

Ruckus FastIron Software Licensing Guide, 08.0.80

Supporting FastIron Software Release 08.0.80

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Contents

Preface.....	5
Document Conventions.....	5
Notes, Cautions, and Warnings.....	5
Command Syntax Conventions.....	6
Document Feedback.....	6
Ruckus Product Documentation Resources.....	6
Online Training Resources.....	7
Contacting Ruckus Customer Services and Support.....	7
What Support Do I Need?.....	7
Open a Case.....	7
Self-Service Resources.....	7
About This Document.....	9
Supported hardware.....	9
How command information is presented in this guide.....	9
What's new in this document.....	9
Software Licensing Overview.....	11
How Software Licensing Works.....	11
Self-Authenticated Upgrade Licensing.....	11
Software Licensing Terminology.....	11
Licensing Rules.....	12
FastIron Licensed Features and Platform Support.....	12
Upgrading from FastIron 08.0.70 and Earlier Releases.....	13
Upgrade Considerations for the Layer 3 Premium License.....	13
Upgrade Considerations for Ports on Demand Licenses.....	14
Upgrade Considerations for MACsec Licenses.....	15
Software Licensing Tasks.....	17
Software Licensing Configuration Tasks	17
Generating a Certificate of Entitlement (CoE).....	17
Querying the Licensing Portal.....	24
Installing and Downgrading SAU Licenses.....	26
Installing an SAU License.....	26
Downgrading an SAU License.....	28
Upgrading Licenses for a Stack.....	28
Viewing the Serial Number of the Device.....	29
Viewing the License Database	30
Deleting a License from an ICX Device.....	31
Deleting an SAU License	31
Deleting an XML License.....	31
Transferring a License.....	32
Syslog Messages and Trap Information.....	32
Layer 3 Premium Licensing.....	33
Layer 3 Premium Features and Platform Support.....	33
Ports on Demand Licensing.....	37
Ports on Demand Overview and Platform Support	37

Ports on Demand Licensing on the ICX 7150.....	37
Stacking Support on Ruckus ICX 7150 Devices.....	38
Ports on Demand Licensing on the ICX 7250	38
Upgrading a PoD License.....	39
Configuring PoD on an interface.....	40
Displaying the license configuration for PoD ports after a license upgrade.....	41
Campus Fabric Licensing	41
MACSec Key-Based Licensing.....	43
How MACsec works.....	43
How MACsec handles data and control traffic.....	43
MACsec Key Agreement protocol.....	43
MKA message exchange between two switches.....	44
Secure channels.....	44
MACsec licensing.....	44
Enabling and configuring group interfaces for MACsec.....	45
Verifying the MACsec license.....	45
Appendix: ICX License Serial Number Prefixes and Sample CoE.....	47
ICX License Serial Number Prefixes.....	47
Sample Certificate of Entitlement.....	48

Preface

- Document Conventions..... 5
- Command Syntax Conventions..... 6
- Document Feedback..... 6
- Ruckus Product Documentation Resources..... 6
- Online Training Resources..... 7
- Contacting Ruckus Customer Services and Support..... 7

Document Conventions

The following tables list the text and notice conventions that are used throughout this guide.

TABLE 1 Text conventions

Convention	Description	Example
monospace	Identifies command syntax examples.	<code>device(config)# interface ethernet 1/1/6</code>
bold	User interface (UI) components such as screen or page names, keyboard keys, software buttons, and field names	On the Start menu, click All Programs .
<i>italics</i>	Publication titles	Refer to the <i>Ruckus Small Cell Release Notes</i> for more information

Notes, Cautions, and Warnings

Notes, cautions, and warning statements may be used in this document. They are listed in the order of increasing severity of potential hazards.

NOTE

A NOTE provides a tip, guidance, or advice, emphasizes important information, or provides a reference to related information.



CAUTION

A CAUTION statement alerts you to situations that can be potentially hazardous to you or cause damage to hardware, firmware, software, or data.



DANGER

A DANGER statement indicates conditions or situations that can be potentially lethal or extremely hazardous to you. Safety labels are also attached directly to products to warn of these conditions or situations.

Command Syntax Conventions

Bold and italic text identify command syntax components. Delimiters and operators define groupings of parameters and their logical relationships.

Convention	Description
bold text	Identifies command names, keywords, and command options.
<i>italic text</i>	Identifies a variable.
[]	Syntax components displayed within square brackets are optional. Default responses to system prompts are enclosed in square brackets.
{ x y z }	A choice of required parameters is enclosed in curly brackets separated by vertical bars. You must select one of the options.
x y	A vertical bar separates mutually exclusive elements.
< >	Nonprinting characters, for example, passwords, are enclosed in angle brackets.
...	Repeat the previous element, for example, <i>member[member...]</i> .
\	Indicates a “soft” line break in command examples. If a backslash separates two lines of a command input, enter the entire command at the prompt without the backslash.

Document Feedback

Ruckus is interested in improving its documentation and welcomes your comments and suggestions.

You can email your comments to Ruckus at: docs@ruckuswireless.com

When contacting us, please include the following information:

- Document title and release number
- Document part number (on the cover page)
- Page number (if appropriate)
- For example:
 - Ruckus Small Cell Alarms Guide SC Release 1.3
 - Part number: 800-71306-001
 - Page 88

Ruckus Product Documentation Resources

Visit the Ruckus website to locate related documentation for your product and additional Ruckus resources.

Release Notes and other user documentation are available at <https://support.ruckuswireless.com/documents>. You can locate documentation by product or perform a text search. Access to Release Notes requires an active support contract and Ruckus Support Portal user account. Other technical documentation content is available without logging into the Ruckus Support Portal.

White papers, data sheets, and other product documentation are available at <https://www.ruckuswireless.com>.

Online Training Resources

To access a variety of online Ruckus training modules, including free introductory courses to wireless networking essentials, site surveys, and Ruckus products, visit the Ruckus Training Portal at <https://training.ruckuswireless.com>.

Contacting Ruckus Customer Services and Support

The Customer Services and Support (CSS) organization is available to provide assistance to customers with active warranties on their Ruckus Networks products, and customers and partners with active support contracts.

For product support information and details on contacting the Support Team, go directly to the Support Portal using <https://support.ruckuswireless.com>, or go to <https://www.ruckuswireless.com> and select **Support**.

What Support Do I Need?

Technical issues are usually described in terms of priority (or severity). To determine if you need to call and open a case or access the self-service resources use the following criteria:

- Priority 1 (P1)—Critical. Network or service is down and business is impacted. No known workaround. Go to the **Open a Case** section.
- Priority 2 (P2)—High. Network or service is impacted, but not down. Business impact may be high. Workaround may be available. Go to the **Open a Case** section.
- Priority 3 (P3)—Medium. Network or service is moderately impacted, but most business remains functional. Go to the **Self-Service Resources** section.
- Priority 4 (P4)—Low. Request for information, product documentation, or product enhancements. Go to the **Self-Service Resources** section.

Open a Case

When your entire network is down (P1), or severely impacted (P2), call the appropriate telephone number listed below to get help:

- Continental United States: 1-855-782-5871
- Canada: 1-855-782-5871
- Europe, Middle East, Africa, and Asia Pacific, toll-free numbers are available at <https://support.ruckuswireless.com/contact-us> and Live Chat is also available.

Self-Service Resources

The Support Portal at <https://support.ruckuswireless.com/contact-us> offers a number of tools to help you to research and resolve problems with your Ruckus products, including:

- **Technical Documentation**—<https://support.ruckuswireless.com/documents>
- **Community Forums**—<https://forums.ruckuswireless.com/ruckuswireless/categories>
- **Knowledge Base Articles**—<https://support.ruckuswireless.com/answers>

Preface

Contacting Ruckus Customer Services and Support

- [Software Downloads and Release Notes](https://support.ruckuswireless.com/software)—<https://support.ruckuswireless.com/software>
- [Security Bulletins](https://support.ruckuswireless.com/security)—<https://support.ruckuswireless.com/security>

Using these resources will help you to resolve some issues, and will provide TAC with additional data from your troubleshooting analysis if you still require assistance through a support case or RMA. If you still require help, open and manage your case at https://support.ruckuswireless.com/case_management

About This Document

- Supported hardware..... 9
- How command information is presented in this guide..... 9
- What's new in this document..... 9

Supported hardware

This guide supports the following Ruckus products:

- Ruckus ICX 7750 Series
- Ruckus ICX 7650 Series
- Ruckus ICX 7450 Series
- Ruckus ICX 7250 Series
- Ruckus ICX 7150 Series

For information about what models and modules these devices support, see the hardware installation guide for the specific product family.

How command information is presented in this guide

For all new content supported in FastIron release 08.0.20 and later, command information is documented in a standalone command reference guide.

In the *Ruckus FastIron Command Reference*, the command pages are in alphabetical order and follow a standard format to present syntax, parameters, mode, usage guidelines, examples, and command history.

NOTE

Many commands introduced before FastIron release 08.0.20 are also included in the guide.

What's new in this document

This document is updated for FastIron software release 08.0.80.

TABLE 2 Summary of enhancements in FastIron release 08.0.80

Feature	Description	Described in
Self-Authenticated Upgrade (SAU) licensing was implemented on all ICX platforms that run FastIron 08.0.80 or later releases.	SAU licensing allows a licensed feature set to be installed with a single command.	Most of the information in this guide is relevant to SAU licensing, but the following sections in particular should be noted: <ul style="list-style-type: none">• Upgrading from FastIron 08.0.70 and Earlier Releases on page 13• Upgrading or Downgrading SAU Licenses•

Software Licensing Overview

- How Software Licensing Works..... 11
- Self-Authenticated Upgrade Licensing..... 11
- Software Licensing Terminology..... 11
- Licensing Rules..... 12
- FastIron Licensed Features and Platform Support..... 12
- Upgrading from FastIron 08.0.70 and Earlier Releases..... 13

How Software Licensing Works

Software licensing provides increased scalability and rapid deployment of hardware and software features on the supported Ruckus family of switches. One or more valid software licenses are required to run licensed features on the device.

A permanent license (for select features on specific units) can be ordered pre-installed in a Ruckus device when first shipped from the factory, or later ordered and installed by the customer. In either case, additional licenses can be ordered as needed.

When a license is ordered separately (not pre-installed), an entitlement certificate or email message, along with an Activation Code, are issued to the customer by Ruckus as proof of purchase.

Once a license is installed on the Ruckus devices, the license unlocks the licensed feature and it becomes available immediately. There is no need to reload the software.

Self-Authenticated Upgrade Licensing

Self-Authenticated Upgrade (SAU) licensing allows you to upgrade or downgrade to a licensed feature set with a single command. The **license install** command replaces other licensing commands for installing or deleting a license. You no longer need to install a license file using TFTP or SCP.

Software Licensing Terminology

The following terms are used in this document:

- Certificate of Entitlement (CoE): The proof-of-purchase certificate issued by Ruckus when a license is purchased. When a license is purchased, an Activation Code is sent to the customer via email. This Activation Code and the target device serial number are needed to create the CoE, which has its own unique serial number and is downloaded as a .pdf file from the Ruckus Support site. The CoE serial number can be entered on the switch using the **license set** command, which causes the CoE serial number to be displayed in show command output and available via SNMP. One CoE is issued for each feature license that is purchased.
- Licensed feature: Any hardware or software feature or set of features that require a valid software license in order to operate on the device.
- Activation Code: A unique key, along with the serial number, used to generate a CoE on the Ruckus Support site. The Activation Code is issued by Ruckus when a license is purchased. The Activation Code is delivered in an email message a few minutes after the order is placed, though the timing will vary depending on the network, Internet connection, and so on.

Licensing Rules

The following licensing rules apply to all ICX devices that support SAU software licensing:

- A license is not tied to a specific device. It can be removed from one device and redeployed on another device.
- Licensed features can be activated prior to obtaining a valid license and used for a trial period of 45 days, based on an agreement to obtain a license.
- More than one license can be installed per device concurrently.
- Trial licenses for all licensed features are built into the device. Enabling any licensed feature will activate a 45-day trial period which will require the user to accept the Ruckus terms and conditions of use.
- More than one trial license can be in effect at the same time, as long as each trial license applies to a unique licensed feature.
- A trial license cannot replace or supersede a normal license.

FastIron Licensed Features and Platform Support

Some Ruckus ICX devices come with feature licenses pre-installed. For devices that do not have pre-installed licenses, you can purchase licenses separately for the features or feature sets you want to use.

The following table lists the licenses that are available for each Ruckus ICX platform. Note the following descriptions of the fields:

- **Licensed Feature:** Licensed features available for that platform.
- **License Install Options:** Names of the licenses that can be installed on the platform. These are the license names used in the CLI when installing a license. Note that the "R" in the license name indicates the L3 Prem license.
- **License Delete Options:** Names of the licenses that can be deleted from the platform. These are the license names used in the CLI when deleting a license.
- **Default Package:** Pre-installed licenses on the platform.
- **Possible Packages:** Possible license packages available for that platform. These license package names appear in the **show license** command output.

Platform	Licensed Feature	License Install Options	License Delete Options	Default Package	Possible Packages
ICX 7150-24/48	L3 PREM PoD	4x1g, 2x10g, 4x10gr	2x10g, 4x10gr	4x1G	4x1G, 2x10G, 4x10GR
ICX 7150-48ZP	L3 PREM PoD	2x10g, 8x10gr	8x10gr	2x10G	2X10G, 8x10GR
ICX 7150-C12	L3 PREM PoD	2x1g, 2x10gr	2x10gr	2x1G	2x1G, 2x10GR
ICX 7250	L3 PREM PoD	l3-prem 2x10g, 8x10g	l3-prem 2x10g, 8x10g	l3-base	l3-base, l3-prem, l3-base-2x10G, l3-prem-2x10G, l3-base-8x10G, l3-prem-8x10G
ICX 7450	L3 PREM MACSec	l3-prem macsec	l3-prem macsec	l3-base	l3-base, l3-prem, l3-base-macsec, l3-prem-macsec

Platform	Licensed Feature	License Install Options	License Delete Options	Default Package	Possible Packages
ICX 7650	L3 PREM	l3-prem	l3-prem	l3-base	l3-base, l3-prem, l3-base-macsec, l3-prem-macsec
	MACSec	macsec	macsec		
ICX 7750	L3 PREM	L3 PREM	L3 PREM	l3-base	l3-prem

Upgrading from FastIron 08.0.70 and Earlier Releases

Beginning in FastIron 08.0.80, the Self-Authenticated Upgrade (SAU) licensing model was implemented on all the Ruckus ICX platforms. When upgrading from FastIron 08.0.70 or earlier releases, existing software feature licenses on the device will be converted to SAU licenses. The original XML licenses are preserved on the system in case the switch is downgraded to an earlier version that requires them.

Refer to the following topics for important considerations when upgrading:

- [Upgrade Considerations for the Layer 3 Premium License](#) on page 13
- [Upgrade Considerations for Ports on Demand Licenses](#) on page 14
- [Upgrade Considerations for MACsec Licenses](#) on page 15

Upgrade Considerations for the Layer 3 Premium License

In FastIron 08.0.70 and earlier releases, Layer 3 Premium licenses on the ICX 7250 and ICX 7450 were implemented as XML licenses. Beginning with FastIron 08.0.80, all Layer 3 Premium licenses are Self-Authenticated Upgrade (SAU) licenses.

Upgrading a System Without a Layer 3 Premium License from FastIron 08.0.70 or Earlier Releases

Layer 3 Premium licensed features are not available until the user has enabled the Layer 3 Premium SAU license. Without the Layer 3 Premium license, the Layer 3 licensed features cannot be used. This is a change in behavior for the ICX 7250 and ICX 7450; in releases prior to FastIron 08.08.80, licensed Layer 3 features could be enabled before a license was installed.

In an upgrade from FastIron 08.0.70 or earlier releases to FastIron 08.0.80 or later releases, the system enables the Layer 3 Base license package automatically, which means all Layer 3 premium features are disabled.

However, if the system does not have a Layer 3 Premium XML license and Layer 3 Premium features are configured, these L3 features will be lost after the upgrade. In order to avoid losing Layer 3 configurations, perform one of the following actions before or after the upgrade:

- Before upgrading the system, check the license compliance status. Purchase and install the Layer 3 Premium XML license on the device if needed. Always back up the configuration, and keep a backup of all license files.
- Before upgrading the system, back up the configuration. After the upgrade, enable the Layer 3 Premium SAU license and copy the configuration back to the system.
- After upgrading the system, immediately enable the Layer 3 Premium SAU license, but do not save the configuration, and then reload. After the system is back up, the Layer 3 Premium configuration should be back as it was before the upgrade.

NOTE

In this case, the running configuration is lost, but the Layer 3 premium configuration remains in the startup configuration as long as the user does not enter the **write mem** command after the upgrade.

In a stacking configuration, if Layer 3 licensed features are required then a valid Layer 3 Premium license must be installed on all members of the stack.

If the active unit has an XML Layer 3 Premium license installed, the Layer 3 Premium configuration should remain the same after the upgrade, but member units without a Layer 3 Premium XML license will enter a non-operational state. To prevent member units from becoming non-operational, copy the Layer 3 Premium XML license to relevant units before the upgrade, or enable the Layer 3 Premium SAU license on relevant units after the upgrade.

If the active unit does not have a Layer 3 Premium XML license, the configuration of any premium Layer 3 features will be lost after the upgrade. Use one of the three preceding methods to prevent the loss of or to recover the Layer 3 configuration.

ICX Device with an Existing Layer 3 Premium XML License

If there is an existing Layer 3 Premium XML license on the device, the system will automatically enable the Layer 3 Premium SAU license upon upgrade to 08.0.80, and Layer 3 feature configuration will be retained. All Layer 3 features will function as before the upgrade.

All XML license files will be preserved in case the device is loaded with a non-SAU license image (that is, in case of a downgrade).

Upgrade Considerations for Ports on Demand Licenses

In FastIron 08.0.70 and earlier releases, Ports on Demand (PoD) licenses on the ICX 7250 were implemented as XML licenses. Beginning with FastIron 08.0.80, all PoD licenses are Self-Authenticated Upgrade (SAU) licenses.

Upgrading an ICX 7250 Without an XML PoD License

Without a PoD license, all the licensed ports on an ICX 7250 have 1-Gbps speed. After an upgrade to 08.0.80 or later releases, these ports will continue to have 1-Gbps speed. If a user needs a 10-Gbps port after the upgrade, user can enable the PoD SAU license for the 2x10G or 8x10G option.

Upgrading an ICX 7250 With an Existing XML PoD License

When an ICX 7250 with an existing PoD XML license is upgraded to FastIron 08.0.80 or later releases, the system automatically converts the PoD XML license to the corresponding PoD SAU license.

An upgrade to 08.0.80 has no impact on a stacking system.

When a user sets the PoD SAU license, the system looks at the existing XML license. If the option selected is of an equal or lower capacity to the PoD XML license, the SAU license is enabled. If an option with a higher capacity than the PoD XML license is selected, the SAU license is not enabled and the system displays a message instructing you to delete the PoD XML license before enabling the SAU license.

All XML license files will be preserved in case the device is downgraded to FastIron 08.0.70 or earlier release.

Upgrade Considerations for MACsec Licenses

In FastIron 08.0.70 and earlier releases, MACsec licenses were implemented as XML licenses. Beginning with FastIron 08.0.80, all MACsec licenses are Self-Authenticated Upgrade (SAU) licenses.

Upgrading an ICX 7450 or ICX 7650 Without an Existing MACsec License

A MACsec license is required to enable MACsec encryption on a port. When upgrading from FastIron 08.0.70 or earlier releases to FastIron 08.0.80 or later releases, if there is not an existing MACsec XML license on the switch, the MACsec SAU license will not be enabled after the upgrade.

Upgrading an ICX 7450 or ICX 7650 With an Existing MACsec License

When an ICX 7450 or ICX 7650 with an existing MACsec XML license is upgraded to FastIron 08.0.80 or later releases, the system automatically converts the MACsec XML license to the corresponding SAU license.

An upgrade to FastIron 08.0.80 or later releases has no impact on a stacking system.

Software Licensing Tasks

• Software Licensing Configuration Tasks	17
• Generating a Certificate of Entitlement (CoE).....	17
• Querying the Licensing Portal.....	24
• Installing and Downgrading SAU Licenses.....	26
• Upgrading Licenses for a Stack.....	28
• Viewing the Serial Number of the Device.....	29
• Viewing the License Database	30
• Deleting a License from an ICX Device.....	31
• Transferring a License.....	32
• Syslog Messages and Trap Information.....	32

Software Licensing Configuration Tasks

Software licensing configuration tasks require generating and obtaining a software license, and then installing the license on the Ruckus device. The following tasks must be performed in the order given.

1. Order the desired license.
2. Retrieve the serial number of the Ruckus device and the license Activation Code, which will be delivered via email.
3. Log in to the Ruckus Support portal (<https://support.ruckuswireless.com>) to generate the CoE.
4. Install the SAU license on the Ruckus device, and optionally add the CoE serial number.
5. Verify that the license is installed.

Generating a Certificate of Entitlement (CoE)

You must generate the CoE from the Ruckus Support portal before you can install your SAU license.

The following procedure demonstrates how to generate a CoE.

You need the following information to generate a CoE:

- Activation Code
 - Serial number of the device
 - Support account
1. Order a license CoE.

After ordering the license, an Activation Code will be sent to you in an email.

NOTE

45-day trial licenses are built in to the device and available by default.

NOTE

Do not delete the e-mail with the electronic Activation Code until the CoE has been generated, in case it is needed for technical support.

- Find the serial number of your Ruckus device by entering the **show version** command on the device.

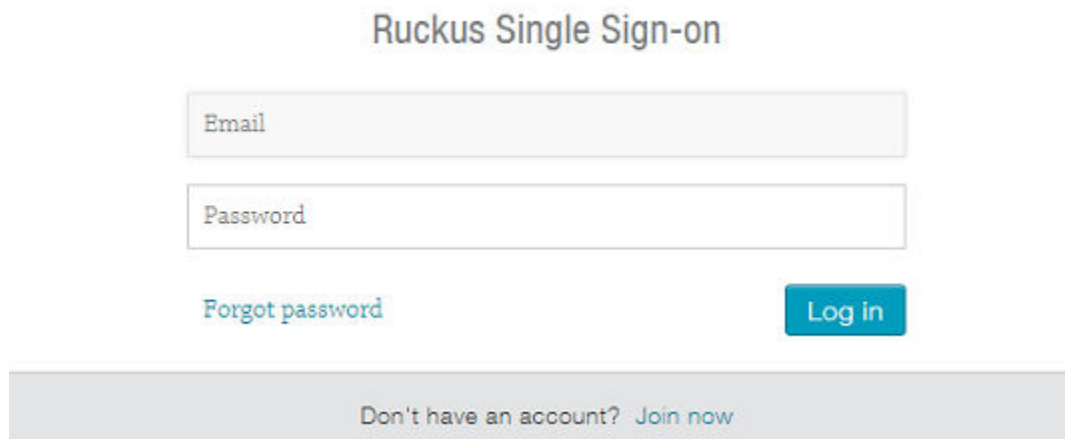
```
device> show version

Copyright (c) 2017 Ruckus Wireless, Inc. All rights reserved.
UNIT 1: compiled on Jul 25 2017 at 12:04:34 labeled as SPR08070b1
(29789712 bytes) from Secondary SPR08070b1.bin
  SW: Version 08.0.70b1T213
  Compressed Boot-Monitor Image size = 786944, Version:10.1.09T215 (spz10109b008)
  Compiled on Wed Sep 21 05:58:52 2016
UNIT 2: compiled on Jul 25 2017 at 12:04:34 labeled as SPR08070b1
(29789712 bytes) from Secondary SPR08070b1.bin
  SW: Version 08.0.70b1T213
  Compressed Boot-Monitor Image size = 786944, Version:10.1.09T215 (spz10109b008)

HW: Stackable ICX7250-24
=====
UNIT 1: SL 1: ICX7250-24 24-port Management Module
  Serial #:DUH3821L070
  License: ICX7250_L3_SOFT_PACKAGE (LID: fwjINHGnFMF)
  Current License: L3-PREM-2x10G
  P-ASIC 0: type B344, rev 01 Chip BCM56344_A0
=====
UNIT 1: SL 2: ICX7250-SFP-Plus 8-port 80G Module
=====
UNIT 2: SL 1: ICX7250-24 24-port Management Module
  Serial #:DUJ3845L0FV
  License: ICX7250_L3_SOFT_PACKAGE (LID: fwlINJKnFhx)
  Current License: L3-PREM-8x10G
=====
UNIT 2: SL 2: ICX7250-SFP-Plus 8-port 80G Module
=====
```

- Click on the Activation Code link in the email or log in to the Ruckus support portal at <https://support.ruckuswireless.com>. The **Ruckus Single Sign-on** window appears.

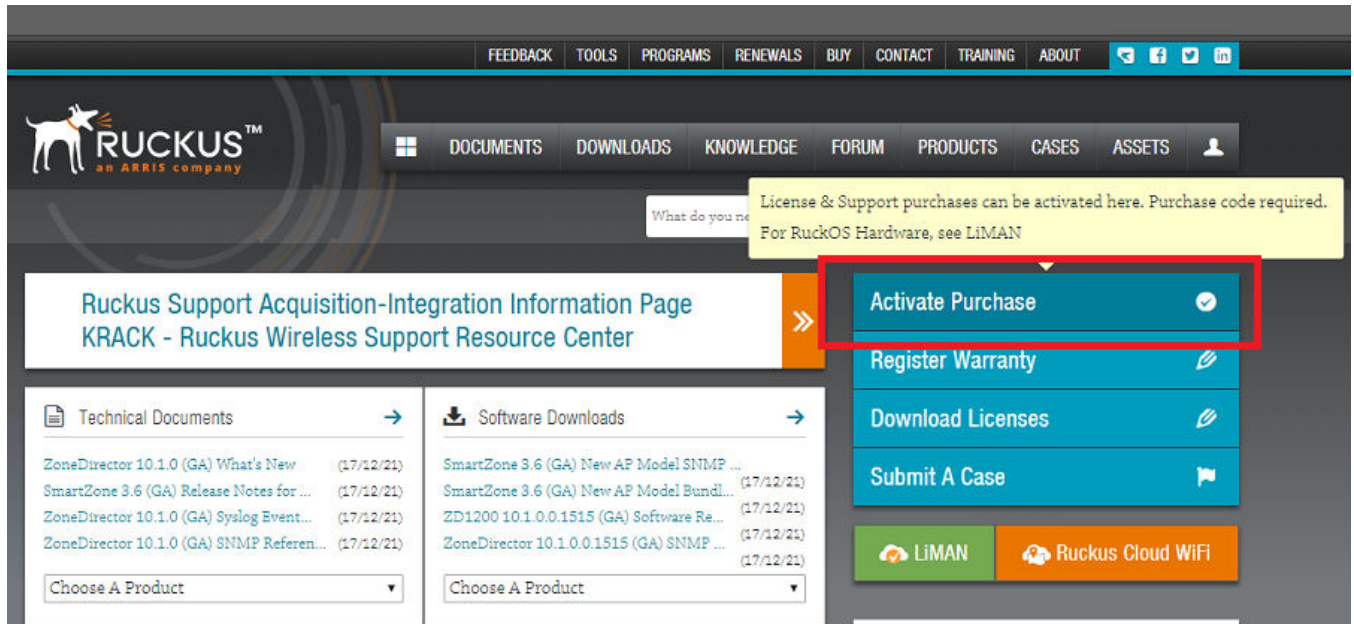
FIGURE 1 Ruckus Single Sign-on Window



- Enter your email address and password, and click **Log in**. If you do not have an account, click **Join now** and follow the instructions.

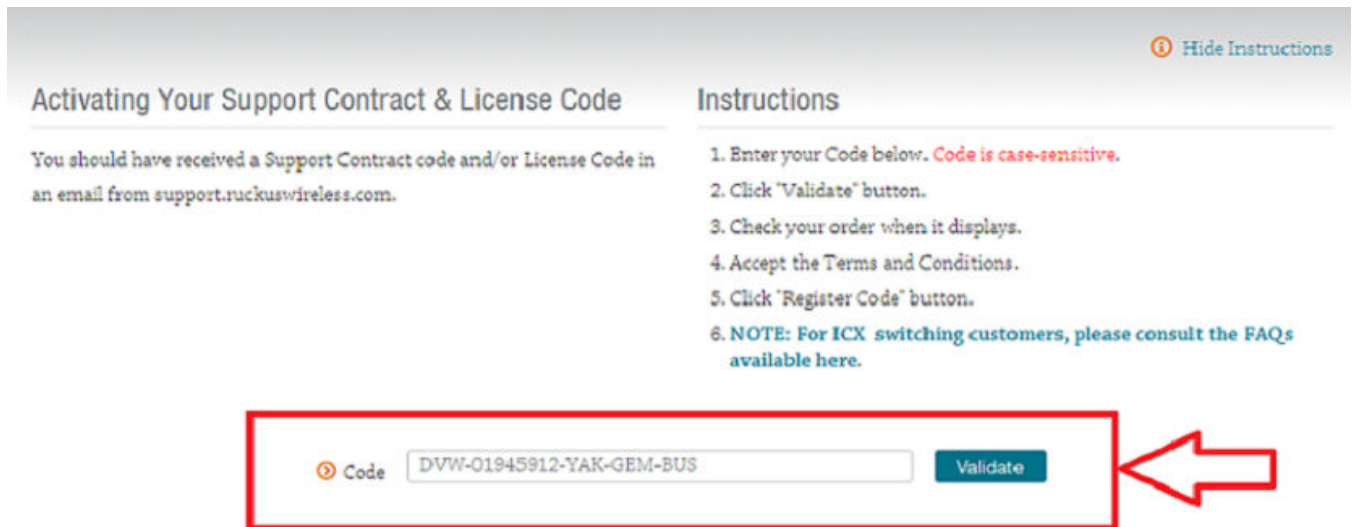
5. Click **Activate Purchase**.

FIGURE 2 Activate Purchase



6. Enter the Activation Code received by email, and click **Validate**.

FIGURE 3 Activating Your Support Contract & License Code Window



- The software license details appear. Review the information to ensure it is correct. Accept the terms and conditions, and click **Activate Purchase**.

FIGURE 4 Reviewing Software License Details

[Hide Instructions](#)

Activating Your Support Contract & License Code

You should have received a Support Contract code and/or License Code in an email from support.ruckuswireless.com.

Instructions

1. Enter your Code below. **Code is case-sensitive.**
2. Click "Validate" button.
3. Check your order when it displays.
4. Accept the Terms and Conditions.
5. Click "Register Code" button.
6. **NOTE: For ICX switching customers, please consult the FAQs available here.**

Please Review The Order

Click the 'Activate Purchase' button at the bottom of the page.

Qty	License Product Code	Description
1	ICX7250-8X10G-LIC-POD	S/W,ICX7250 2X10+6X1 TO 8X10 UPLNK/STKNG

Accept Terms and Conditions

By checking accept, you hereby acknowledge and agree to the following [Terms and Conditions](#)

Activate Purchase

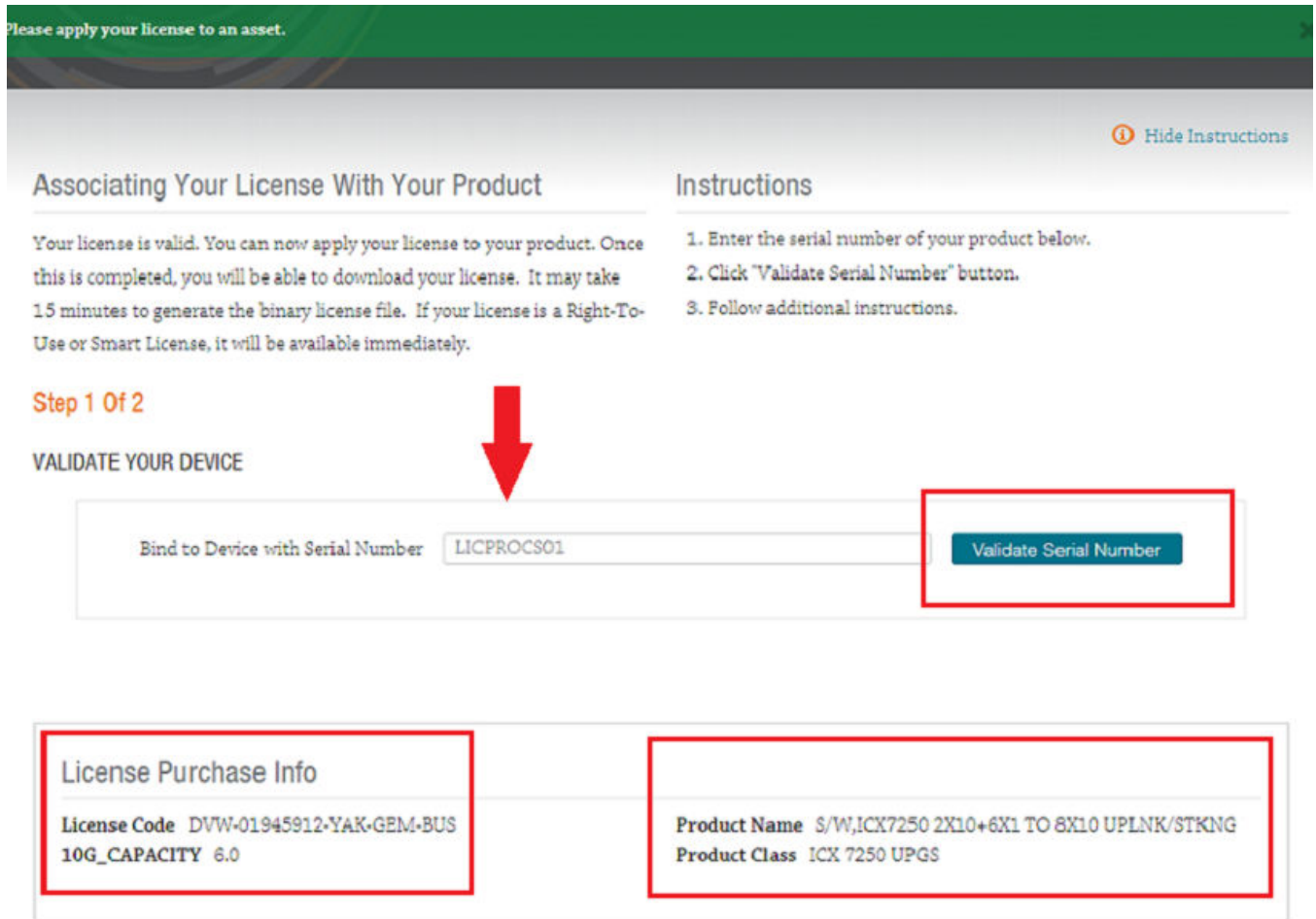
Cancel

8. The **Associating Your License With Your Product** window appears. Enter the serial number of the device. Click **Validate Serial Number**.

NOTE

Retrieve the serial number of your Ruckus device by entering the **show version** command on the device.

FIGURE 5 Associating Your License with Your Product



9. The device information appears. Review the device information.
- If the information is correct, click **Register Device & Bind To License**.
 - If the information is incorrect, click **Change Serial Number**. Re-enter the serial number of the device.

FIGURE 6 Registering Your Device

Associating Your License With Your Product

Your license is valid. You can now apply your license to your product. Once this is completed, you will be able to download your license. It may take 15 minutes to generate the binary license file. If your license is a Right-To-Use or Smart License, it will be available immediately.

Step 2 Of 2

REGISTER YOUR DEVICE

- Select Device Model.
- Click 'Register Device & Bind To License' Button.
- Once registered, your license will be bound to this device.

ICX7250-24G 24-PRT 4X1G SFP

Change Serial Number

Serial Number: LICPROCS01

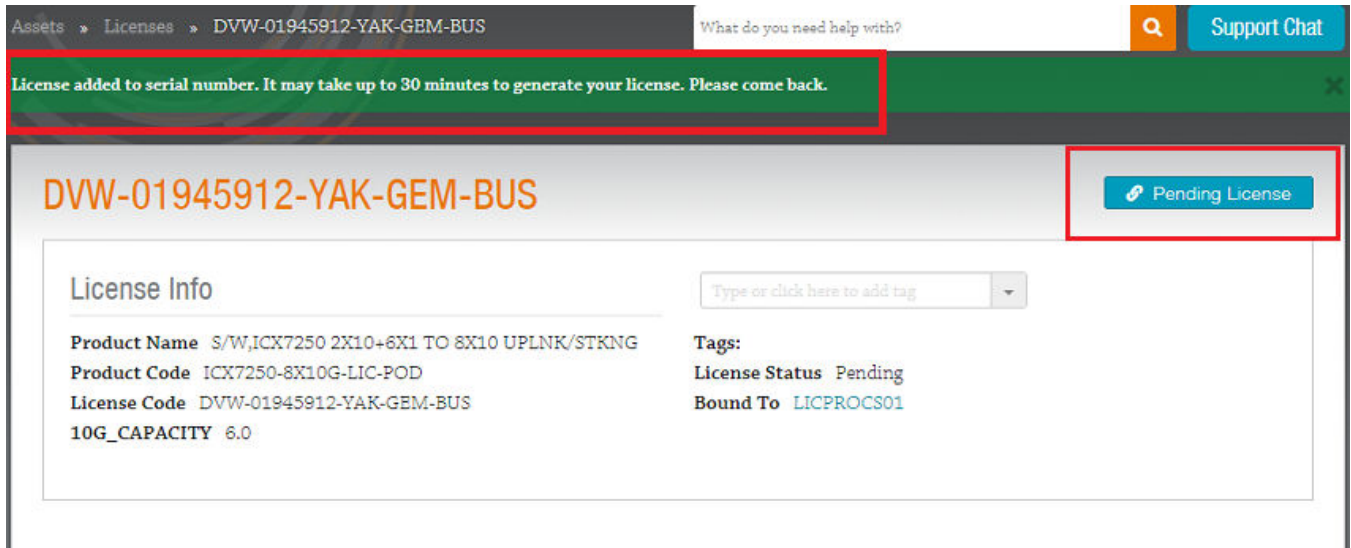
Register Device & Bind To License or

License Purchase Info

License Code	DVW-01945912-YAK-GEM-BUS	Product Name	S/W,ICX7250 2X10+6X1 TO 8X10 UPLNK/STKNG
10G_CAPACITY	6.0	Product Class	ICX 7250 UPGS

If you selected **Register Device & Bind To License**, the **Pending License** status appears. The **Pending License** status can take up to 30 minutes.

FIGURE 7 Pending License Status



10. Once the license is available, the **Pending License** status disappears and **Download License** and **Download CoE** buttons appear.
 - Click **Download CoE** to download the CoE PDF to your PC.
 - Click **Download License** to download the XML license file to your PC. Note that the XML file is only needed if you are going to downgrade your ICX 7250 or 7450 to FastIron 8.0.70 or older releases. After downloading the XML license, you will need to upload the license file to the Ruckus device. See the Ruckus FastIron Software Licensing Guide for your release for instructions on uploading the license file.

FIGURE 8 Download CoE Window



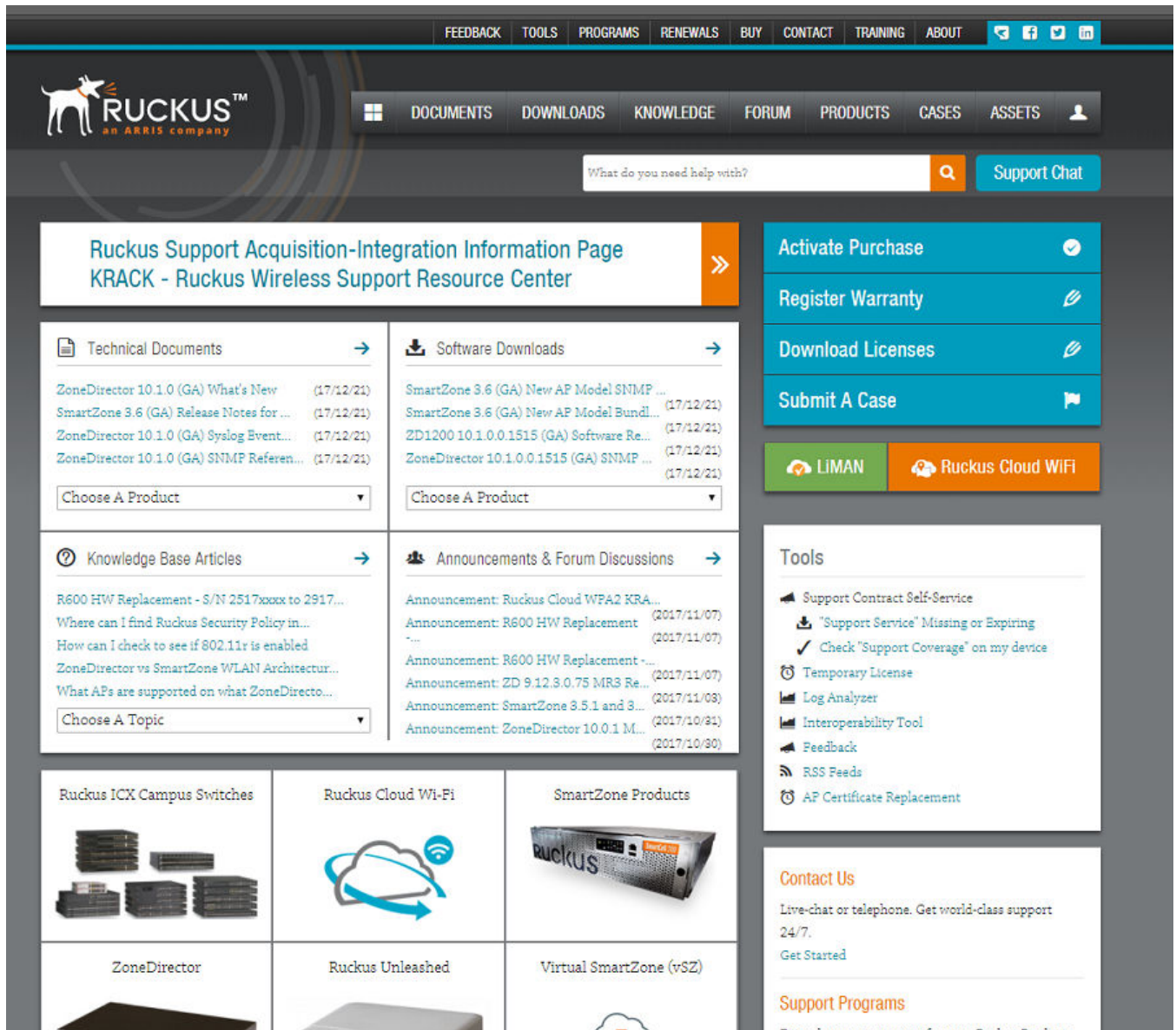
11. Refer to the [FastIron End User License Agreement](#) before enabling SAU licenses on ICX devices.

Querying the Licensing Portal

To view software license information for a particular product, you can find that information on the Ruckus Licensing Portal with an Activation Code or serial number.

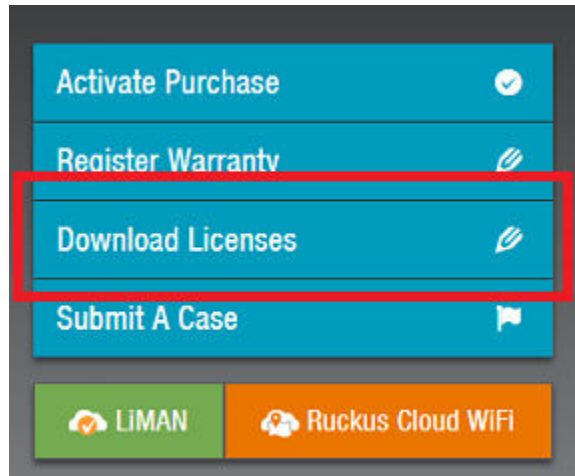
1. To view software license information, go to <https://support.ruckuswireless.com/>. The Support window appears.

FIGURE 9 Support Window



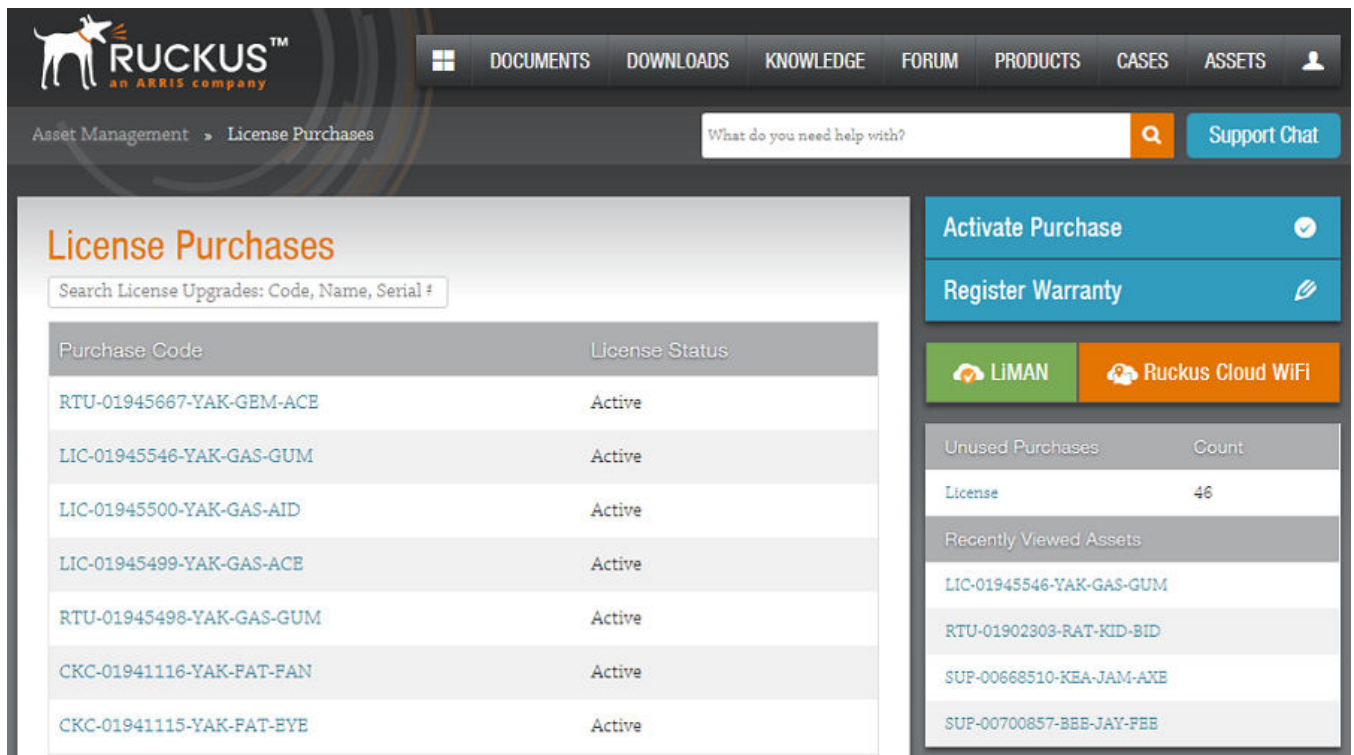
2. Select **Download Licenses**.

FIGURE 10 Download Licenses



3. Search for your license using either your Activation Code or serial number.

FIGURE 11 Search for Your License



- Depending on the status of the license (for example, whether or not the license was generated), the report includes the following product information:

- Product name SKU
- ID value
- Activation Code
- License
- Created date
- Capacity
- Customer name
- Description

If the query is performed before the Activation Code is generated, the hardware-related information will not appear as part of the search results. Similarly, if the query is performed before the license is generated, some of the information in the software-related information will not be displayed.

- Click **more** or **less** in **ID value** to view the serial number.
- Click the **License** hyperlink to download the license information.
- Click **Export to Excel** to download the report for sharing or archiving purposes, or click **Search Another Unit** to query another product.

Installing and Downgrading SAU Licenses

Installing and downgrading an SAU licensed feature set use the same commands and similar steps.

Installing an SAU License

To install an SAU license, perform the following steps. The examples in the steps show how to upgrade from a 2X10G license to a 4X10GR license on a Ruckus ICX 7150.

NOTE

In order to perform the following task, you must have ordered and generated a license CoE on the Ruckus Support site. A unit number and the purchased license name are required. The CoE serial number is optional.

- (Optional) Enter the **show license** command to verify the licenses already installed on the device.

```
device# show license
Unit License Name L3 Premium Port Speed Upgrade Speed Ports MACsec
1 2X10G No Yes 10G 2 NA
```

- Enter the **show version** command to verify license details. The Current License field displays the license package you have currently installed on the device.

```
ICX7150-24P Router# show version
Copyright (c) 2017 Ruckus Wireless, Inc. All rights reserved.
UNIT 1: compiled on May 18 2018 at 15:53:24 labeled as SPR08080b1
(30771912 bytes) from Secondary SPR08080b1.bin
SW: Version 08.0.80b1T213
Compressed Boot-Monitor Image size = 786944, Version:10.1.09T225 (mnz10109b010)
Compiled on Tue Nov 15 17:06:47 2016

HW: Stackable ICX7150-24-POE
=====
UNIT 1: SL 1: ICX7150-24P-4X1G POE 24-port Management Module
Serial #:BSY3229M001
Software Package: ICX7150_BASE_L3_SOFT_PACKAGE
Current License: 2X10G
P-ASIC 0: type B160, rev 11 Chip BCM56160_B0
=====
UNIT 1: SL 2: ICX7150-2X1GC 2-port 2G Module
=====
UNIT 1: SL 3: ICX7150-4X10GF 4-port 40G Module
=====
1000 MHz ARM processor ARMv7 88 MHz bus
8192 KB boot flash memory
2048 MB code flash memory
1024 MB DRAM
STACKID 1 system uptime is 5 minute(s) 42 second(s)
The system started at 22:46:06 GMT+00 Tue Mar 21 2000

The system : started=warm start reloaded=by "reload"
*** NOT FOR PRODUCTION ***
```

- Enter the **license install perpetual** command, followed by the unit number and the purchased license name.

```
device# license install perpetual 1 4x10gr
```

The example installs a perpetual 4X10GR license on unit 1.

- Enter **y** to accept the End User License Agreement (EULA), or **n** to cancel.

```
The Ruckus FastIron End User License Agreement (EULA) terms and conditions found at https://
www.ruckuswireless.com/icxfastironeula apply to your use of this software. The evaluation license
period is 45 days after which you must purchase a license should you continue using the software.
Please confirm that you have read and accept these terms and conditions (entry y or n): y
```

- Confirm the license installation with the **show license** command.

```
device# show license
Unit License Name L3 Premium Port Speed Upgrade Speed Ports MACsec
1 4X10GR Yes Yes 10G 4 NA
2 2X10G No Yes 10G 2 NA
```

The example shows a 4X10GR license with Layer 3 Premium features installed on unit 1, and a 2X10G license installed on unit 2.

- Enter the **show version** command for additional details to verify that the license is installed correctly.

NOTE

If you attempt to install a license that is already installed on the device, an error message is displayed, as shown in the following example.

```
device# license install perpetual 1 2x10g
License package 2x10g is already installed.
```

7. Use the **license set serial-number** command to add the CoE serial number to the device.

```
device)# license set serial-number 1 l3-prem PR320400289
```

Once entered, the CoE serial number will be displayed as part of the **show license installed** output, and also available via SNMP.

Downgrading an SAU License

To downgrade an SAU license, perform the following steps. The examples in the steps show how to downgrade from a 4X10GR license to a 2X10G license on a Ruckus ICX 7150.

1. (Optional) Use the **show license** command to verify the licenses already installed on the device.

```
device# show license
Unit License Name L3 Premium Port Speed Upgrade Speed Ports MACsec
1 4X10GR Yes Yes 10G 4 NA
2 2X10G No Yes 10G 2 NA
```

In the example, a 4X10GR license is installed on unit 1.

2. Enter the **license install perpetual** command followed by the unit number for the device and the name of the license to which you are downgrading.

```
device# license install perpetual 1 2x10g
```

The example installs a perpetual 2X10G license on unit 1.

3. Enter **y** to accept the downgrade of the license, or **n** to cancel.

```
By selecting 'y' current license will be downgraded. All licensed configurations will be lost after reload.
Continue?(enter 'y' to continue, 'n' to cancel): y
License downgrade successful. Reboot may be required for licensed features to be automatically disabled. If you did not intend to perform a license downgrade, you can use the license install command to upgrade the license.
```

NOTE

When performing a license downgrade, the licensed features continue working until you reload the device.

4. Enter the **show version** command to verify the correct license to which you have downgraded. The Current License field displays the license you have currently installed on the device.

Upgrading Licenses for a Stack

Licenses for members of a stack can be managed from the active controller.

License updates for stack members can be entered from the active controller. As with standalone devices, the **license install perpetual** command is used to update licenses on a stack. Licenses can be installed on each stack member by referencing its stack unit ID in the command. The updates are retained and applied by the individual stack member, and related information is then shared with the active controller. If a stack unit is non-operational, license updates are applied when the unit returns to active mode. If a stack member goes down, it retains its own license information, but the active controller does not retain it.

The active and standby controllers for the stack store and sync license information. License information is retained during controller switchover or failover. When a device joins the stack, its license information is synced to the active and standby controllers.

An ICX 7150 and ICX 7250 must have a PoD license installed to join a stack because the minimum speed for ICX stacking ports is 10 Gbps. A PoD license must be installed on a port before it can be upgraded to 10 Gbps.

NOTE

ICX 7150-48ZP devices are an exception because they are shipped with two pre-installed 10-Gbps ports.

In an ICX stack, Layer 3 Premium features can be enabled if all units in the stack have a Premium license installed. If a Layer 3 Premium feature is enabled, any unit that joins the stack without a Premium license becomes non-operational. Either the Premium feature must be disabled, or the unit must be upgraded with a Premium license to become operational.

Viewing the Serial Number of the Device

Ruckus devices that ship during and after the release of software licensing have the license ID (LID) imprinted on the label affixed to the device. You can use the **show version** command as well to view the LID on these devices, and on devices that shipped before the release of software licensing.

Use the **show version** command to verify the serial number, software and hardware license package name, and LID of all units in the device. The following example is sample output from an ICX unit with the L3-PREM-2x10G package installed on unit 1 and L3-PREM-8x10G installed on unit 2.

```
device> show version
Copyright (c) 2017 Ruckus Wireless, Inc. All rights reserved.
UNIT 1: compiled on Jul 25 2017 at 12:04:34 labeled as SPR08070b1
(29789712 bytes) from Secondary SPR08070b1.bin
SW: Version 08.0.70b1T213
Compressed Boot-Monitor Image size = 786944, Version:10.1.09T215 (spz10109b008)
Compiled on Wed Sep 21 05:58:52 2016
UNIT 2: compiled on Jul 25 2017 at 12:04:34 labeled as SPR08070b1
(29789712 bytes) from Secondary SPR08070b1.bin
SW: Version 08.0.70b1T213
Compressed Boot-Monitor Image size = 786944, Version:10.1.09T215 (spz10109b008)

HW: Stackable ICX7250-24
=====
UNIT 1: SL 1: ICX7250-24 24-port Management Module
Serial #:DUH3821L070
License: ICX7250_L3_SOFT_PACKAGE (LID: fwjINHnFMF)
Current License: L3-PREM-2x10G
P-ASIC 0: type B344, rev 01 Chip BCM56344_A0
=====
UNIT 1: SL 2: ICX7250-SFP-Plus 8-port 80G Module
=====
UNIT 2: SL 1: ICX7250-24 24-port Management Module
Serial #:DUJ3845L0FV
License: ICX7250_L3_SOFT_PACKAGE (LID: fwLINJnFhx)
Current License: L3-PREM-8x10G
=====
UNIT 2: SL 2: ICX7250-SFP-Plus 8-port 80G Module
=====
1000 MHz ARM processor ARMv7 88 MHz bus
8192 KB boot flash memory
2048 MB code flash memory
2048 MB DRAM
STACKID 1 system uptime is 32 minute(s) 12 second(s)
STACKID 2 system uptime is 35 minute(s) 13 second(s)
The system started at 22:01:42 GMT+00 Tue Jul 25 2017

The system : started=warm start reloaded=by "reload"
My stack unit ID = 1, bootup role = active
```

Viewing the License Database

To display general information about all software licenses for all units in a device, use the **show license** command. The **show license** command only displays software license information for a unit, not hardware license information, as shown in the following example.

```
device# show license
Unit License Name      L3 Premium Port Speed Upgrade Speed  Ports  MACSec
1      L3-PREM-2X10G     Yes        Yes        10G    2      NA
2      L3-PREM-8x10G      Yes        Yes        10G    8      NA
device#
```

Use the **show license installed** command to display license information, including the CoE serial numbers, if entered.

```
device# show license installed
Unit License Name  L3 Premium Port Speed Upgrade Speed  Ports  MACsec SerialNo(L3/ICX7150) SerialNo(PoD/
MACsec)
1      L3-PREM-2X10G   Yes        Yes        10G    2      NA      PR320400289      PR320400290
2      L3-PREM-8x10G   Yes        Yes        10G    8      NA      PR320400289      PR320400291
device#
```

Use the **show license unit *unit-id*** command to display license information for a specific unit. Both SAU and pre-existing XML licenses are displayed. In the following output example, the ICX premium license, and the PoD license are installed on unit **1**.

```
device# show license unit 1
Unit License Name  L3 Premium Port Speed Upgrade Speed  Ports  MACSec
1      L3-PREM-2X10G   Yes        Yes        10G    2      NA

Index  Lic Mode      Lic Name          Lid/Serial No  Lic Type  Status  Lic Period  Lic
Capacity
Stack unit 1:
1      Non-Node Lock ICX7250-PREM-LIC-SW EN0E583FD98   Normal   Active  Unlimited  1
2      Node Lock     ICX7250-10G-LIC-POD fwjINHGnFMF   Normal   Active  Unlimited  2
device#
```

Use the **show license node-locked** command to display information about node-locked licenses that were installed on the device before release 08.0.80.

```
device show license node-locked
Index  Lic Mode      Lic Name          Lid          Lic Type  Status  Lic Period  Lic
Capacity
Stack unit 1:
2      Node Lock     ICX7250-10G-LIC-POD fwjINHGnFMF   Normal   Active  Unlimited  2
Stack unit 2:
1      Node Lock     ICX7250-10G-LIC-POD fwlINJknFhx   Normal   Active  Unlimited  8
device#
```

Use the **show license non-node-locked** command to display information about non-node-locked licenses that were installed on the device before release 08.0.80.

```
device# show license non-node-locked
Index  Lic Mode      Lic Name          Serial Number  Lic Type  Status  Lic Period  Lic
Capacity
Stack unit 1:
1      Non-Node Lock ICX7250-PREM-LIC-SW EN0E583FD98   Normal   Active  Unlimited  1
Stack unit 2:
2      Non-Node Lock ICX7250-PREM-LIC-SW EN0C606AA2E   Normal   Active  Unlimited  1
device#
```

Deleting a License from an ICX Device

A license remains in the license database until it is deleted. If you want to delete a license, Ruckus recommends that you first disable the licensed feature before deleting the associated license.

The sections below explain how to delete an SAU license as well as an XML license (from release 08.0.70 or earlier) from an ICX device.

Deleting an SAU License

The steps below explain how to delete an SAU license as well as an XML license (from release 08.0.70 or earlier) from an ICX device.

Use the **license delete perpetual** command to delete an SAU license and restore the default license option.

```
device# license delete perpetual 1 l3-prem
```

Deleting an XML License

- To delete all license files for a specific unit, enter the following command at the privileged EXEC level of the CLI.

```
device# license delete unit 3 all
```

Syntax: **license delete unit** *unit_id* [**all** | **index** *license_index*]

The *unit_id* variable specifies the unit ID number.

The **all** option allows you to delete all license files for a specific unit.

The **index** *license_index* parameter specifies the software license file, and is generated by the member unit. The license index number is the license file you want to delete from a unit. The license index number is not unique across stack units, and the user must specify both the unit number and the index number to delete a license from a specific unit. For example, the ICX-ADV-LIC-SW license is installed on both stack unit 3, index 1, and stack unit 5, index 1. Because the index numbers are the same, the user must specify both the unit number and the index number to delete a license from a specific unit.

- NOTE**

In the ICX 7250 devices, if more than one non-node locked license file is installed, the deletion of the license file sequence should start from the software license file identified by index 1. If this is not done, any attempt to delete the license file returns an error 141 (LICENSE_IN_USE).

Use the **show license unit** command to display the index numbers.

```
device# show license unit 1
Unit License Name   L3 Premium   Port Speed Upgrade   Speed   Ports   MACSec   Serial# (Prem/PoD/
MACsec)
1    L3-PREM-2X10G   Yes           Yes      10G     2      NA      PR320400289/NA/NA

Index   Lic Mode      Lic Name      Lid/Serial No   Lic Type   Status   Lic Period
Lic Capacity
Stack unit 1:
1    Non-Node Lock   ICX7250-PREM-LIC-SW   EN0E583FD98   Normal   Active
Unlimited 1
2    Node Lock      ICX7250-10G-LIC-POD   fwjINHGnFMF   Normal   Active
Unlimited 2
```

3. Use the **license delete** command to delete the XML license identified by index 1.

```
device# license delete unit 1 index 1  
device# license delete unit 1 index 2
```

Transferring a License

SAU licenses can be transferred from one Ruckus device to another Ruckus device if the license is being transferred between two similar models (for example, from an ICX 7250 to another ICX 7250 or from an ICX 7450 to another ICX 7450).

A license transfer is intended for retrieving licenses from defective units. The licenses are removed from the defective unit within the support database and the unit is flagged as removed from service.

You can transfer an SAU license without assistance from Ruckus technical staff (this type of license is not locked to a specific device). To transfer an SAU license, you must disable the feature associated with the license on the original device before you transfer the license to another device.

Syslog Messages and Trap Information

The following table lists the syslog messages and traps that are supported for software licensing.

TABLE 3 Syslog Messages

Message level	Message	Explanation M
Informational	Stack: SAU license option on <unit_id> is changed to <license_name>	The SAU license option on the unit has changed.
Informational	Stack: unit <unit_id> deleted SAU license option <license_name>	The SAU license option on the unit has been deleted.

Layer 3 Premium Licensing

- [Layer 3 Premium Features and Platform Support..... 33](#)

Layer 3 Premium Features and Platform Support

A Ruckus FastIron Layer 3 Premium license enables Layer 3 Premium features to be configured on an ICX switch.

In a stacking system, the Layer 3 Premium features can be enabled if all units in the stacking system have the premium license. If a Layer 3 Premium feature is enabled, any unit without a Layer 3 Premium license will go into a non-operational state when the unit is added to the stack. This unit will become operational if the Layer 3 Premium feature is disabled or if the Layer 3 Premium license is enabled on that unit.

The Layer 3 Premium feature set varies according to the ICX platform on which the license is used. The following sections list the Layer 3 features that are supported by the Layer 3 Premium license for each platform.

NOTE

Layer 3 Premium licenses are supported only on Layer 3 devices. Layer 3 Premium licenses are not supported on Layer 2 devices.

ICX 7150 Layer 3 Premium Features

The Layer 3 Premium license supports the following features on an ICX 7150:

- OSPFv2
- OSPFv3
- VRRP
- VRRPv3
- VRRP-E
- PBR
- PIM-SM, PIM-SSM, PIM-DM
- PIM Passive

ICX 7250 Layer 3 Premium Features

The Layer 3 Premium license supports the following features on an ICX 7250:

- OSPFv2
- OSPFv3 (IPv6)
- VRRP
- VRRPv3 (IPv6)
- VRRP-E
- GRE
- PBR
- PIM-SM, PIM-SSM, PIM-DM

Layer 3 Premium Licensing

Layer 3 Premium Features and Platform Support

- PIM Passive
- VRF (IPv4 and IPv6)
- IPv6 over IPv4 Tunnels

Static routing, RIP v1/v2, and RIPng (IPv6) features are available on the ICX 7250 without the Layer 3 Premium license.

ICX 7450 Layer 3 Premium Features

The Layer 3 Premium license supports the following features on an ICX 7450:

- OSPFv2
- OSPFv3 (IPv6)
- VRRP
- VRRPv3 (IPv6)
- VRRP-E
- GRE
- PBR
- PIM-SM, PIM-SSM, PIM-DM
- PIM Passive
- BGP, BGP4+ (IPv6)
- VRF (IPv4 and IPv6)
- IPv6 over IPv4 Tunnels

Static routing, RIP, RIPng (IPv6), and IPv6 IPsec tunneling features are available on the ICX 7450 without the Layer 3 Premium license.

ICX 7650 Layer 3 Premium Features

The Layer 3 Premium license supports the following features on an ICX 7650:

- OSPFv2
- OSPFv3
- VRRP
- VRRPv3
- VRRP-E
- GRE
- PBR
- PIM-SM, PIM-SSM, PIM-DM
- PIM Passive
- BGP, BGP4+ (IPv6)
- VRF (IPv4 and IPv6)
- IPv6 over IPv4 Tunnels

Static routing and RIP features are available on the Ruckus ICX 7650 without the Layer 3 Premium license.

ICX 7750 Layer 3 Premium Features

The following Layer 3 Premium features are supported by default on a ICX 7750. You do not have to purchase or enable a Layer 3 Premium license to use these features.

- OSPFv2
- OSPFv3 (IPv6)
- VRRPv3 (IPv6)
- VRRP-E
- GRE
- PBR
- PIM-SM, PIM-SSM, PIM-DM
- PIM Passive
- BGP, BGP4+ (IPv6)
- VRF (IPv4 and IPv6)
- IPv6 over IPv4 Tunnels

Ports on Demand Licensing

- Ports on Demand Overview and Platform Support 37
- Upgrading a PoD License.....39
- Configuring PoD on an interface..... 40
- Displaying the license configuration for PoD ports after a license upgrade.....41
- Campus Fabric Licensing 41

Ports on Demand Overview and Platform Support

Ports on Demand (PoD) enables a 1-Gbps port to be upgraded to a speed of 10-Gbps. Licensing for Ports on Demand is available on the Ruckus ICX 7150 and Ruckus ICX 7250 devices.

To upgrade the port speed, you must first upgrade the license using the **license install perpetual** command, and then configure the port speed to 10 Gbps. To install the PoD license, refer to [Installing and Downgrading SAU Licenses](#) on page 26. To upgrade the ports from 1 Gbps to 10 Gbps, refer to [Configuring PoD on an interface](#) on page 40.

Ports on Demand Licensing on the ICX 7150

Ruckus ICX 7150-48ZP devices are shipped with two 10-Gbps ports (1/2/1 and 1/2/3). By default, ports 1/2/1 and 1/2/3 on Ruckus ICX 7150-48ZP devices are 10-Gbps ports that do not require a PoD license (although Layer 3 Premium features are not included). Additional 10-Gbps ports require a PoD license. The PoD ports on Ruckus ICX 7150-48ZP devices are ports 1/2/2 and 1/2/4 through 1/2/8.

On other 24-port and 48-port models of the Ruckus ICX 7150, the PoD ports are 1/3/1 through 1/3/4. On the Ruckus ICX 7150-C12 model, the PoD ports are 1/3/1 and 1/3/2.

TABLE 4 Ruckus ICX 7150 SKU and License Information

Part Number for Upgrades	License Name	Description
BR-ICX-7150-41U210-P-01	2X10G	CoE license to upgrade any ICX 7150 24-port or 48-port model from 4x1G SFP to a 2x1G SFP and 2x10G SFP+ uplink or stacking ports.
BR-ICX-7150-210U410R-P-01	4X10GR	CoE license to upgrade any ICX 7150 24-port or 48-port model from 2x1G SFP and 2x10G SFP+ to a 4x10G SFP+ uplink or stacking ports. Two default ports are available for stacking. Layer 3 Premium license features (OSPF, VRRP, PIM, PBR) are also included.
BR-ICX-7150-41U410R-P-01	4X10GR	CoE license to upgrade any ICX 7150 24-port or 48-port model from 4x1G SFP to a 4x10G SFP+ uplink or stacking ports. Two default ports are available for stacking. Layer 3 Premium license features (OSPF, VRRP, PIM, PBR) are also included.
BR-ICX-7150C-21U210R-P-01	2X10GR	CoE license to upgrade the ICX 7150-C12P switch from 2x1G SFP to a 2x10G SFP+ uplink or stacking ports. Layer 3 Premium license features (OSPF, VRRP, PIM, PBR) are also included.
BR-ICX-7150Z210U810R-P-01	8X10GR	CoE license to upgrade an ICX 7150-48ZP Z-Series switch from 6x1G SFP and 2x10G SFP+ to 8x10G SFP+ uplink or stacking ports. Layer 3 Premium license features (OSPF, VRRP, PIM, PBR) are also included.

Stacking Support on Ruckus ICX 7150 Devices

All Ruckus ICX 7150 devices support stacking on specific licensed 10-Gbps ports. On Ruckus ICX 7150-48ZP devices, two 10-Gbps ports that support stacking are pre-installed. Licenses must be purchased for all other 10-Gbps ports and for Layer 3 Premium feature support. The following table summarizes stacking support and available licenses for all Ruckus ICX 7150 models.

TABLE 5 Ruckus ICX 7150 Stacking Options

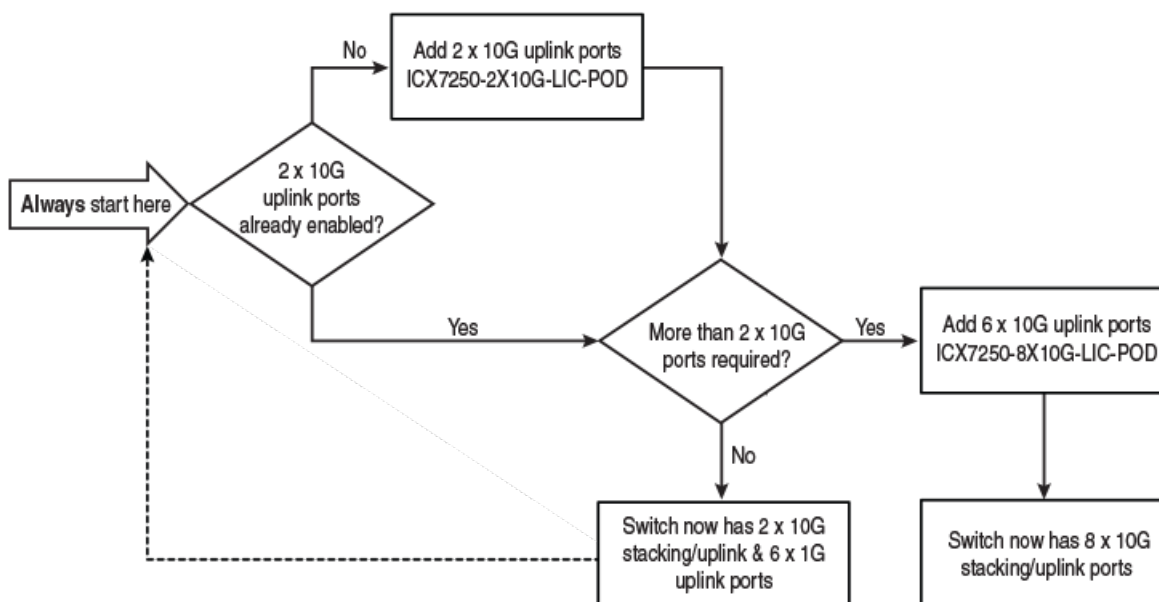
Model	License Name	10-Gbps Ports	Premium Feature Support	Default Stacking Ports
ICX7150-24, ICX7150-24P, ICX7150-48, ICX7150-48P, and ICX7150-48PF	4X1G	0	No	None
	2X10G	2	No	x/3/1, x/3/3
	4X10GR	4	Yes	x/3/1, x/3/3
ICX7150-C12P	2X1G	0	No	None
	2X10GR	2	Yes	x/3/1, x/3/2
ICX7150-48ZP (2.5G)	2X10 (default)	2	No	x/2/1, x/2/3
	8X10GR	8	Yes	x/2/1, x/2/3

Ports on Demand Licensing on the ICX 7250

The ICX 7250 device has eight ports (ports 1/2/1 through 1/2/8) that can be upgraded to 10-Gbps speed. To upgrade the ports, you must purchase one or more PoD licenses. The number of licenses you need depends on the number of ports that you want to upgrade:

- To upgrade the two default stacking ports (port numbers 1/2/1 and 1/2/3), you need the 2-port capacity PoD license, part number ICX7250-2X10G-LIC-POD.
- To upgrade the eight PoD ports (ports numbers 1/2/1 through 1/2/8), you need the 2-port capacity PoD license *and* the 8-port capacity PoD license, part number ICX7250-8X10G-LIC-POD.

FIGURE 12 ICX 7250 10G PoD Licenses



NOTE

Although the ICX7250-8X10G-LIC-POD license is referred to as an 8-port capacity license, it cannot be used by itself to upgrade all 8 ports to 10 Gbps. The 8-port capacity license enables you to upgrade the 6 remaining ports on the device to 10-Gbps speed.

Upgrading a PoD License

Upgrading a PoD license involves the following high-level steps.

1. Log in to the Ruckus Support portal to generate the license CoE you need.
2. Install the PoD license on the device. Refer to [Installing and Downgrading SAU Licenses](#) on page 26 for detailed steps.
3. Upgrade the ports to 10-Gbps speed. Refer to [Configuring PoD on an interface](#) on page 40 for the steps to complete the upgrade.

NOTE

When the device boots up, the running configuration displays the ports at speed-duplex 1000-full.

4. Use the **show license** command to confirm that the license was installed correctly. The command output shows the license capacity in the Ports field and the license name in the Lic Name field.

If the **speed-duplex 10g-full** command fails because of a licensing issue, one or more syslog messages are automatically generated. A licensing issue can occur because no license is installed on the device or you have incorrectly installed a license that is not tied to the LID of the device.

The following example shows the output from a device with the 8-port capacity version of the PoD license.

- A syslog is generated informing you about the failure.

```
SYSLOG: <14>Jul 31 00:33:46 10.20.147.22 PoD: No license present for port 1/2/1.
```

- A system message made up of individual syslog errors is generated that gives details about each port.

```
ICX7250-48 Router(config-if-e10000-1/2/1)#speed-duplex 10g-full  
PoD: No license present for port 1/2/1
```

```
SYSLOG: <14>Jul 29 07:20:47 PoD: No license present for port 1/2/1  
ICX7250-48 Router(config-if-e10000-1/2/1)#
```

If you delete a PoD license (either the 2-port or 8-port capacity license), the affected ports continue working at 10-Gbps until you reload the device. When you reload the device, the ports are returned to 1-Gbps speed. For more information about deleting a license, refer to [Deleting a license on ICX devices](#).

Configuring PoD on an interface

NOTE

Configuring PoD on an interface is supported on Ruckus ICX 7150 and Ruckus ICX 7250 ports when upgrading to 10-Gbps speed.

To upgrade the ports from 1-Gbps to 10-Gbps speed, perform the following steps.

1. Generate the CoE for the PoD license you want on the Ruckus Support portal.
2. Install the SAU PoD license on the device. See [Installing and Downgrading SAU Licenses](#) on page 26 for detailed steps.
3. Insert the 10-Gbps optic transceiver.
4. Enter the **speed-duplex 10g-full** command on a single interface, multiple interfaces, or an interface range on the ICX 7250.

```
device(config)# interface ethernet 1/2/2  
device(config-if-e10000-1/2/2)# speed-duplex 10g-full
```

5. Enter the **write memory** command to save the configuration. The ports are automatically configured to 10-Gbps speed.

If you enable the port to 10-Gbps speed and then enter the **no speed-duplex** command, the port continues to run at 10-Gbps speed. When the device reboots, the port reverts to 1-Gbps speed.

If the **speed-duplex 10g-full** command fails, a syslog message is generated and displayed. The command fails because there is no license available for the port. The following example is a syslog message generated informing you about the failure.

```
SYSLOG: <14>Jul 31 00:33:46 10.20.147.22 PoD: No license present for port 1/3/1.
```


Displaying the license configuration for PoD ports after a license upgrade

The **show pod** command is used to display the license configuration for PoD ports in a stack after a license upgrade on the ICX 7250.

The **show pod** command displays the license configurations for all PoD ports for all the units in a stack..

```
device# show pod
Unit-Id: 1
PoD license capacity: 8
PoD license capacity used: 8

PoD-ports  Lic-Available Lic-Used
1/2/1      Yes           Yes
1/2/2      Yes           Yes
1/2/3      Yes           Yes
1/2/4      Yes           Yes
1/2/5      Yes           Yes
1/2/6      Yes           Yes
1/2/7      Yes           Yes
1/2/8      Yes           Yes

Unit-Id: 11
PoD license capacity: 8
PoD license capacity used: 8

PoD-ports  Lic-Available Lic-Used
11/2/1     Yes           Yes
11/2/2     Yes           Yes
11/2/3     Yes           Yes
11/2/4     Yes           Yes
11/2/5     Yes           Yes
11/2/6     Yes           Yes
11/2/7     Yes           Yes
11/2/8     Yes           Yes
```

The following table describes the information displayed in the output of the **show pod** command.

TABLE 6 Output from the show pod command

Field	Description
Unit-Id	The unit ID number of the PoD port.
PoD license capacity	The port capacity of the PoD license that was purchased.
PoD license capacity used	The number of PoD ports that are upgraded to 10-Gbps speed.
PoD-ports	The list of PoD ports in the PoD unit.
Lic-Available	Whether the license is available for the port.
Lic-Used	Whether the license is used by the port.

Campus Fabric Licensing

In a Campus Fabric network, devices configured as port extender (PE) units require the PoD license.

In Campus Fabric (802.1BR or SPX), the ICX 7650 or ICX 7750 can be configured as the 802.1BR control bridge, and the ICX 7150, ICX 7450, and ICX 7250 can be configured as PE units. To connect to a control bridge over a 10-Gbps SPX link, the PE units must have a 10-Gbps PoD license installed. For information about PoD licensing, refer to [Ports on Demand Licensing](#) on page 37. In an SPX system, the PoD license is required only on the ICX 7150 and ICX 7250 PE units.

The SPX system supports setting an SAU license on the PE unit from the control bridge by using the **license install** command. Refer to [Installing and Downgrading SAU Licenses](#) on page 26 for more information.

MACSec Key-Based Licensing

- How MACsec works..... 43
- MACsec licensing..... 44

How MACsec works

MACsec capabilities prevent Layer 2 security threats, such as passive wiretapping, denial of service, intrusion, man-in-the-middle, and playback attacks.

MACsec protects communications using several configurable techniques. Data origin is authenticated and data is transported over secured channels. Frames are validated as MACsec Ethernet frames. The integrity of frame content is verified on receipt. Frame sequence is monitored using an independent replay protection counter. Invalid frames are discarded or monitored.

Data traffic carried within the MACsec frame is encrypted and decrypted using an industry-standard cipher suite.

How MACsec handles data and control traffic

All traffic is controlled on an active MACsec port; that is, data is encrypted, or its integrity is protected, or both. If a MACsec session cannot be secured, all data and control traffic is dropped.

When MACsec is active on a port, the port blocks the flow of data traffic. Data traffic is not forwarded by the port until a MACsec session is secured. If an ongoing session is torn down, traffic on the port is again blocked until a new secure session is established.

Control traffic (such as STP, LACP, or UDLD traffic) is not transmitted by an active MACsec port until a MACsec session is secured. While a session is being established, only 802.1x protocol packets are transmitted from the port. Once a secure session is established, control traffic flows normally through the port.

MACsec Key Agreement protocol

MACsec Key Agreement (MKA) protocol installed on a device relies on an IEEE 802.1X Extensible Authentication Protocol (EAP) framework to establish communication.

MACsec peers on the same LAN belong to a unique connectivity association. Members of the same connectivity association identify themselves with a shared Connectivity Association Key (CAK) and Connectivity Association Key Name (CKN). The CAK is a static key that is preconfigured on each MACsec-enabled interface. MACsec authentication is based on mutual possession and acknowledgment of the preconfigured CAK and Connectivity Association Key Name (CKN).

Each peer device establishes a single unidirectional secure channel for transmitting MACsec frames (Ethernet frames with MACsec headers that usually carry encrypted data) to its peers within the connectivity association. A connectivity association consists of two secure channels, one for inbound traffic, and one for outbound traffic. All peers within the connectivity association use the same cipher suite, either Galois/Counter Mode Advanced Encryption Standard 128 or 256 (GCM-AES-128 or GCM-AES-256), for MACsec-authenticated security functions.

MACsec Key Agreement (MKA) protocol uses the Connectivity Association Key to derive transient session keys called Secure Association Keys (SAKs). SAKs and other MKA parameters are required to sustain communication over the secure channel and to perform encryption and other MACsec security functions. SAKs, along with other essential control information, are distributed in MKA protocol control packets, also referred to as MKPDUs.

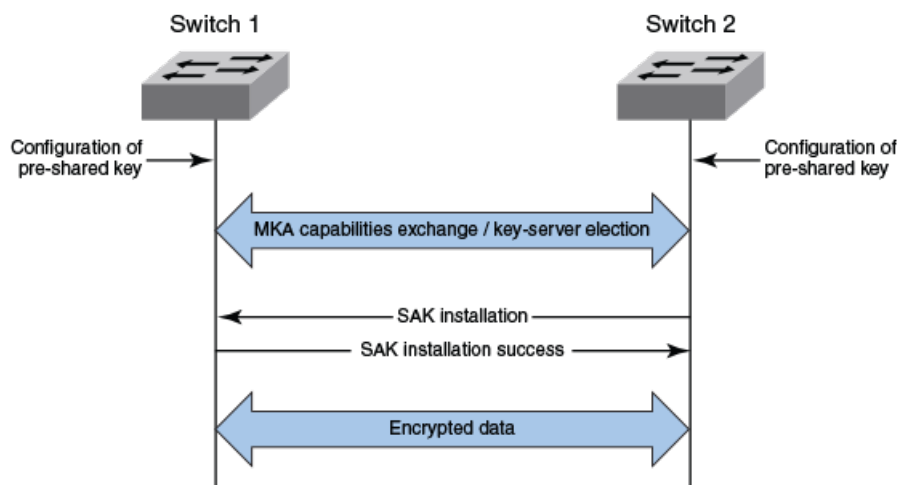
MKA message exchange between two switches

When two MACsec peers confirm possession of a shared CAK and CKN, MKA protocol initiates key-server election.

The key-server is responsible for determining whether MACsec encryption is used and what cipher suite is used to encrypt data. The key-server is also responsible for generating Secure Association Keys (SAKs) and distributing them to the connected device. Once a SAK is successfully installed, the two devices can exchange secure data.

The following figure shows the message flow between two switches during MACsec communication.

FIGURE 13 MKA pre-shared key and key name exchange between two switches



Secure channels

Communication on each secure channel takes place as a series of transient sessions called secure associations. These sessions can only be established with a unique Secure Association Key (SAK) assigned to the session.

Secure associations expire and must be re-established after transmission of a certain number of frames, or after a peer disconnects and reconnects.

The secure association is designated by a Secure Association Identifier (SAI), formed from the Secure Channel Identifier (SCI) combined with an Association Number (AN). When a MACsec frame is received by a peer interface, the device identifies the session key from the SAI carried in the MACsec frame and uses the key to decrypt and authenticate the received frame.

MACsec licensing

Devices that support MACsec functionality can be enabled for MACsec by purchasing a MACsec license.

There is no license capacity and no trial license associated with the MACsec license. The MACsec license works independently of Premium or PoD licenses already installed on ICX devices. In a stacking system, the MACsec license is required only for the specific units in the stacking system that enable MACsec and use the encryption capabilities at the port level. This MACsec license is not required for other units within the stacking system that do not enable MACsec.

The MACsec feature-related CLI commands are not controlled by the MACsec license. The MACsec preconfiguration commands and enabling commands are visible and available without a MACsec license. However, a valid MACsec license is required for the command to enable MACsec encryption at the port level on that device. When you enter the CLI command to enable MACsec at

the port level without a MACsec license, the command does not execute, and an error message is displayed. The command enables MACsec encryption on that port only when a valid MACsec license is installed on the device.

Enabling and configuring group interfaces for MACsec

After MACsec is enabled for the device, each MACsec interface must be individually enabled, and a configured group of parameters must be applied.

1. To enable MACsec, at the dot1x-mka configuration level, enter the **enable-mka** command, and specify the interface as *device/slot/port*.

In the following example, Ethernet port 2 on slot 2 of device 1 is enabled for MACsec security.

```
device# configure terminal
device(config)# dot1x-mka
device(config-dot1x-mka)# enable-mka ethernet 2/2/1
device(config-dot1x-mka-2/2/1)#
```

NOTE

The following output is displayed if there is no MACsec license present on the device.

```
device(config-dot1x-mka)# enable-mka ethernet 2/2/1
Error: No MACsec License available for the port 2/2/1. Cannot enable MACsec !!!
Error: MKA cannot be enabled on port 2/2/1
```

2. At the dot1x-mka interface configuration level, enter the **mka-cfg-group** command, and specify the MKA group configuration to apply to the interface.

In the following example, MACsec options configured for group test1 are applied to the enabled interface.

```
device# configure terminal
device(config)# dot1x-mka
device (config-dot1x-mka)# enable-mka ethernet 2/2/1
device(config-dot1x-mka-2/2/1)# mka-cfg-group test1
```

Verifying the MACsec license

After installing the MACsec license on a supported device, you can verify the installation.

Use the **show license** command to ensure that the correct license is installed.

From the user EXEC or privileged EXEC prompts, enter the **show license** command.

```
device# show license
```

Unit	License Name	L3 Premium	Port Speed Upgrade	Speed	Ports	MACSec
1	l3-prem-macsec	Yes	NA	NA	NA	Yes
2	l3-base-macsec	No	NA	NA	NA	Yes

Appendix: ICX License Serial Number Prefixes and Sample CoE

- ICX License Serial Number Prefixes..... 47
- Sample Certificate of Entitlement..... 48

ICX License Serial Number Prefixes

The Certificate of Entitlement (CoE) issued for each license purchased includes a unique serial number.

The CoE license serial numbers have the format: PPPRabcdefg. In this format,

- PPP is the Serial Number Prefix, which identifies the type of license
- R is a serial number produced by Ruckus
- abcdefg is a unique number string.

An example CoE serial number is DVVR1234567.

The serial number prefixes are unique to each license type, as shown in the following table.

Ruckus Part Number	Description	Product Type	Serial Number Prefix
BR-ICX-7150-41U210-P-01	ICX 7150 24-port or 48-port model from 4x1G SFP to 2x10G SFP+ uplink ports	ICX 7150	FJB
BR-ICX-7150-210U410R-P-01	ICX 7150 24-port or 48-port model from 2x10G SFP+ to 4x10G SFP+ uplink ports and the full layer 3 feature capabilities	ICX 7150	FJC
BR-ICX-7150-41U410R-P-01	ICX 7150 24-port or 48-port model from 4x1G SFP to 4x10G SFP+ uplink ports and the full layer 3 feature capabilities	ICX 7150	FJD
BR-ICX-7150C-21U210R-P-01	ICX 7150-C12P 12-port compact switch model from 2x1G SFP to 2x10G SFP+ uplink ports and the full layer 3 feature capabilities	ICX 7150-C12P	FJA
BR-ICX-7150Z210U810R-P-01	ICX 7150-48ZP, Z-Series switch from 6x1G SFP & 2x10G SFP+ to 8x10G SFP+ uplink ports and the full Layer 3 Premium feature capabilities	ICX 7150-48ZP	FJU
ICX7650-PREM-LIC	ICX 7650 layer 3 Premium software license	ICX7650	FJE
ICX7750-L3-COE	ICX 7750 Layer 3 Premium certificate of entitlement	ICX7750	CYL
ICX-MACSEC-LIC	ICX 7450/7650 MACSEC License	ICX7450 ICX7650	DBJ

ICX7250-2X10G-LIC-POD	ICX7250 upgrade from 8x1GE uplink ports to 2x1/10GE + 6x1GE uplink/stacking ports. Only one 2X10G license upgrade can be applied to an ICX7250.	ICX7250	DVW
ICX7250-8X10G-LIC-POD	ICX7250 upgrade from 2X1/10GE + 6X1GE uplink/stacking ports to 8X1/10GE uplink/stacking ports. This can only be applied to an ICX7250 that already has a 2X10G license applied.	ICX7250	DVW
ICX7250-PREM-LIC	ICX 7250 Layer 3 Premium Software License	ICX7250	DVX
ICX7450-PREM-LIC	ICX 7450 Layer 3 Premium Software License	ICX7450	DTR


Sample Certificate of Entitlement

The license Certificate of Entitlement (CoE) is a proof of purchase that includes a description of the license, the Ruckus part number, and the license serial number.

See the following figure for a example of a CoE.

FIGURE 14 Sample CoE

Ruckus Networks
350 West Java Drive
Sunnyvale, CA 94089
USA



Ruckus Certificate of Entitlement

Please keep this certificate for your records

License Type: **Description**

Part Number: **Ruckus Part Number**

Part Number Barcode

License Serial Number: **Serial Number**

Serial Number Barcode

This Ruckus Certificate of Entitlement authorizes you to upgrade one device as described above. Your use of the software is subject to the Ruckus terms and conditions located at www.ruckuswireless.com.

To access the latest documentation and software for your product go to support.ruckuswireless.com. If you do not already have a Ruckus support account you can create one via the log in screen.]

In the event that you require support from the Ruckus Technical Assistance Center (TAC) you may need to provide the license Serial Number as proof of your entitlement to use the features covered by this certificate.

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