9K-BNGLIC-8K=
A9K-BNG-ADV-8K		✓		5.2.2	ASR 9000 BNG license for Advance Features (e.g Geo-R)	S-A9K-BNG-ADV-8K	L-SA9K-BNG-ADV-8K=
A9K-BNG-CLUSTR-8K		✓		5.2	BNG License Unit for 8,000 subscribers to be used in Cluster deployment. To be used along with A9K-NV-CLUSTR.	S-A9K-BNG-CLST-8K	L-SA9K-BNG-CLS-8K=

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A9K-SESSION-128K		✓			BNG License Unit for 128000 subscribers	S-A9K-SESSION-128K	L-SA9K-SESS-128K=
ISM/VSM LICENSES							
A9K-CGN-LIC-5M		✓		4.2	Each unit of license supports 5 million translations. Each ISM blade supports up to 4 units for 20 million translations. In 4.2 release, CGN support is for NAT444.	S-A9K-CGN-LIC-5M	L-SA9K-CGN-LIC-5M=
A9K-DSLTLIC-5M		✓			DS-Lite License Unit for 5 Million translations	S-A9K-DSLTLIC-5M	L-SA9K-DSLTLIC-5M=
A9K-XLAT-LIC-5M		✓		5.1.1	Software License PID for 5M Stateful translations of NAT44 (5.1.1), NAT64* & DS-Lite	S-A9K-XLAT-LIC-5M	L-SA9K-XLAT-5M=
A9K-VM-LIC		✓		5.2.2/5.3.0	Virtual Machine License for Cisco ASR9000 Series Router	S-A9K-VM-LIC	L-SA9K-VM-LIC=
A9K-IPSEC-LIC-20G		✓		5.2.2/5.3.0	IPSEC Feature License for ASR9000 up to 20G	S-A9K-IPSEC20GLIC	L-SA9K-IPSEC-20G=
A9K-IPSEC-LIC-40G		✓		5.2.2/5.3.0	IPSEC Feature License for ASR9000 up to 40G	S-A9K-IPSEC40GLIC	L-SA9K-IPSEC-40G=
OTHER FEATURE LICENSES (CHASSIS LICENSES)							
A9K-SYS-VID-LIC		✓	Trident / Typhoon	4.3	Chassis license for both Trident and Typhoon starting 4.3.0	S-A9K-SYS-VID-LIC	L-SA9K-SYSVIDLIC=
A9K-MOBILE-LIC		✓		4.2	To enable IEEE 1588-2008 protocol to distribute precision timing and frequency. Works only on system with RSP 440 and Typhoon line cards.	S-A9K-MOBILE-LIC	L-SA9K-MOBILELIC=
A9K-NV-CLUSTER-LIC		✓		4.2	ASR 9000 NV Cluster license per chassis	S-A9K-NV-CLST-LIC	L-SA9K-NVCLST-LIC=
A9K-LI-LIC		✓		4.2	The same license works on both Trident and Typhoon line cards based system	S-A9K-LI-LIC	L-SA9K-LI-LIC=
A9K-TUNNEL-ENT		✓		5.2	ASR9000 RTU license for Tunnel Protocols (e.g. PMIPv6).	S-A9K-TUNNEL-ENT	L-SA9K-TUNNEL-ENT=

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					Chassis level only and supported on SE RSP and ASR9001/S only.		
NEW RSP440-LT LICENSE							
A9K-RSP440-LALIC	✓			5.3.0	A9K-RSP440-LT Upgrade License to enable 440Gbps/slot	S-A9K-RSP440LALIC	
NEW 40G/56G LINE CARD LICENSES							
A9K-40G-AIP-TR	✓		A9K-40G-TR	5.2.2	L3 VPN license for 40-Port GE Linecard, Transport Optimized	S-A9K-40G-AIP-TR	L-SA9K-40G-AIP-TR=
A9K-40G-AIP-SE	✓		A9K-40G-SE	5.2.2	L3 VPN license for 40-Port GE Linecard, Service Edge	S-A9K-40G-AIP-SE	L-SA9K-40G-AIP-SE=
A9K-40G-VID-LIC	✓		A9K-40G-TR/SE	5.2.2	Advanced Video & Multicast License for A9K-4T16GE line card	S-A9K-40G-VID-LIC	L-SA9K-40G-VIDLIC=
A9K-4T16GE-AIP-TR	✓		A9K-4T16GE-TR	5.3	L3 VPN license for 4-Port 10GE, 16-Port GE Linecard, Transport Optimized	S-A9K-4T16G-AIPTR	L-SA9K-4T16-AIPTR=
A9K-4T16GE-AIP-SE	✓		A9K-4T16GE-SE	5.3	L3 VPN license for 4-Port 10GE, 16-Port GE Linecard, Service Edge	S-A9K-4T16G-AIPSE	L-SA9K-4T16-AIPSE=
A9K-4T16GE-VID-LIC	✓		A9K-4T16GE-TR/SE	5.3	Advanced Video & Multicast License for A9K-4T16GE line card	S-A9K-4T16GVIDLIC	L-SA9K-4T16VIDLIC=
A9K-2T-TR-LIC	✓		A9K-4T16GE-TR	5.3	20G Upgrade License on A9K-4T16GE-TR Packet Transport Optimized card	S-A9K-2T-TR-LIC	L-SA9K-2T-TR-LIC=
A9K-2T-SE-LIC	✓		A9K-4T16GE-SE	5.3	20G Upgrade License on A9K-4T16GE-SE Service Edge Optimized card	S-A9K-2T-SE-LIC	L-SA9K-2T-SE-LIC=
NEW TOMAHAWK LICENSES							
A9K-800G-IVRF	✓		Tomahawk 8x100G	5.3	IVRF license on the new Tomahawk line card to enable up to 8 unique VRFs. This is per slot license.	S-A9K-800G-IVRF	L-SA9K-800G-IVRF=
A9K-800G-AIP-SE	✓		A9K-8X100GE-L-SE	5.3	AIP license on the new Tomahawk line card to enable the full-scale VRF.	S-A9K-800G-AIP-SE	L-SA9K-800G-AIPSE=
A9K-800G-AIP-TR=	✓		A9K-8X100GE-L-TR	5.3.1	AIP license on the new Tomahawk line card to enable	S-A9K-800G-AIP-TR	L-SA9K-800G-AIPTR=

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					the full-scale VRF.		
A9K-800G-CGN-LIC=	✓		Tomahawk 8x100G	5.3.1	ASR 9000 8-port 100GE IPv6 Inline Carrier Grade NAT License	S-A9K-800G-CGN	L-SA9K-800G-CGN=
A9K-800G-OPT-LIC=	✓		Tomahawk 8x100G	5.3.1	ASR 9000 8-port 100GE Advanced Optical License	S-A9K-800G-OPTLIC	L-SA9K-800G-OPT=
A9K-800G-VID-LIC=	✓		Tomahawk 8x100G	5.3.1	ASR 9000 8-port 100GE Advanced Video License (enables the full-scale VRF.)	S-A9K-800G-VIDLIC	L-SA9K-800G-VID=
A9K-400G-AIP-SE=	✓		Tomahawk 4x100G	5.3.1	ASR 9000 4-port 100GE Advanced IP license for SE Line Card (enables the full-scale VRF.)	S-A9K-400G-AIP-SE	L-SA9K-400G-AIPSE=
A9K-400G-AIP-TR=	✓		Tomahawk 4x100G	5.3.1	ASR 9000 4-port Advanced IP license for TR Line Card	S-A9K-400G-AIP-TR	L-SA9K-400G-AIPTR=
A9K-400G-CGN-LIC=	✓		Tomahawk 4x100G	5.3.1	ASR 9000 4-port 100GE IPv6 Inline Carrier Grade NAT License	S-A9K-400G-CGN	L-SA9K-400G-CGN=
A9K-400G-IVRF=	✓		Tomahawk 4x100G	5.3.1	VRF License for 4-port 100GE linecard (enables up to 8 unique VRFs.)	S-A9K-400G-IVRF	L-SA9K-400G-IVRF=
A9K-400G-OPT-LIC=	✓		Tomahawk 4x100G	5.3.1	ASR 9000 4-port 100GE Advanced Optical License	S-A9K-400G-OPTLIC	L-SA9K-400G-OPT=
A9K-400G-VID-LIC=	✓		Tomahawk 4x100G	5.3.1	ASR 9000 4-port 100GE Advanced Video License	S-A9K-400G-VIDLIC	L-SA9K-400G-VID=

*For each type of line card feature license, please refer data sheet at <http://www.cisco.com/c/en/us/products/routers/asr-9000-series-aggregation-services-routers/datasheetlisting.html>

Consumption model – License PIDs and ordering procedure:

- Step 1: Choose your hardware
- Step 2: Choose Your Foundation SW Licenses
- Step 3: Choose Your Advanced SW Licenses

PID	Description
A9K-8X100GE-CM	ASR 9000 8x100GE Tomahawk "Consumption Model" LC

Foundational SW Licenses	
PID	Description
S-A9K-IPB-10G	ASR 9000 IP/MPLS Basic 10G Foundational License
S-A9K-IPP-10G	ASR 9000 IP/MPLS Premium 10G Foundational License
S-A9K-L2B-10G	ASR 9000 IP/MPLS/L2VPN Basic 10G Foundational License
S-A9K-L2P-10G	ASR 9000 IP/MPLS/L2VPN Premium 10G Foundational License
S-A9K-L3B-10G	ASR 9000 IP/MPLS/L3VPN Basic 10G Foundational License
S-A9K-L3P-10G	ASR 9000 IP/MPLS/L3VPN Premium 10G Foundational License
S-A9K-L2L3B-10G	ASR 9000 IP/MPLS/L2VPN/L3VPN Basic 10G Foundational License
S-A9K-L2L3P-10G	ASR 9000 IP/MPLS/L2VPN/L3VPN Premium 10G Foundational License

Advanced SW Licenses	
PID	Description
S-A9K-HQOS-RTU-10	ASR 9000 H-QoS 10G Right to Use License
S-A9K-MAP-RTU-10	ASR 9000 CGN Stateless MAP 10G Right to Use License
S-A9K-OAM-RTU-10	ASR 9000 OAM 10G Right to Use License
S-A9K-VIRT-RTU-10	ASR 9000 Virtual Interfaces 10G Right to Use License
S-A9K-EVPN-RTU-10	ASR 9000 E-VPN 10G Right to Use License
S-A9K-VXLN-RTU-10	ASR 9000 VxLAN 10G Right to Use License
S-A9K-DWDM-RTU-10	ASR 9000 IPoDWDM 10G Right to Use License
S-A9K-LI-LIC	ASR 9000 Smart License Lawful Intercept (System License)
S-A9K-MOBILE-LIC	ASR 9000 Advanced Mobile License for System (System License)
S-A9K-NVSAT1-LIC	ASR 9000 nV Satellite Right to Use License for 1 nV Client (System License)

7. Troubleshooting Guide/FAQ

[Smart Licensing FAQ:](#)

[Service Provider Routing – “Consumption Model” FAQ:](#)

[Consumption model – Basics:](#)

[Using the Consumption Model:](#)

[Consumption model – Other clarifications:](#)

[Generic \(Traditional XR\) licensing related:](#)

[License Installation related:](#)

7.1 Service Provider Routing – “Smart Licensing” FAQ:

Q: What is “Smart Licensing”?

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

Smart Licensing helps simplify three core functions:

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

Q: What are the differences between traditional licensing and Smart licensing:

A: Smart Versus Traditional Licensing

Traditional (node locked) licensing	Smart (dynamic) licensing
You must procure the license and manually install it on the device.	Your device initiates a call home and requests the licenses it needs. <i>Configuring Call Home on the Cisco ASR 9000 Series Router</i> describes the Smart Call Home feature.
Node-locked licenses - license is associated with a specific device.	Pooled licenses - licenses are company account-specific, and can be used with any compatible device in your company. You can activate or deactivate different types of licenses on the device without actually installing a license file on the device.
No common install base location to view licenses purchased or software usage trends	Licenses are stored securely on Cisco servers accessible 24x7x365.
No easy means to transfer licenses from one device to another.	Licenses can be moved between product instances without a license transfer. This greatly simplifies the reassignment of a software license as part of the

	Return Material Authorization (RMA) process.
Limited visibility into all software licenses being used in the network. Licenses are tracked only on per node basis.	Complete view of all Smart Software Licenses used in the network using a consolidated usage report of software licenses and devices in one easy-to-use portal.

Q: How does one create a Smart licensing account?

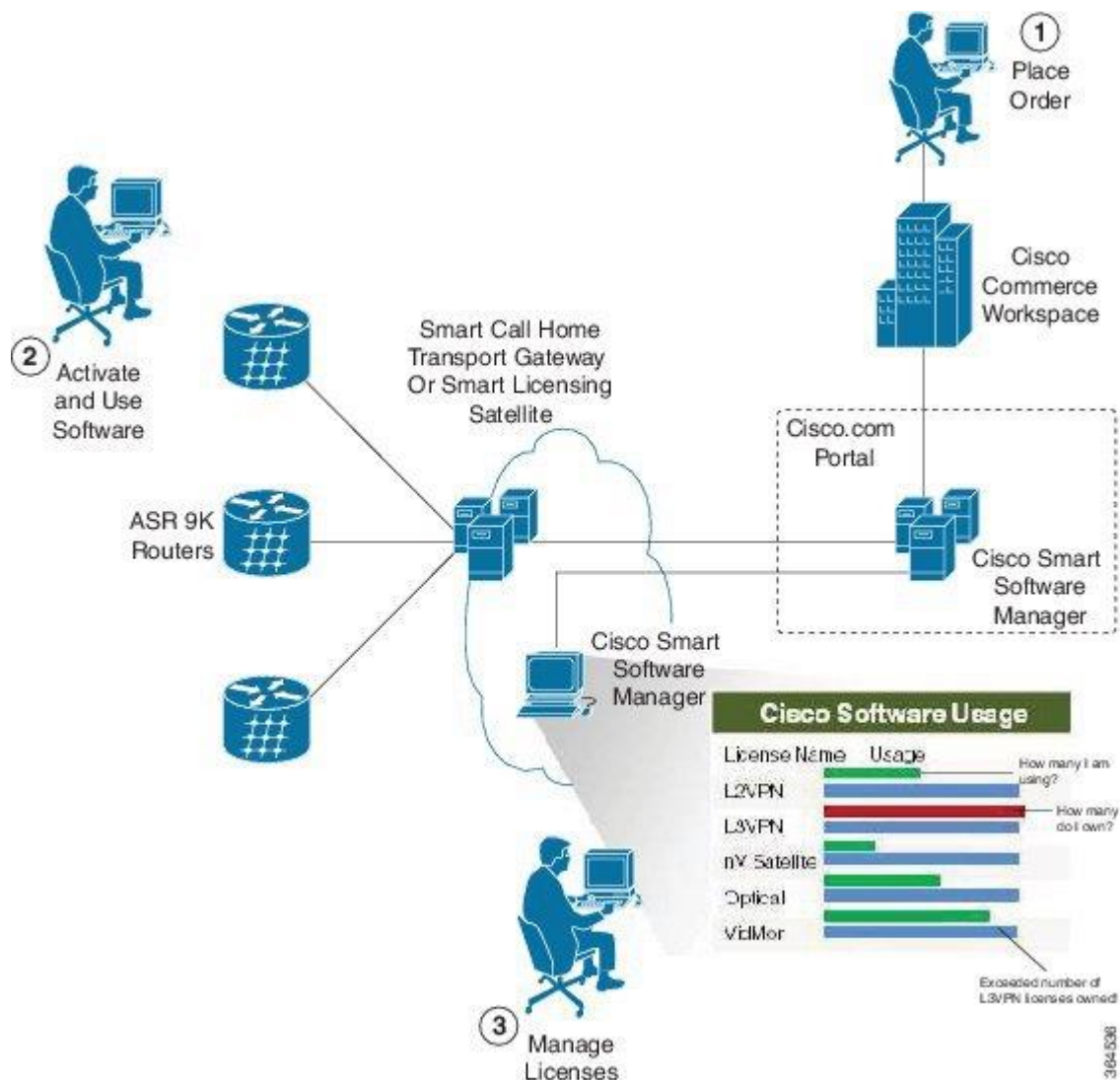
A: Cisco Smart Account is an account where all products enabled for Smart Licensing are deposited. Cisco Smart Account allows you to manage and activate your licenses to devices, monitor license use, and track Cisco license purchases. Through transparent access, you have a real-time view into your Smart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

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

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

Q: How does Smart licensing work?

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



- **Setting up Smart Licensing:** You can place the order for Smart Licensing, to manage licenses on Cisco.com portal. You agree to the terms and conditions governing the use and access of Smart Licensing in the Smart Software Manager portal at <http://www.cisco.com/c/en/us/products/collateral/software/one-software/solution-overview-c22-733273.html>.

- **Enabling and Use Smart Licensing:** [Enable Smart Licensing](#) describes the steps you must follow to enable Smart Licensing.

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

- **Smart Call Home:** The Smart Call Home feature is automatically configured after the Smart Licensing is enabled. Smart Call Home is used by Smart Licensing as a medium for communication with the Cisco license service. Call Home feature allows Cisco products to periodically call-home and perform an audit and reconciliation of your software usage information. This information helps Cisco efficiently track your install base, keep them

up and running, and more effectively pursue service and support contract renewals, without much intervention from your end. For more information on Smart Call Home feature, see http://www.cisco.com/c/dam/en/us/td/docs/switches/lan/smart_call_home/SCH_Deployment_Guide.pdf.

- **Smart Licensing Satellite:** The Smart licensing satellite option provides an on-premises collector that can be used to consolidate and manage Smart license usage, as well facilitate communications back to Cisco License Service at <http://www.cisco.com>.
- **Manage and Report Licenses:** You can manage and view reports about your overall software usage in the Smart Software Manager portal. [Compliance reporting](#) describes the types of Smart Licensing reports.

Q: How does one configure Smart licensing?

A: Please refer to the following for pointers to help configure Smart licensing: http://www.cisco.com/c/en/us/td/docs/routers/asr9000/software/asr9k_r5-3/sysman/configuration/guide/b-sysman-cg-53xasr9k/b-sysman-cg-53xasr9k_chapter_0110.html#d72729e583a1635

7.2 Service Provider Routing – “Consumption Model” FAQ:

7.2.1 Consumption model – Basics:

Q: What is the “Consumption Model”?

A: The consumption model is a new pricing model that is being introduced in the Service Provider Routing product portfolio that leverages Cisco Smart Software Licensing and allows for customers to purchase capacity (ports) and features in an as needed basis.

Q: Why is the new “Consumption Model” being introduced?

A: Customers need a new way to purchase capacity and features that are inline with what they are actually using in their platforms and the network to better align with their actual consumption in the network.

Q: What is the value of the “Consumption Model” for my customer?

A: The new consumption model has a number of advantages that can’t be realized in today’s purchasing models:

- Customers can now purchase physical and virtual systems starting at a minimum amount and working up to the full capacity based on their demand. This eliminates the need to either over-purchase initially or continually cycle linecards as demand grows

- Customers can leverage Cisco Smart Software Licensing and enable network wide license pooling in their network. This eliminates concerns around license transfers and manual management during new purchases, RMAs, and use with spares.
- Customers gain license visibility at the network level through report generation from the Cisco Smart Software License Server. This enables views into license utilization and optimization at the network level.
- The open platform concept is utilized so that customers no longer have to wait for the sometimes long order process to enable new ports or features, the system is open for all configuration and a monthly or quarterly true-up of license consumption vs. license usage will be employed to take care of license logistics.

Q: When will the Consumption Model be available?

A: Tomahawk Consumption Model LC (A9K-8X100GE-CM) is now orderable (XR 5.3.2). Please reach out to the [spr-consumption-model](#) alias for interest in the program.

Q: When will pricing be available?

A: Tomahawk Consumption Model LC (A9K-8X100GE-CM) is now orderable. Please contact the spr-routing team (alias: [spr-consumption-model](#)) for more details and pricing.

7.2.2 Using the Consumption model:

Q: How do I utilize the Consumption Model?

A: During the initial ramp up of this program, we are asking all opportunities to leverage the [spr-consumption-model](#) alias to qualify deals, receive pricing and gain information.

Q: What platforms can I use the Consumption Model on?

A: Initially, the Consumption Model will be used on the ASR 9000 Tomahawk linecards. The model will also be supported on the IOS-XRv 9000 virtual router as well as merchant silicon offerings at the end of CY15.

Q: What linecards will the Consumption Model be offered on for the ASR 9000?

A: The ASR 9000 will be offering the Consumption Model on the 8x100GE WAN/OTN linecard initially with future offerings on other linecards being evaluated.

Q: What are the components that make up a purchase using the Consumption Model?

A: When purchasing product using the Consumption Model, the customer needs to have an ASR 9000 modular linecard system or can purchase a new one, either is fine. This includes all ASR 9000 chassis with the exception of the ASR 9001 (and ASR 9001s). A new system is purchases

the exact same way an existing system is purchased today. The difference lies in the linecard purchase. The Consumption Model linecard will be offered at dramatically reduced price from today's 8x100G linecard prices. Additionally, the customer will be required to purchase foundational software licenses for every 10G worth of capacity the customer wishes to utilize. A minimum of 20 of the 10G foundational licenses is required or the equivalent of two of the possible eight 100G ports on each linecard. Optionally, customers can purchase additional advanced software licenses for specific features that are not included in the foundation licenses. These licenses can either be metered on a per 10G basis (like the foundation license) or be purchased at a system level.

Q: What is a meter and how does it relate to the Consumption Model?

A: In order to enable the ability for customers to purchase capacity as needed, each Consumption Model linecard is split up into consumable chunks and sold as a "meter". In the case of the 8x100G linecard, the appropriate choice was 10G meters as an individual 100G port can be divided into discrete 10G interfaces and utilized with different foundational software features. So, after customers have consumed the minimum amount of ports, additional ports can be consumed in 10G increments.

Q: What is the minimum number of ports required to be purchased when buying the new Consumption Model 8x100G linecard?

A: We will be "metering" the linecard in 10G increments and the minimum will be twenty 10G foundation licenses to be purchased with each linecard. This is the equivalent of two 100G ports of the possible eight.

Q: What are the available foundational software licenses?

A: The 8x100G Tomahawk Consumption Model linecard will have essentially four foundational software licenses based on features being utilized on the port:

- IP/MPLS – for interfaces that have only IP/MPLS defined on the interface
- IP/MPLS + L2VPN – for interfaces that have Layer 2 interfaces defined (EFPs) on the interface
- IP/MPLS + L3VPN – for interfaces that have Layer 3 VRFs defined on the interface
- IP/MPLS + L2VPN + L3VPN – for interfaces that have both Layer 2 interfaces (EFPs) and Layer 3 VRF interfaces defined on the same interface

Q: Are there scale considerations for the foundational software licenses?

A: Yes. For each foundational software license, there are two tiers, basic and advanced. The tiers are intended to map to the number of services being delivered on each interface and within the system. For details on the scale, please consult with the [spr-consumption-model](#) alias.

Q: Do I have to buy all foundation and advanced software licenses before I enable ports or turn on features?

A: No. The minimum foundation licenses must be purchased along with the card but all additional licenses can be purchased at a later date. The customer and Cisco account team will receive monthly usage reports that compare what is used in the network vs. what has been purchased and then a discussion can occur to see if action is required to true-up the licenses that have been purchased.

Q: What is license portability and how do my customers make their licenses portable?

A: License portability is a new concept that allows for customers to utilize licenses anywhere in their network as they are consumed. This concept is centered around the use of network wide license pooling for use on common hardware. This is enabled by use of the Cisco Smart Software Licensing, a prerequisite for the Consumption Model. Having Smart Licensing enabled and use of the consumption model is not enough to ensure license portability, the customer must also purchase SoftWare and Support Services (SWSS) for each software license.

Q: What is SWSS?

A: SWSS is a new option for services on the software licenses that enables the traditional support including TAC support but also enables the option of license portability. If SWSS is discontinued at any time, the license is no longer portable.

Q: How will the customer know what licenses they need?

A: The ASR 9000 system will run a self-audit routine periodically to determine the licenses being consumed. The results of the self-audit will be communicated back to the Smart Licensing Server where comparisons can be made on what has been consumed vs. what is being used.

Q: How does the system self-audit work?

A: The self-audit is a script run outside of the normal router operations that surveys the configuration and the real time scale being utilized on the platform. The audit has an algorithm that translates the results into the actual licenses that are being consumed.

7.2.3 Consumption model – Other clarifications:

Q: Can I use the Consumption Model on the Typhoon linecards?

A: Currently, no. We are evaluating using this on the Typhoon linecards but that is not a committed program.

Q: Can I still buy the ASR 9000 and other Consumption Model products using today's traditional model?

A: Yes! For the time being, parallel pricing models will be available on the ASR 9000 to allow for transitions and alternative buying options.

Q: Can I use an existing 8x100GE linecard with the Consumption Model?

A: No. As part of the introduction of the Consumption Model, a new Consumption Model specific 8x100G linecard is being introduced. This linecard will be the equivalent of the “SE” version linecard and will have the latest PHY to allow for 10G WAN PHY and OTN termination.

Q: Can I use licenses I have already purchased with the Consumption Model?

A: Yes and no. Existing system wide licenses will continue to function and operate although may require a conversion to its smart licensing version equivalent. Per-linecard licenses will not be able to be used as they are being replaced with the new licensing model as defined in the Consumption Model.

Q: Since there is a 10G meter on the Tomahawk Consumption Linecards, how does the Consumption Model work with 1G ports?

A: There are no native 1G ports on the linecard. The only option for 1G would be via a nV satellite device and in this situation the 10G ICL connected to the Tomahawk Consumption Model Linecard will be what is licensed, not the individual 1G port.

7.3 Generic (Traditional XR) licensing related:

The following frequently asked questions highlight common issues and troubleshooting information for each:

Q: Do I need VRF license for virtual interfaces?

A: No, VRF license is not required to be installed for virtual interfaces (BVI, bundles, loopback). This is applicable to the traditional licensing model. Consumption based licensing model though, would still call for license for all interface types.

Q: There are so many video licenses on offer. What are these for? What’s best suited for me? How do I position these?

A: Here’s a quick summary demystifying it all:

- A9K-ADV-VIDEO-LIC - This license is required for inline video monitoring on all Trident LCs. This is a per-system license (Trident only).

- A9K-SYS-VID-LIC - This license is for inline video monitoring for Trident and Typhoon based LCs. This is a per-system license as well (starting 4.3.0).
- Aside these, there are also per-LC licenses for Typhoon cards (A9K-MOD80-VID-LIC, A9K-2x100-VID-LIC, etc). These provide inline video monitoring per-LC.

Q: Does the VRF license (A9K-IVRF-LIC or A9K-9001-AIP-LIC) address my VRF requirements on the 4 onboard 10G ports and the MPA bays on the ASR9001?

A: Yes, 1 VRF license (IVRF for VRFs <= 8 or AIP for VRFs > 8) is all you need to address the VRF requirements on the onboard 10G ports and the MPA bays on the ASR9001.

Q: Can I have my licenses e-delivered?

A: Yes, if the license SKU has “L-“prefixed, those are the ones that are enabled for e-delivery. For instance: “L-A9K36X10OPT-LIC=”

Q: I have a customer who runs the ISM card with the A9K-CGN-LIC-5M. They would like to move to VSM card and would like to know if their actual license can be used in the VSM card or need a new one.

A: The corresponding CGN license on the VSM is “A9K-XLAT-LIC-5M”.

Q: I see “A9K-TUNNEL-ENT” listed on the ordering tool. What’s this license for?

A:

A9K-TUNNEL-ENT A9K-TUNNEL-ENT=	ASR 9000 RTU license for Tunnel Protocols (e.g. PMIPv6)	Chassis level only and supported on SE RSP and ASR9001/S only.
---	--	---

Q: What’s the advanced mobile license needed for?

A:

A9K-MOBILE-LIC	Advanced Mobile	To enable IEEE 1588-2008 protocol to distribute precision timing and frequency	Per system	New license that works only on system with RSP 440 and Typhoon line cards
-----------------------	------------------------	---	-------------------	--

Q: Is MOBILE-LIC needed for SyncE?

A: Yes, MOBILE-LIC is needed for both SyncE and PTP operations.

Q: In order to be able to configure nV Satellite ports under a VRF, do I need an VRF license on the 10G card I connect the nV Satellite to?

A: Yes, if it’ <= 8 VRFs, IVRF should do. For anything more than 8, you’ll need the AIP license

[Note: These are per LC licenses]

Q: Please clarify as to why do we require the below license on the A9K-4T16GE-TR and A9K-4T16GE-SE Line cards. Without this license, doesn't it operate on line rate i.e.; 56 Gbps?

A9K-2T-TR-LIC	20G Upgrade License on A9K-4T16GE-TR Packet Transport Optimized card
A9K-2T-SE-LIC	20G Upgrade License on A9K-4T16GE-SE Service Edge Optimized card

A: PAYG! By default, either the 4*10GE or (2*10GE + 16*1GE) ports would be enabled. The license PIDs A9K-2T-TR-LIC/A9K-2T-SE-LIC are to enable the remaining 2 * 10GE ports (or 16* 1GE ports). In essence, yes, to unlock the full 56G, you'll need these licenses. This license is specific to the Wildchild combo cards (A9K-4T16GE-TR/SE).

Q: Is there an upgrade SKU to migrate from IVRF license to the AIP?

A: No, there is no such upgrade SKU. AIP is a superset of the IVRF license. Having AIP license is enough to turn on the full VRF scale on the box.

Q: What's the difference between A9K-BNG-LIC-8K and A9K-BNG-ADV-8K?

A: The A9K-BNG-ADV-8K addresses the Geo-redundancy schemes. For subscribers which are given higher SLA through Geo-R, you'll need both the A9K-BNG-LIC-8K and A9K-BNG-ADV-8K. Just the A9K-BNG-LIC-8K is the vanilla ASR 9000 BNG Software License (1 LIC per 8K subscribers).

Q: If we have dual homed nV satellite (asr9000v), do we require two nv satellite host licenses, one on each host?

A: Yes, you'd need one license on each host.

Q: I have an existing ASR9K running BNG (8K subs). I now want to add in another chassis and convert this to a cluster setup and also have BNG subscribers running off of both the racks. Is this doable?

A: Yes, very much doable. Here's what the configuration would look like:

Chassis 1: 1 x A9K-NV-CLUSTR

Chassis 2: 1 x A9K-BNG-CLUSTR-8K, 1 A9K-NV-CLUSTR

Q: What's the difference between setting up 16K subs in a cluster setup v/s upgrading existing cluster 8K sub to Cluster 16K subs?

A: 16K sub in Cluster scenario:

- Chassis 1 : 2 x A9K-BNG-CLUSTR-8K, 1 A9K-NV-CLUSTR

- Chassis 2 : 2 x A9K-BNG-CLUSTER-8K, 1 A9K-NV-CLUSTER

Upgrading existing cluster 8K sub to Cluster 16K subs:

- Chassis 1: 1 x A9K-BNG-LIC-8K=
- Chassis 2: 1 x A9K-BNG-LIC-8K=

Q: Can I migrate the L3VPN licenses (AIP) on the Trident cards to the MOD80 (Typhoon based cards) or will they need to purchase new L3VPN licenses?

A: These are different PIDs across Trident and Typhoon. They cannot be transferred / migrated. You'll need either a A9K-MOD80-AIP-SE= or A9K-MOD80-AIP-TR= depending on the card

Q: Is it possible to move a nV license from one ASR 9000 host to another? Can you share the link or the document with the information?

A: This would call for a license re-hosting for which you'll need to open up a case with the Cisco Global Licensing Operations / SWIFT support team. Do look up the "Chassis RMA" section on the licensing whitepaper for details.

Q: Do I need a VRF license to be able to configure loopbacks under VRF for the satellite auto-IP feature?

A: No, starting XR 4.3.1, a special VRF (**nVSatellite) is created automatically and doesn't need a VRF license to be activated. This is for the Auto-IP feature only.

Q: How can I convert a 9001-S to a 9001 (120G)?

A: You will need the A9K-9001-120G-LIC that will enable the 2 additional onboard 10G ports and the extra MPA bay.

Q: I intend to run pure IP/MPLS forwarding services. Do I still need a VRF license?

A: No, as long as you don't associate an interface to a VRF, a VRF license will not be required.

Q: I enabled the DWDM-XFP-C and I see the following message:

```
vic_0[355]: %PLATFORM-VIC-3-IF_OPERATION_FAIL : Advanced optic pie is deactivated for OTN (G709), port 1, error code port shutdown
```

It's not clear to me if I need the optics pie only, the Advanced Optics license, or both to have OTN enabled.

A: Yes, you'll need both the optic pie and the ADV-OPTIC-LIC to have OTN enabled.

Q: I don't have the LI license installed or LI configured. But when I install the LI PIE, I see a syslog reporting a missing license. Is this expected?

A: Yes, it's expected. On installing a LI PIE, the system polls for an available LI license instantly.

Q: I plan on transferring the BNG license (A9K-BNG-LIC-8K) from my ASR 9001 to another ASR 9006 chassis. Is this doable?

A: Yes, this is doable. As long as the chassis license PID is common across the different chassis types (A9K BNG-LIC-8K in this case), this can be achieved via a re-hosting. You'll need to open up a case with the Cisco Global Licensing Operations / SWIFT support team.

<https://tools.cisco.com/SWIFT/LicensingUI/html/contact.html>

Q: If I lose the e-delivered variant or the paper version of the license, is there a way to retrieve/re-issue them?

A: Although e-delivery is a good option, if the paper version or the e-delivered version is lost, a case can be opened with the licensing team to help re-generate.

Q: I plan to replace my 24X10G with a 36X10G card. Would I need the corresponding license/s to be bought for the 36X10G line card or can I continue to use the ones that I had installed for my 24X10GE card?

A: Yes, you'll need to buy the corresponding licenses for the 36X10G line card as the per line cards PIDs are all different for 24X10G v/s 36X10G v/s MOD80/160. The new Tomahawk "Consumption Model" (targeted for 5.3.2) LCs will offer cool features like easy upgrades and easy portability of licenses between line cards or chassis. These LCs are tied in with Smart Software licensing and will be "per 10G licenses" that can easily be ported between any Tomahawk CM LCs (8X100G-CM and 12x100G-CM).

Q: I have a customer who wants to convert his 9001-S to 9001 ASAP and then work out the licensing part with the Account team. Can I get a 120G license for now till the financials are worked out?

A: Route your queries to the licensing council at "asr9k-license@cisco.com".

7.4 License Installation related:

Q: What if I am unable to install license on to a router?

A: In general you should not encounter issues on license installation as long as the license is generated for the chassis. Sometimes the issue is caused by software license tool, and in that case the license needs to be re-generated. To quickly identify if it is tool's issue, please open the license file and pay special attention to the values associated with the <FEATURE_VERSION> and <COUNT> tags, and the EXCL value in the CDATA field.

Here is an example of license file:

```
<?xml version="1.0" encoding="UTF-8"?>
<CISCO_WT_ARTIFACTS version="1.0">
<CISCO_WT_LICENSE version="1.0">
<FEATURE_NAME>A9K-AIP-LIC-B</FEATURE_NAME>
<FEATURE_VERSION>3.9</FEATURE_VERSION>
<UDI>
<PID>ASR-9010-DC</PID>
<SN>FOX1510GGHH</SN>
</UDI>
<SOURCE>Cisco HQ</SOURCE>
<CREATE_DATE>2011-11-28T06:23:27</CREATE_DATE>
<LICENSE_LINE_HASH hashAlgo="SHA1">fucEkjHl3V5FwulwB55oD6Z4Q=</LICENSE_LINE_HASH>
<TYPE>PERMANENT</TYPE>
<COUNT>2</COUNT>
<LICENSE_LINE>
<![CDATA[
11 A9K-AIP-LIC-B 3.9 LONG NORMAL STANDALONE EXCL 2_KEYS INFINITE_KEYS NEVER NEVER NiL SLM_CODE
CL_ND_LCK NiL *1XWDHUD88GQVVE4400 NiL NiL NiL 5_MINS <UDI><PID>ASR-9010-
DC</PID><SN>FOX1510GGHH</SN></UDI> <SEQ>0</SEQ>
X0RGkTt,zbP9Z1Rlv1DLVB8mnpG5jdl1OUw0z3O:yL5mJdnMuxsNOVIFqm5v
fhHV:zX0,ThN4BKxygUlkHOcTLrKNLsvaTzoBnNK8,i:6s73k14raxZg2GSOYCynPS:Vo Vwrn-
FSGh,DAyxa3OEvfWL43V$<WLC>AQEBIf8B//+rou6azOh2yxAbN5+Dm2lQn9jE4a4ztFVkJlkOUcPiJQoO+xNlw8U7yt8eIOuLV
kRHebPkGIARtYd1UQO7GJ3KnufZ9oZ6JdFniDf5HrQ8DrXdpCz5
RgZE+y8fbN200xiXA5cB3fwcJqoPIFZm2HmD1qFfsyTAzui066t6Xk5y8xo1lbVhvoh/FZfy5iRY3 oE=<WLC>]]>
</LICENSE_LINE>
<USER_MODIFIABLE_COMMENT fieldRestrictions="Max 99 ASCII characters in length.">
</USER_MODIFIABLE_COMMENT>
</CISCO_WT_LICENSE>
</CISCO_WT_ARTIFACTS>
```

The above license file is generated on 2011-11-28 for an A9K-AIP-LIC-B license for chassis with product ID ASR-9010-DC and S/N FOX1510GGHH. The count of license is 2, match with the value for EXCL – 2_KEYS. The value for <FEATURE_VERSION> is 3.9 matching with the software version in which the license is introduced.

If the value for <FEATURE_VERSION> is incorrect you may have issue to install the license, for instance if the value in the file is 4.2 while you are installing the license on to a router with software image earlier than 4.2.

Given that the count of A9K-AIP-LIC-B license in the above license file is 2, if you have installed two A9K-AIP-LIC-B licenses on the router already with a previously generated license file, and expect to install this license file for a new order, the installation will fail. This is because ASR9K follows sentinel replacement logic; as such earlier counts get added in the license file. Thus the count in your newest license file should always be equal to the total number of the licenses purchased.

We have also seen cases in which the value of <FEATURE_NAME> is wrong. For such issue although the license file can be installed successfully the key is useless because it is not valid.

In short if the values for <FEATURE_VERSION>, <COUNT> and <FEATURE_NAME> are wrong, please contact <http://www.cisco.com/go/license> . This is not IOS-XR software issue.

Please note if a license file is ever re-generated for any reasons above, the new license file should reflect the new date coded in <CREATE_DATE> tag.

Q: What if the license is not checked out by the feature using the license?

A: Now you have installed a license and enabled the feature via feature configuration, however the license doesn't get checked out, i.e. it remains in available state.

As mentioned in section 1, features like L3VPN, G.709 and vidmon have software licensing support; other features, such as nV satellite, nV cluster, mobile, BNG, CGN and V6-INLN, are yet to be implemented.

Therefore if the license is not checked out as expected, please do "admin show license" and make sure the license feature ID matches exactly to one listed in Table 2. Mismatched feature ID is no use, please contact <http://www.cisco.com/go/license> to have license file/key re-generated. Secondly please make sure you have license configured (apply to release 4.3.0 and early releases). Executing "admin show run" will display all the configured licenses (refer section 4.1 for license configuration). Thirdly please check if L3VPN is configured on virtual interfaces or on A9K-SIP-700 card. To-date L3VPN on virtual interfaces (BVI, bundles, loopback) or A9K-SIP-700 card does not require license.

If above checks all look fine, it may be a software issue. There are a few identified software bugs in the released images. If you're running 4.2.3 release software, we advise you to install 4.2.3 license umbrella SMU (CSCug35890) because it contains the fixes to a few bugs that user may hit with 4.2.3 release image.

Or try the two workarounds described below depending on the license errors you have encountered -- if you keep receiving license warning message, e.g. every 24 hours, you may try with workaround 1). However if you don't see license warning messages periodically, you may try with workaround 2).

1. "admin clear license" and then re-install the license from the original license files;

Or

2. Restart feature processes. For VRF, the feature process name is rsi_agent; for G.709, if the feature is running on Ethernet card, it is ether_ctrl_if_10ge; otherwise, it is vic on Enhanced Ethernet card. Please indicate the location when restart the concerned processes.

Q: What if I have to initiate a RMA to a line card, RSP or a chassis?

A: Please refer section 5.6 for details.

Q: What if the licensed feature doesn't pass traffic?

A: All ASR9K licensed features are soft enforced, meaning there is no functionality blockage by licensing software even if the license is not installed on the router. Yet it is out of compliance for the right of use of software without license installation, and for that the license warning messages are printed out every 24 hours.

If the licensed feature is configured but doesn't pass traffic, please contact the Cisco Technical Assistance Center (TAC).

Q: What if you're turning on G.709 feature while waiting for the license order to be processed by CCO?

A: Because of software bugs prior to 4.3.1, if you are turning on G.709 feature without installing the license, you may run into the issue described in CSCud87100. There is a production SMU available and you're advised to install this SMU to avoid the issue.

Q: What if I keep getting license warning messages for nV-SAT license while I have already installed appropriate nV satellite license on the router?

A: In 4.3.1 release, we added software checks for nV-SAT license if the router has satellites connected remotely. However the implementation has some limitation, as a result the satellite licenses are not stackable. We have decided to take out the check until we have a better approach. Please install 4.3.1 C-SMU (CSCui38382) the satellite licensing will be reverted to prior 4.3.1 behavior once the SMU is activated.

Q: What if you replaced both RSP cards with RSPs from other chassis and now you see error log from licmgr[302]: %LICENSE-LICMGR-3-CHASSIS_MISMATCH : License database and this chassis do not match. If licenses were installed, restore from a backup or contact Cisco TAC, and you are unable to install any licenses for this chassis?

A: In practice, on RSP swapping, license operation described in 5.2 should be followed. If not, issue like this will occur. To recover, you may perform the steps below:

1. Remove license_opid.puf from both RSP

```
delete nvram:/license_opid.puf loc 0/RSP0/CPU0
delete nvram:/license_opid.puf loc 0/RSP1/CPU0
```

2. Remove license storage and licmgr temporary files from disk0: on both RSP

```
run attach 0/RSP0/CPU0
cd /disk0:
```

```
rm -R license  
rm /tmp/chkpt_licmgr*  
exit
```

```
run attach 0/RSP1/CPU0  
cd /disk0:  
rm -R license  
rm /tmp/chkpt_licmgr*  
exit
```

3. Restart processes licmgr and plat_license_udi_mgr

```
process restart plat_license_udi_mgr  
process restart licmgr
```

4. Check the result

“show license udi” should display the correct chassis S/N and operation ID value of 0

5. Proceed with new license installation

How to buy

To view buying options and speak with a Cisco sales representative, visit www.cisco.com/c/en/us/buy