

Ruckus ICX Switch Port Extender Deployment Guide

Supporting FastIron Software Release 08.0.70

Copyright, Trademark and Proprietary Rights Information

© 2018 ARRIS Enterprises LLC. All rights reserved.

No part of this content may be reproduced in any form or by any means or used to make any derivative work (such as translation, transformation, or adaptation) without written permission from ARRIS International plc and/or its affiliates ("ARRIS"). ARRIS reserves the right to revise or change this content from time to time without obligation on the part of ARRIS to provide notification of such revision or change.

Export Restrictions

These products and associated technical data (in print or electronic form) may be subject to export control laws of the United States of America. It is your responsibility to determine the applicable regulations and to comply with them. The following notice is applicable for all products or technology subject to export control:

These items are controlled by the U.S. Government and authorized for export only to the country of ultimate destination for use by the ultimate consignee or end-user(s) herein identified. They may not be resold, transferred, or otherwise disposed of, to any other country or to any person other than the authorized ultimate consignee or end-user(s), either in their original form or after being incorporated into other items, without first obtaining approval from the U.S. government or as otherwise authorized by U.S. law and regulations.

Disclaimer

THIS CONTENT AND ASSOCIATED PRODUCTS OR SERVICES ("MATERIALS"), ARE PROVIDED "AS IS" AND WITHOUT WARRANTIES OF ANY KIND, WHETHER EXPRESS OR IMPLIED. TO THE FULLEST EXTENT PERMISSIBLE PURSUANT TO APPLICABLE LAW, ARRIS DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, TITLE, NON-INFRINGEMENT, FREEDOM FROM COMPUTER VIRUS, AND WARRANTIES ARISING FROM COURSE OF DEALING OR COURSE OF PERFORMANCE. ARRIS does not represent or warrant that the functions described or contained in the Materials will be uninterrupted or error-free, that defects will be corrected, or are free of viruses or other harmful components. ARRIS does not make any warranties or representations regarding the use of the Materials in terms of their completeness, correctness, accuracy, adequacy, usefulness, timeliness, reliability or otherwise. As a condition of your use of the Materials, you warrant to ARRIS that you will not make use thereof for any purpose that is unlawful or prohibited by their associated terms of use.

Limitation of Liability

IN NO EVENT SHALL ARRIS, ARRIS AFFILIATES, OR THEIR OFFICERS, DIRECTORS, EMPLOYEES, AGENTS, SUPPLIERS, LICENSORS AND THIRD PARTY PARTNERS, BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, PUNITIVE, INCIDENTAL, EXEMPLARY OR CONSEQUENTIAL DAMAGES, OR ANY DAMAGES WHATSOEVER, EVEN IF ARRIS HAS BEEN PREVIOUSLY ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, WHETHER IN AN ACTION UNDER CONTRACT, TORT, OR ANY OTHER THEORY ARISING FROM YOUR ACCESS TO, OR USE OF, THE MATERIALS. Because some jurisdictions do not allow limitations on how long an implied warranty lasts, or the exclusion or limitation of liability for consequential or incidental damages, some of the above limitations may not apply to you.

Trademarks

ARRIS, the ARRIS logo, Ruckus, Ruckus Wireless, Ruckus Networks, Ruckus logo, the Big Dog design, BeamFlex, ChannelFly, Edgellon, FastIron, HyperEdge, ICX, IronPoint, OPENG, SmartCell, Unleashed, Xclaim, ZoneFlex are trademarks of ARRIS International plc and/or its affiliates. Wi-Fi Alliance, Wi-Fi, the Wi-Fi logo, the Wi-Fi CERTIFIED logo, Wi-Fi Protected Access (WPA), the Wi-Fi Protected Setup logo, and WMM are registered trademarks of Wi-Fi Alliance. Wi-Fi Protected Setup™, Wi-Fi Multimedia™, and WPA2™ are trademarks of Wi-Fi Alliance. All other trademarks are the property of their respective owners.

Contents

Preface	5
Overview.....	5
Purpose of This Document.....	6
Audience.....	6
Objectives.....	7
Document History.....	7
SPX Technical Architecture	9
Control Bridge.....	9
Port Extenders.....	9
Supported SPX Topologies	11
Unsupported SPX Topologies	15
Scaling (Supported Topologies)	19
SPX Construction Methods	21
Prerequisites.....	21
Valid Port Combinations.....	21
Bill of Materials	23
Deployment Considerations	27
Bringing Up SPX	29
Configuration Notes.....	29
Reference Topology.....	30
Configuring the CB.....	30
Configuring the PE.....	32
SPX PE Ring	37
Overview.....	37
How a PE Ring Works with Different Types of Traffic.....	38
Unicast Traffic.....	38
Multicast/Broadcast and Unknown Unicast Traffic.....	39
Deployment Scenarios	41
Reference Topology.....	41
Deployment Scenario 1: Deploying a PE Ring in an Existing Campus Fabric Domain.....	42
Deployment Scenario 2: Deploying a PE Ring Using ZTP.....	43
Deployment Scenario 3: Adding a New PE Unit to an Existing PE Ring.....	44
Deployment Scenario 4: Replacing a PE in an Existing PE Ring.....	48
Deployment Scenario 5: Moving SPX Links Between Modules in a PE Ring.....	51
Deployment Scenario 6: Adding More Links to a Live SPX Link Using the multi-spx-lag Command.....	54
Deployment Scenario 7: Removing Links from a Live SPX LAG and Converting the LAG to an SPX Port.....	56
Deployment Scenario 8: Changing a PE Ring to a Linear PE Chain.....	59
Image Upgrade	63
Debugging and Verification Commands	67
Verification Commands: SPX PE Ring.....	72
Debugging PE Ring Failures.....	74

PE Ring FSM States	77
Running Configuration	79
Best Practices	81
Zero-Touch Provisioning	85
ZTP Overview.....	85
Zero-Touch Deployment Requirements.....	85
PE Candidate Requirements.....	86
Topology Requirements.....	87
Supported Topologies for Zero-Touch.....	88
Unsupported Topologies for Zero-Touch.....	89
Zero-Touch Features.....	90
SPX Interactive-Setup.....	93
Managing PEs.....	94
SPX Interactive-Setup Enhancement.....	95
Zero-Touch Deployment Considerations.....	95
Deployment Scenarios.....	96
Deployment Scenario 1: Bringing Up a Complete Campus Fabric Domain with Zero-Touch.....	96
Deployment Scenario 2: Adding Units to a Ring or Linear Topology Using the SPX Interactive-Setup Utility.....	103
Deployment Scenario 3: Migrating an Existing Stack to Campus Fabric.....	108
Deployment Scenario 4: Replacing a PE.....	116
Deployment Scenario 5: Preventing an ICX 7250 or ICX 7450 from Being Discovered by Zero-Touch.....	121
Deployment Scenario 6: Changing PE IDs Using SPX Interactive-Setup.....	122
Deployment Scenario 7: SPX PE Movement: Moving PEs Without Changing IDs.....	126
Deployment Scenario 8: Adding a New Link Between CB-PE or PE-PE to Change Existing Linear Topology to Ring Topology	128
Deployment Recommendations for ZTP	130
Best Practices.....	131
Debugging Notes.....	132

Preface

- Overview..... 5
- Purpose of This Document..... 6
- Audience..... 6
- Objectives..... 7
- Document History..... 7

Overview

Ruckus Campus Fabric technology integrates high-performance, fixed-form-factor switches to create a single distributed logical switch that is independent of physical location and that allows organizations to add ports across the campus whenever and wherever needed without adding complexity. Traditional three-tier network designs with a "big-box" chassis at the aggregation and core layers require a significant up-front investment, but with Ruckus Campus Fabric, switches can be added when needed and they still perform like one big switch. Switch Port Extender, abbreviated as SPX, is the name of this Campus Fabric solution.

ATTENTION

The SPX architecture simplifies network management by unifying core, aggregation, and access functions. A core stack (distributed chassis) serving as the control bridge connects to downstream Switch Port Extender (PE/SPX) units that aggregate large numbers of access devices. Switch Port Extender creates a more scalable architecture based on IEEE 802.1BR standards.

Advantages of the SPX architecture:

- A centralized point of control and management
- IEEE 802.1BR open-standard-based solution
- STP-free Layer 2 design
- Policy and feature inheritance
- Scale-out using fixed switches

The following devices from the Ruckus ICX product family support SPX configurations in FastIron 08.0.50 and later releases:

- Ruckus ICX 7250 Switches (ICX 7250): port extenders
- Ruckus ICX 7450 Switches (ICX 7450): port extenders
- Ruckus ICX 7750 Switches (ICX 7750): control bridge

NOTE

The Ruckus ICX 7250 and ICX 7450-ZP switches are not supported as port extenders in FastIron 08.0.40.

NOTE

The Ruckus ICX 7250-24G switch cannot be used as a PE unit in FastIron 08.0.50.

NOTE

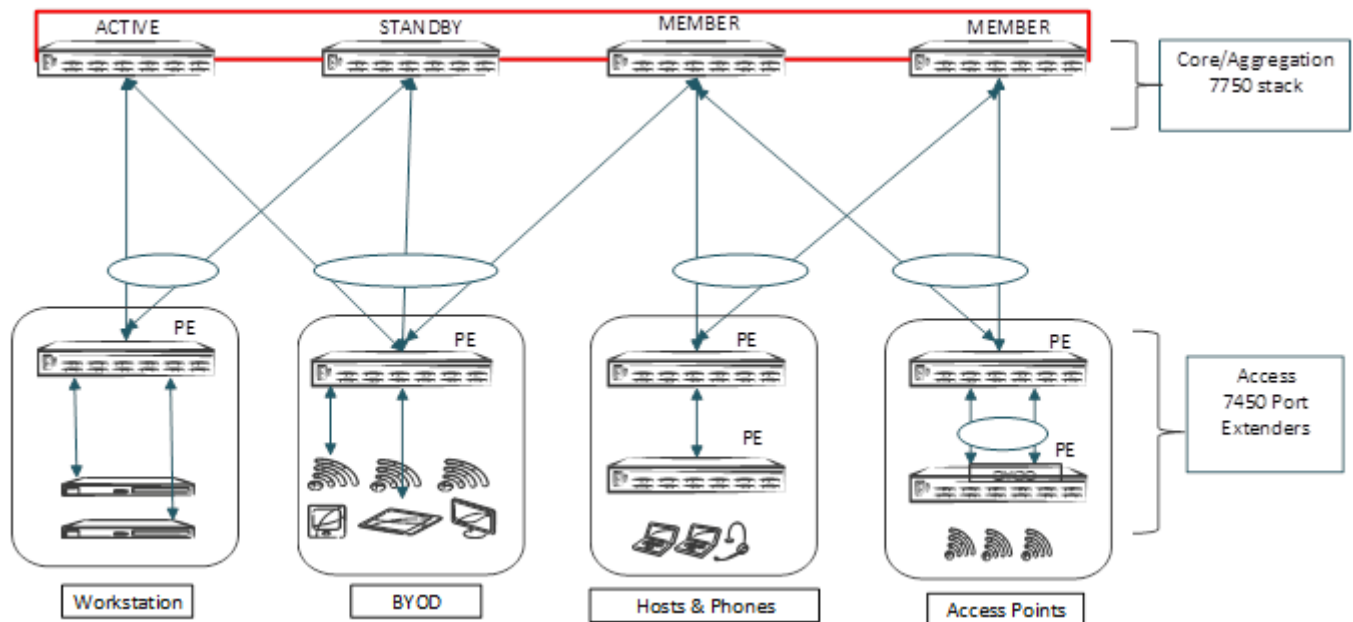
The Ruckus ICX 7150 switch is supported as a port extender in FastIron 08.0.70 and later.

The Ruckus ICX 7750 is a powerful stackable switch that enables simplified distributed chassis deployments for the scale-out campus aggregation and core networks; helping organizations seamlessly add network capacity in an agile, cost-efficient manner.

The Ruckus ICX 7250 and ICX 7450 switches deliver the performance, flexibility, and scalability required for enterprise gigabit Ethernet access deployment. These switches offer market chassis-level performance and reliability with the flexibility, cost-effectiveness, and "pay as you grow" scalability of a stackable solution.

The components of the Ruckus SPX architecture are the Ruckus ICX 7250 and ICX 7450 routers configured as port extenders (PEs), or PE units, to a set of Ruckus ICX 7750 stack units configured as the 802.1BR control bridge. The ICX 7750 control bridge (CB) provides a single point of management for the extended network. Active and standby controller functions are retained in the ICX 7750 (control bridge) stack and continue to provide hitless recovery and extended administrative functions. SPX widely increases the number of access devices in the network that can be controlled and managed from a single point. The distributed CB at the center of the SPX architecture manages PE units and hundreds of ports at the network edge.

FIGURE 1 SPX Architecture (Collapsed Access and Core/Aggregation)



Purpose of This Document

This document provides the technical architecture, configuration, deployment scenarios, and use cases for the Ruckus Campus Fabric Switch Port Extender.

Audience

This document is useful for network designers, system engineers, administrators, and customers.

Objectives

The objective of this guide is to assist the administrator in bringing up and configuring the Switch Port Extender. This deployment guide covers the following topics in depth:

- SPX technical architecture
- SPX topologies
- SPX construction methods
- Adding or replacing a port extender unit
- Migrating from stack to SPX fabric
- Image upgrade

Noteworthy best practices and recommendations are also covered in this guide.

Document History

Date	Description
February 2016	Initial version.
January 2017	Support for the ICX 7250 was introduced in FastIron 08.0.50.
July 2018	Support for the ICX 7150 as a port extender was introduced in FastIron 08.0.70; added support for image upgrade using IPC over Ethernet, and zero-touch enhancements.

SPX Technical Architecture

- [Control Bridge.....](#) 9
- [Port Extenders.....](#) 9

Control Bridge

The control bridge (CB) manages port extender (PE) units. It performs switching, routing, and forwarding for PE ports and provides centralized policy management. The CB uses the Link Layer Discovery Protocol (LLDP) to discover PE units. When the CB discovers a PE unit, it connects to the PE unit and creates a control plane using Control and Status Protocol (CSP) over the uplink/cascade port. Each PE port is managed as a virtual port from the CB perspective. The CB sets up each PE unit for traffic forwarding and creates multicast and unicast forwarding tables through CSP.

The Ruckus ICX 7750 acts as control bridge. The control bridge can be a standalone device or a stack. The control bridge stack can have a maximum of four units with a ring or linear topology. The ICX 7750 supports long-distance stacking spanning up to 10 kilometers between stack units.

Refer to [Bill of Materials](#) on page 23 for qualified optics and port combinations supported for long-distance stacking on the ICX 7750.

The models of the ICX 7750 have a similar hardware design. The differences lie mostly in the external interfaces. All models support the 802.1BR standard. The ICX 7750 has the following models:

- ICX7750-48F
- ICX7750-48C
- ICX7750-32Q

Port Extenders

The port extenders (PEs) provide a data path between end hosts and the control bridge and use LLDP to advertise 802.1BR capabilities to the CB over the upstream port or LAG. If capabilities match, the PE uses CSP to attach to the CB. The PE reports the number of available ports to the CB, and the CB allocates an ECID for each PE port. The PE units perform hardware-based multicast and broadcast replication.

The Ruckus ICX 7250 and ICX 7450 act as port extender units, which are managed by the control bridge. All ICX 7150 models can be configured as PE units beginning with FastIron 08.0.70 and later.

PE units rely on the CB for most network functions.

The ICX 7450 has six different models based on port density, PoE capability, and port type; in addition, each of the models supports four different flex modules. The ICX 7450 has the following models:

- ICX7450-24
- ICX7450-24P
- ICX7450-48
- ICX7450-48P
- ICX7450-48F
- ICX7450-ZP

NOTE

The Ruckus ICX 7450-ZP does not support 802.1BR in FastIron 08.0.40.

The ICX 7250 has the following models:

- ICX7250-24
- ICX7250-24P
- ICX7250-48
- ICX7250-48P

NOTE

The Ruckus ICX 7250-24G does not support 802.1BR in FastIron 08.0.50.

The ICX 7150 has the following models:

- ICX7150-C12
- ICX7150-24
- ICX7150-24P
- ICX 7150-48F
- ICX7150-48P
- ICX7150-48ZP

NOTE

SPX LAGs on ICX 7150 PEs are limited to eight ports in FastIron 08.0.70.

NOTE

ICX 7150 devices require a PoD license for ports that will be used for 10-Gbps connections. The exception is the ICX 7150-48XP model, which is shipped with two 10-Gbps ports but requires a PoD license for any additional 10-Gbps connections.

NOTE

The ICX 7150 uses trust-based licenses. Refer to the *Ruckus FastIron Software Licensing Guide* for information on installing ICX 7150 licenses.

Supported SPX Topologies

FIGURE 2 Topology 1: SPX-LAG Spanned Across the CB Stack Unit

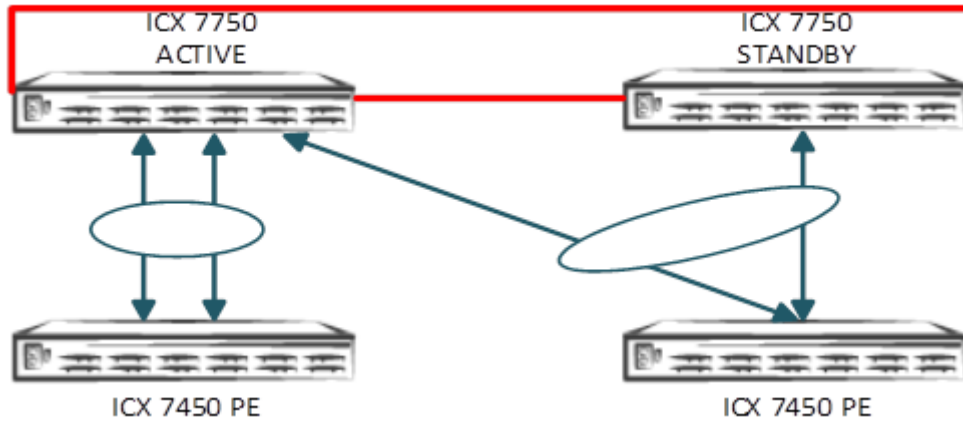


FIGURE 3 Topology 2: Multiple PE Chains Connected to the Same CB Unit

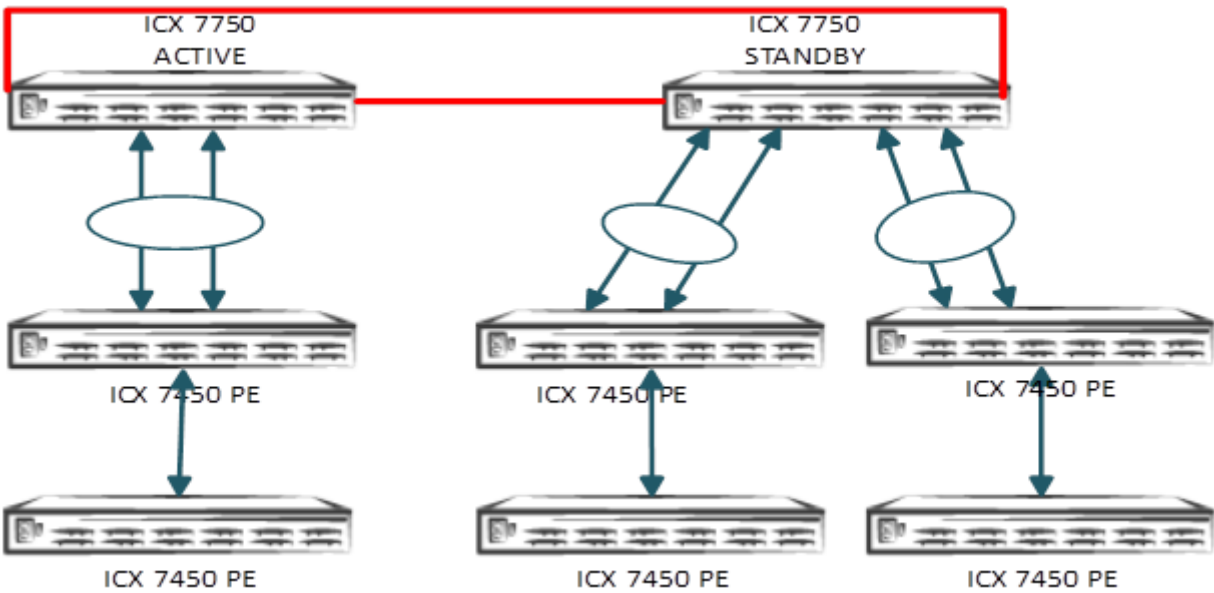


FIGURE 4 Topology 3: SPX-LAG Between PE Units

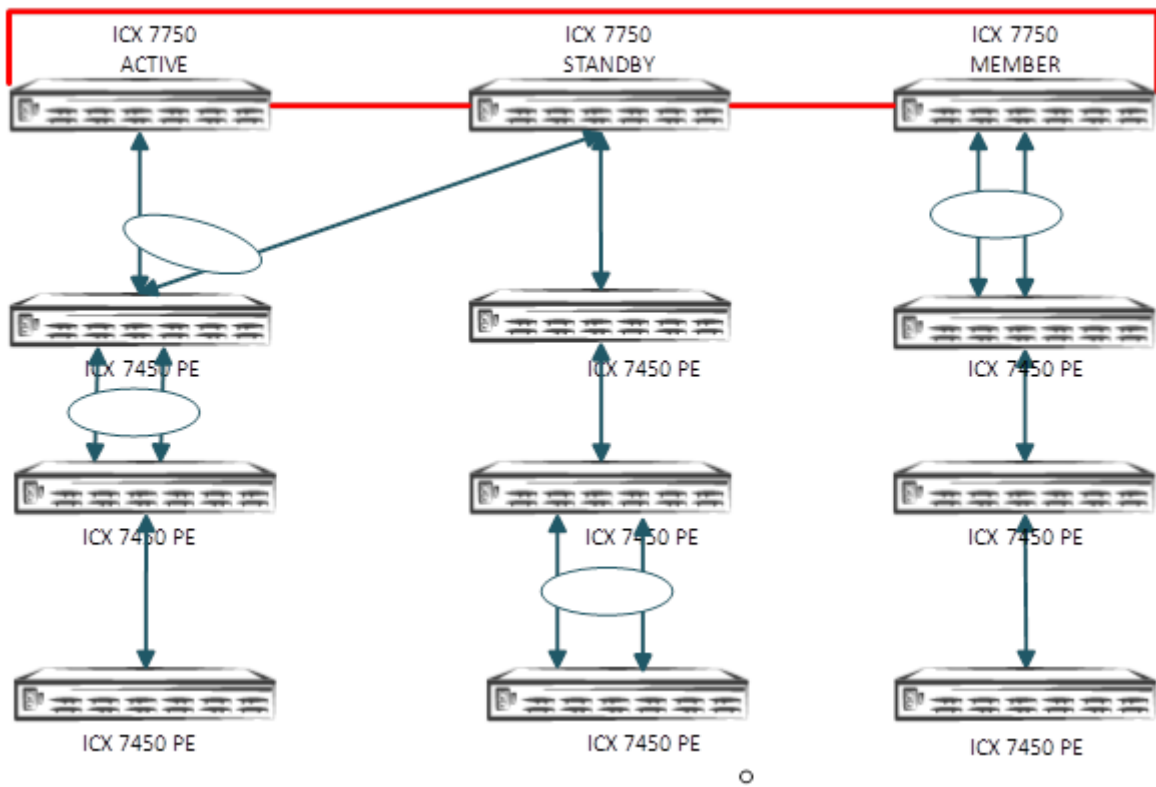


FIGURE 5 Topology 4: SPX with Standalone CB Unit

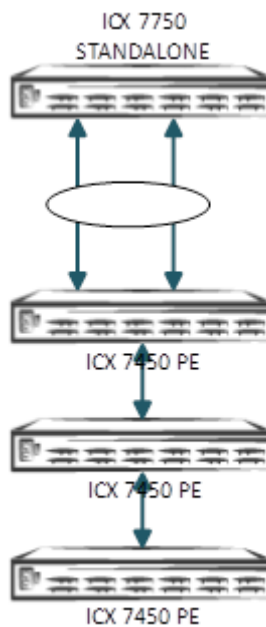
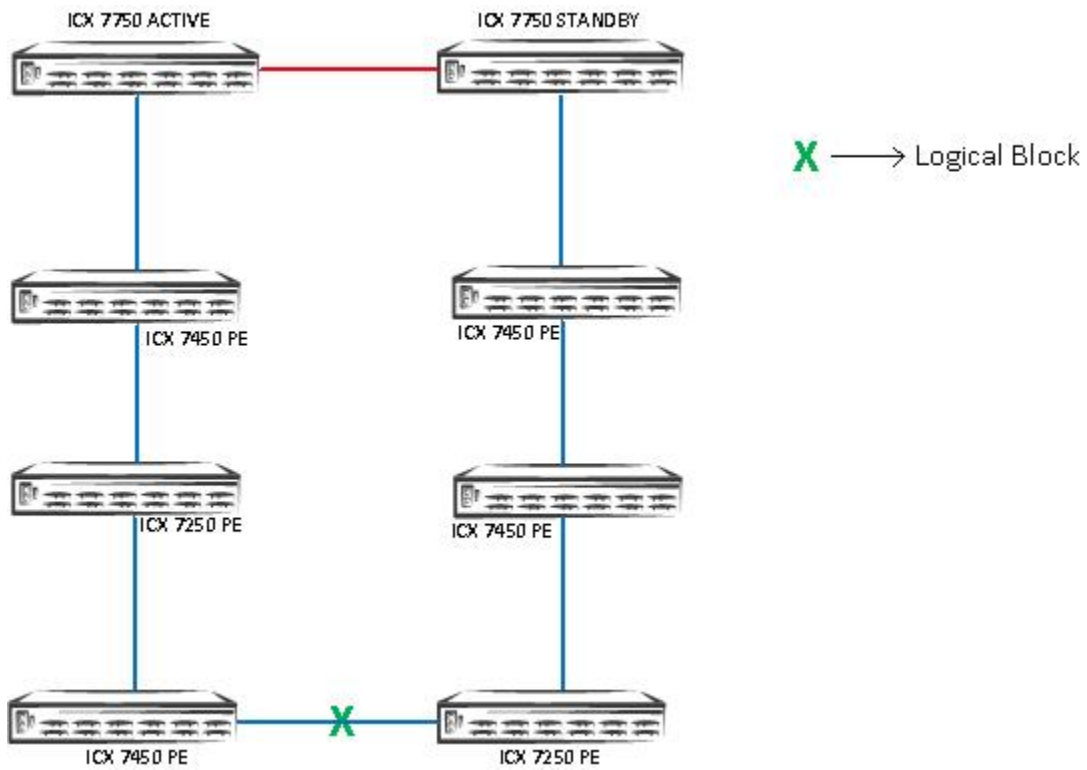


FIGURE 6 Topology 5: SPX PE Ring Topology from PE to CB Units

The green X indicates the location of the logical block for data flow through the PE ring. The logical block is placed on the link that comes up last during the PE ring formation.

Unsupported SPX Topologies

FIGURE 7 Topology 1: Ring Topology Within a PE Chain

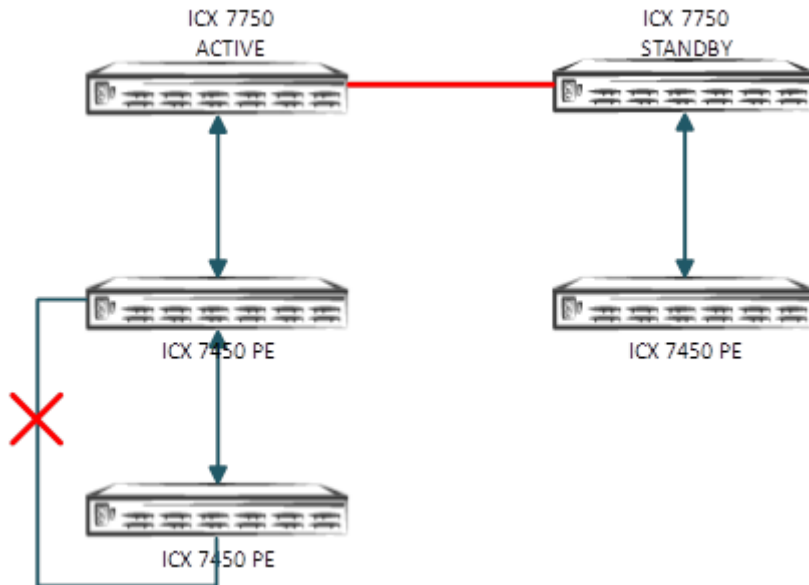


FIGURE 8 Topology 2: Ring Topology from PE to CB Units Is Not Supported in 08.0.40

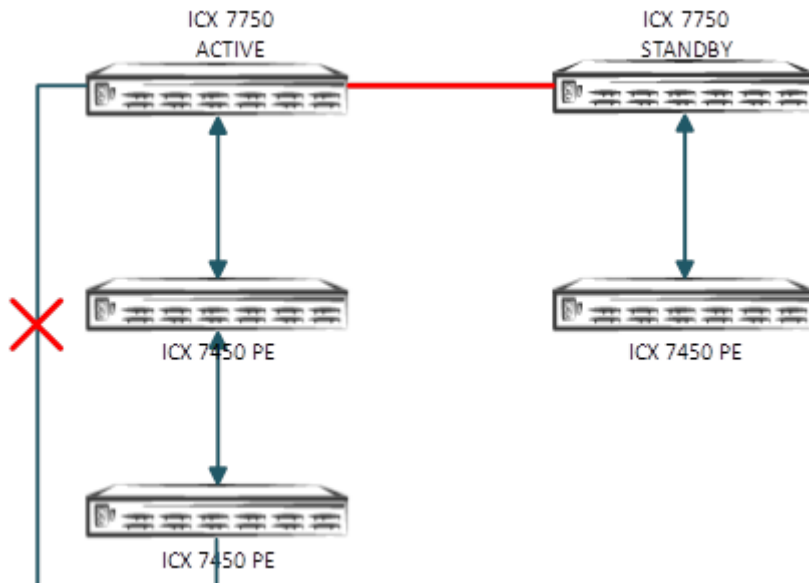


FIGURE 9 Topology 3: SPX-LAG Spanning Multiple PE Chains

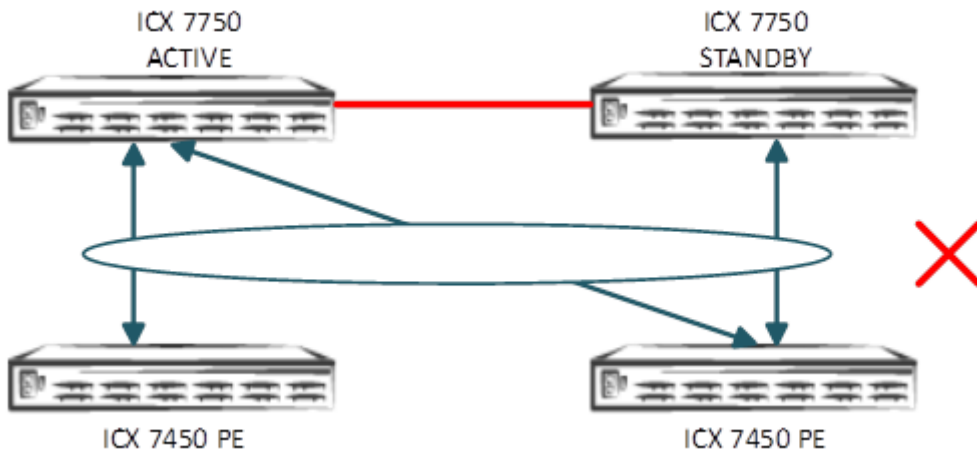


FIGURE 10 Topology 4: More Than One PE Unit Connected to a Transit PE

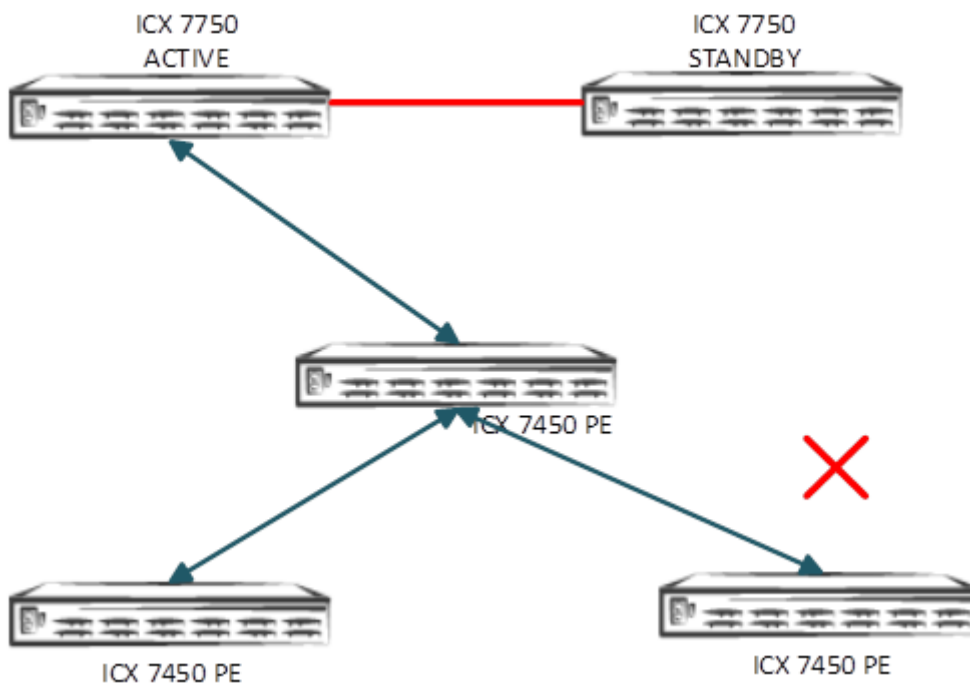


FIGURE 11 Topology 5: Edge PE Connected to an Existing PE Ring

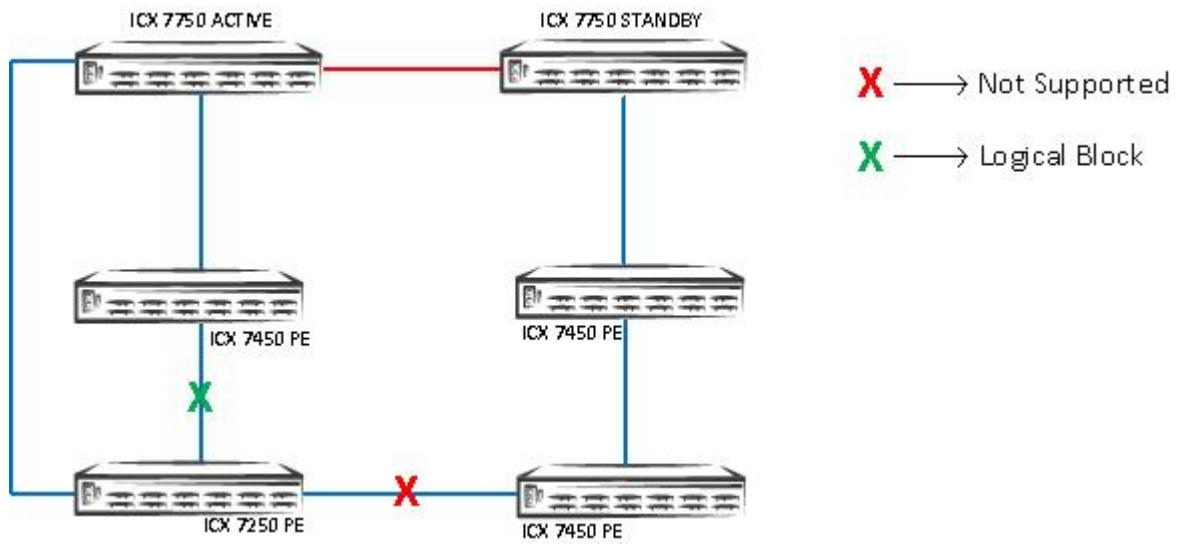


FIGURE 12 Topology 6: SPX PE Ring with One PE

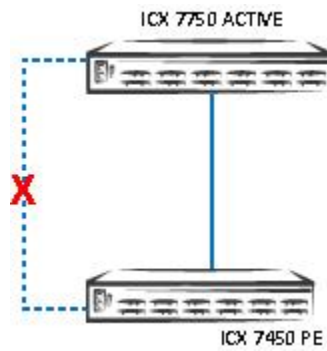
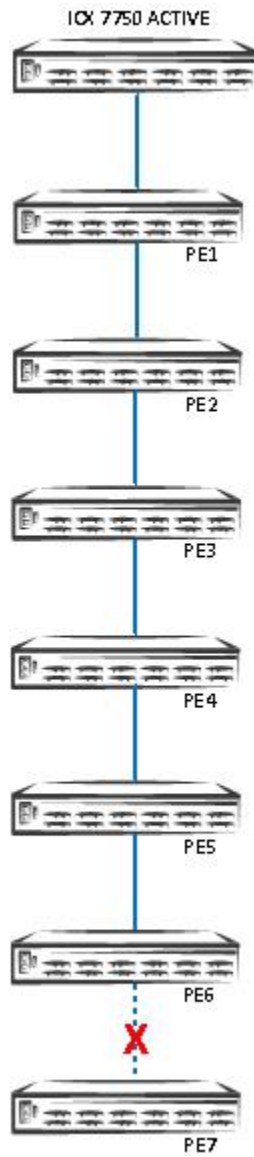
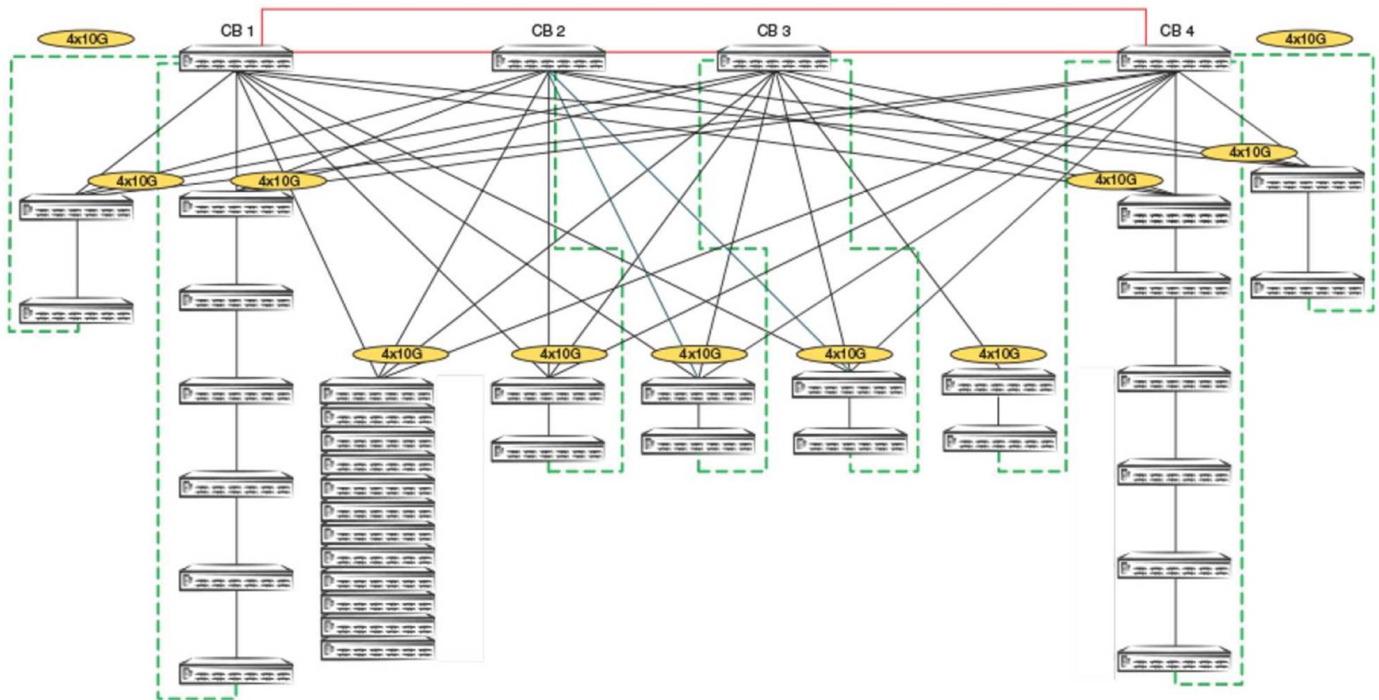


FIGURE 13 Topology 7: PE Chains of Seven or More PEs



Scaling (Supported Topologies)

FIGURE 14 Scaled Topology Including SPX (PE) Ring and PE Chains



Scalability Limits

- 4 CB stack units (ICX 7750)
- 36 PE units (ICX 7450, ICX 7250, and ICX 7150)
- 6 PE units per chain cascade depth
- 1500 PE ports
- 4 VLANs per PE port (including the default VLAN), 32 RSTP instances or 8 MSTP instances
- 12 directly connected PEs
- 8 PE rings
- 8 PE rings and 12 directly connected PEs running in parallel
- 32 SPX ports per CB unit (For example, on a 2-unit CB stack, there are 32 SPX ports on the CB active controller and 32 SPX ports on the CB standby controller.)

ATTENTION

Use port extender ports to hook to APs, phones, and PoE devices. Use control bridge ports to connect to servers, VMs, and so on.

Do not hook the PE ports to any other routers and switches. Do not deploy where compact switches are connected to the PE ports where the compact switches are not part of the Campus Fabric, but standalone units.

Disable LLDP on user ports where it is not required for the FastIron system to scale, and avoid high CPU issues.

Turn off FDP and CDP in scaled environments.

SPX Construction Methods

- Prerequisites..... 21
- Valid Port Combinations..... 21

Prerequisites

- The control bridge can be a standalone unit or a stack (ring or linear).
- Port extenders can be cascaded up to a depth of six. A ring topology of a PE chain is supported beginning with FastIron 08.0.50 and later.
- All units must be booted with the same software image.
- Only a FastIron 08.0.40 or later image is supported on 802.1BR (the CB runs the SWR08040.bin image, and the PE runs the SPR08040.bin image).
- No licenses are required for SPX (802.1BR or Campus Fabric).

Valid Port Combinations

TABLE 1 CB-to-PE Port Combinations

CB Port	PE Port					
	40G QSFP (1X40G)	10G Fiber (4x10GF)	10G Copper (4x10T)	1G Fiber (4X1F)	1G Copper (Base Unit Ports)	1G Fiber (Base Unit Ports)
40G QSFP	Yes	—	—	—	—	—
10G Fiber	—	Yes	—	No	No	No
10G Copper	—	No	Yes	No	No	No

NOTE

A 1-Gbps connection between the CB and the PE is not supported.

TABLE 2 PE-to-PE Port Combinations

PE1 Port	PE2 Port						
	40G QSFP (1X40G)	10G Fiber (4x10GF)	10G Copper (4x10T)	1G Fiber (4X1F)	1G Copper (Base Unit Ports)	1G Fiber (Base Unit Ports)	2.5G Copper (Base Unit Ports)
40G QSFP (1X40G)	Yes	—	—	—	—	—	—
10G Fiber (4x10GF)	—	Yes	—	No	No	No	—
10G Copper (4x10T)	—	—	Yes	No	No	No	Yes
1G Fiber (4X1F)	—	No	No	Yes	No	Yes	—
1G Copper (Base Unit Ports)	—	—	—	—	Yes	—	Yes

TABLE 2 PE-to-PE Port Combinations (continued)

PE1 Port	PE2 Port						
1G Fiber (Base Unit Ports)	—	—	—	Yes	—	Yes	—
2.5G Copper (Base Unit Ports): ICX 7450-32ZP	—	—	Yes	—	Yes	—	Yes

NOTE

For zero-touch provisioning (ZTP), it is mandatory to use nonbase module ports on ICX 7450, ICX 7250, or ICX 7150 units. Nonbase modules are the modules other than module 1. For example, modules 2, 3, and 4 are nonbase modules on ICX 7450 units.

Bill of Materials

The following products are used in this deployment.

TABLE 3 Products Used in ICX 7750 CB Stacking

Identifier	Vendor	Model	Notes
Switch/Units	Ruckus	ICX 7750-48C ICX 7750-48F ICX 7750-32Q	The CB stack can be formed with a mix of all three different models listed.
Stacking Cable: Copper Option	Ruckus	(1) 1, 5-meter QSFP-QSFP passive copper	For each uplink and downlink, 1 cable each. The number varies if 2/3/6 port stack trunks are used.
		(2) 1, 3, 5-meter QSFP-QSFP active copper	
Stacking Cable: Fiber-Optic Options	Ruckus	40G-QSFP-SR4	The fiber optic (SR) maximum distance is 100 m.
		40G-QSFP-LR4	The fiber optic (LR) maximum distance is 10 km. Refer to Table 8 for long-distance port information for ICX 7750 stacking.
Application Image	N/A	Only router image: FastIron 08.0.40 or later	All units should have the same software image: FastIron 08.0.40 or later
License Needed for Stacking	N/A	N/A	A license is not needed.

TABLE 4 Products Used in ICX 7450 PE Ports

Identifier	Vendor	Model	Notes
Switch/Units	Ruckus	ICX7450-24G ICX7450-24P ICX7450-48G ICX7450-48P ICX7450-48F ICX7450-32ZP	PEs can be mixed with different models.
Application Image	N/A	Only router image: FastIron 08.0.40 or later	All units should have the same software image: FastIron 08.0.40 or later (router)
Optics Fiber/Copper	Ruckus	N/A	Refer to Table 7 for part numbers.
License Needed for Stacking	N/A	N/A	A license is not needed.

TABLE 5 Products Used in ICX 7250 PE Ports

Identifier	Vendor	Model	Notes
Switch/Units	Ruckus	ICX7250-24 ICX7250-24P ICX7250-48 ICX7250-48P	PEs can be mixed with different models.
Application Image	N/A	Only router image: FastIron 08.0.50 or later	All units should have the same software image: FastIron 08.0.40 or later (router)
Optics Fiber/Copper	Ruckus	N/A	Refer to Table 7 for part numbers.

TABLE 5 Products Used in ICX 7250 PE Ports (continued)

Identifier	Vendor	Model	Notes
License Needed for 10-GbpsSPX port/SPX LAG	Ruckus	Yes (2x10 or 8x10 PoD license)	A license is not needed for 1-Gbps SPX port.

TABLE 6 Products Used in ICX 7150 PE Ports (FastIron 08.0.70 or Later)

Identifier	Vendor	Model	Notes
Switch/Units	Ruckus	ICX7150-C12 ICX7150-24P/24 ICX7150-48F/48P ICX7150-48ZP	PEs can be mixed with different models.
Application Image	N/A	Only router image: FastIron 08.0.70 or later	All units should have the same software image: FastIron 08.0.40 or a later (router)
Optics Fiber/Copper	Ruckus	N/A	Refer to Table 7 for part numbers.
License Needed for 10-Gbps SPX port/SPX LAG	Ruckus	Yes (2x10 or 8x10 PoD license)	SPX LAGs on ICX 7150 PEs are limited to eight ports in FastIron 08.0.70. ICX 7150 devices require a PoD license for ports that will be used for 10-Gbps connections. The exception is the ICX7150-48XP model, which is shipped with two 10-Gbps ports but requires a PoD license for any additional 10-Gbps connections. The ICX 7150 uses trust-based licenses. Refer to the <i>Ruckus FastIron Software Licensing Guide</i> for information on installing ICX 7150 licenses.

NOTE

Passive cables are not supported for stacking with the ICX 7750.

TABLE 7 Optics Information for ICX 7750 Stacking

QSFP Hardware	Description	Ruckus Part Number
Optics Information for ICX 7750 Intra CB		
40G-QSFP-SR4	40GE SR	57-1000128-01
40G-QSFP-LR4	40GE LR	57-1000263-01
40G-QSFP-C-0101	40GE QSFP + cable (passive copper): 1 m	58-0000033-01
40G-QSFP-C-0501	40GE QSFP + cable (passive copper): 5 m	58-0000035-01
40G-QSFP-QSFP-C-0101	40GE QSFP Active Copper: 1 m	58-0000041-01
40G-QSFP-QSFP-C-0301	40GE QSFP Active Copper: 3 m	58-0000042-01
40G-QSFP-QSFP-C-0501	40GE QSFP Active Copper: 5 m	58-0000043-01
Optics Information for ICX 7750 to ICX 7450 CB=PE and PE=PE		
40G-QSFP-SR4	40GE SR	57-1000128-01
40G-QSFP-LR4	40GE LR	57-1000263-01
40G-QSFP-QSFP-C-0101	40GE QSFP-to-QSFP Active copper cable: 1 m	58-0000041-01
40G-QSFP-QSFP-C-0301	40GE QSFP-to-QSFP Active copper cable: 3 m	58-0000042-01
40G-QSFP-QSFP-C-0501	40GE QSFP-to-QSFP Active copper cable: 5 m	58-0000043-01
40G-QSFP-QSFP-AOC-1001	40GE QSFP to QSFP cable: 10-m AOC	57-1000306-01
40G-QSFP-C-0101	40GE QSFP+cable (passive copper): 1 m	58-0000033-01
40G-QSFP-C-0501	40GE QSFP+cable (passive copper): 5 m	58-0000035-01
40G-QSFP-SR4-INT	40GBASE-SR4 QSFP + (module) (Interoperable with 10GBASE-SR, breakout capable)	57-1000129-01

TABLE 7 Optics Information for ICX 7750 Stacking (continued)

QSFP Hardware	Description	Ruckus Part Number
40G-QSFP-4SFP-C-0101	4x10GE QSFP+ to 4 SFP+copper cable: 1 m	58-0000051-01
40G-QSFP-4SFP-C-0301	4x10GE QSFP+ to 4 SFP+copper cable: 3 m	58-0000052-01
40G-QSFP-4SFP-C-050	4x10GE QSFP+ to 4 SFP+copper cable: 5 m	58-0000053-01
10GE SR SFP+	10G-SFPP-SR	57-0000075-01
10GBase-USR SFP+	10G-SFPP-USR	57-1000130-01
10GE LR SFP+	10G-SFPP-LR	57-0000076-01
10GE-SFPP-AOC-0701	7-m active optical cable	57-1000273-01
10GE-SFPP-AOC-1001	10-m active optical cable	57-1000274-01
10G-Twinax1M	1-m cable Twinax copper	58-1000026-01
10G-Twinax3M	3-m cable Twinax copper	58-1000027-01
10G-Twinax5M	5-m cable Twinax copper	58-1000023-01
E1MG-SX-OM	1000BASE-SX (OM)	33210-100
E1MG-LX-OM	1000BASE-LX (OM)	33211-100
E1MG-TX	1000BASE-T (copper)	33002-000

TABLE 8 Long-Distance Port Information for ICX 7750 Stacking

Model	Front Panel Ports LR4	Optional 40G Module Ports LR4
ICX 7750-26Q	1/2/1, 2, 3, 4, 5, 6	1/3/5 and 1/3/6
ICX 7750-48F	1/2/5 and 1/2/6	1/3/5 and 1/3/6
ICX 7750-48C	1/2/5 and 1/2/6	1/3/5 and 1/3/6

TABLE 9 Feature Support for SPX

Technology Group	Technology
L2/L3	VLAN/STP/VE/LACP/OSPF/BGP/Multicast
QoS	DSCP/PCP Re-marking QoS Classification
High Availability	SPX Ring SPX LAG Hitless Failover
Security	IPv4 ACL IPv6 ACL
Analytics	Port Mirroring
Infrastructure Bringup	Zero-Touch Provisioning (ZTP)

NOTE

For the full list of features supported in FastIron 08.0.50, refer to the *Ruckus FastIron Campus Fabric Configuration Guide*.

Deployment Considerations

- SPX LAG or port: Only one SPX LAG or SPX port is allowed between the CB and the PE or between the PE and the PE.
- Speed: No speed negotiation is possible when SPX links are configured.
- VLANs: 4 VLANs per PE port (including the default VLAN). A maximum of 16 VLANs for 128 PE ports.
- STP: If Spanning Tree Protocol is enabled on the CB, a reload is required.
- IP addressing: No IP addressing on the physical PE port (only VEs are supported).

Bringing Up SPX

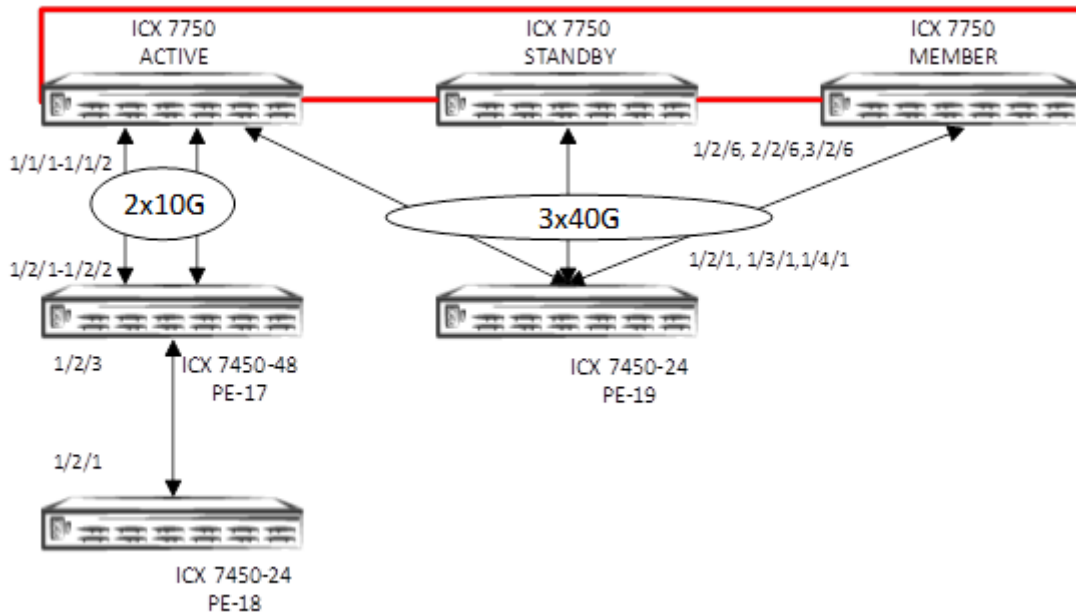
- Configuration Notes..... 29
- Reference Topology..... 30
- Configuring the CB..... 30
- Configuring the PE..... 32

Configuration Notes

- An ICX 7750 traditional stack or a standalone ICX 7750 device can be enabled as an 802.1BR control bridge (CB).
- A traditional stack that serves as a CB stack in an SPX domain should contain no more than four units.
- A CB can be a ring or linear stack or a standalone unit.
- A CB stack can be formed using Module 2 or Module 3 ports on all models.
- A CB-to-PE link can be 10G or 40G.
- A PE-to-PE link can be 1G, 2.5G, 10G, or 40G.
- A CB stack can be formed with a secure setup utility or by manual configuration. (For more information, refer to the *Ruckus ICX 7450, ICX 7750, and ICX 7250 Stacking Deployment Guide*.)
- The CB unit ID ranges from 1 to 12.
- PE IDs range from 17 to 56.
- For manual bring-up, you must establish console sessions to all standalone ICX 7450 units and ICX 7250 units before bringing them up as SPX PEs. Once the SPX fabric is up, all functionality can be managed from the CB active unit's console, SSH, or Telnet session.
- You should use ZTP to deploy the SPX domain. Refer to [Zero-Touch Provisioning](#) on page 85 for more information.

Reference Topology

FIGURE 15 Bringing Up SPX Reference Topology



Configuring the CB

1. Enable SPX on the ICX 7750.
 - Configure **spx cb-enable** on the active CB unit. The **spx cb-enable** command adds "lldp run" to the running configuration in FastIron 08.0.40 and earlier. LLDP then runs on all CB ports.
 - If STP is enabled, the system must be reloaded.
 - If STP is enabled in the core, a reload is prompted once the CB is enabled.

```
ICX7750-48F Router(config)# spx cb-enable
System is now in 802.lbr Control Bridge (CB) mode. Add "lldp run" config.
```

2. Configure the SPX port or the SPX LAG on the CB.

Enter the **spx-port** or **spx-lag** configuration command for connecting the CB to the PE.

NOTE

PE units can join an SPX domain only after at least one working SPX port or SPX LAG has been configured on both the CB and the PE.

```
ICX7750-48F Router(config)# spx cb-configure
ICX7750-48F Router(config-spx-cb)# spx-lag 1/1/1 1/1/2
ICX7750-48F Router(config-spx-cb)# spx-lag 1/2/6 2/2/6 3/2/6
```

3. Configure the PE IDs and name.

- Optionally, you can configure the PE ID using the **pe-id** command.
- If you do not configure the PE ID, the system assigns the available PE IDs based on the join time of the PEs.

PE Chain 17, 18

```
ICX7750-48F Router(config)# spx cb-configure
ICX7750-48F Router(config-spx-cb)# pe-id 1/1/1 17 18
```

PE 19

```
ICX7750-48F Router(config)# spx cb-configure
ICX7750-48F Router(config-spx-cb)# pe-id 1/2/6 19
```

4. Verify that the running configuration has the following configuration.

```
ICX7750-48F Router# show running-config | beg cb
spx cb-enable
spx cb-configure
  spx-lag 1/2/6 2/2/6 3/2/6
  spx-lag 1/1/1 to 1/1/2
  pe-id 1/1/1 17 18
  pe-id 1/2/6 19
```

Configuring the PE

1. Enable SPX on the ICX 7450 or ICX 7250.
 - On a standalone ICX 7450, use the **spx pe-enable** command to bring up the unit in provisional PE mode. When the unit is PE-enabled, the system generates two default SPX ports for the PE.
 - You can either use the default SPX ports or configure a different set of ports as the SPX ports or LAG.

NOTE

The system automatically generates *two* SPX ports on the PE upon enabling SPX. The following rules apply *in order*:

1. If the PE has any 4X10-Gbps ports, the system generates spx-port 1/x/1 and spx-port 1/x/3, where "x" is the slot number of the 4X10-Gbps module. If there are multiple 4X10-Gbps modules, the SPX ports are configured in the slot with the lowest number.
2. If an ICX 7450 has any 40-Gbps modules, the system designates up to two 40-Gbps ports as SPX ports.
3. If no 4X10-Gbps or 40-Gbps modules are present in the ICX 7450, the system does not generate any SPX ports for the unit.

PE-17

```
ICX7450-24 Router (config)# spx pe-enable
Enter provisional PE mode. CLI is limited to spx unit 1.
After finishing all configuration, please "write memory" and reload this unit to be a PE.

Provisional-PE]ICX7450-48P Router# show running-config
Current configuration:
!
ver 08.0.40bT213
!
spx pe-enable
spx unit 1
  module 1 icx7450-48p-poe-management-module
  module 2 icx7400-xgf-4port-40g-module
  module 3 icx7400-qsfp-1port-40g-module
  module 4 icx7400-qsfp-1port-40g-module
  spx-port 1/2/1
  spx-port 1/2/3
!
end
```

PE-18

```
ICX7450-24P Router(config)# spx pe-enable
Enter provisional PE mode. CLI is limited to spx unit 1.
After finishing all configuration, please "write memory" and reload this unit to be a PE.
[Provisional-PE]ICX7450-24P Router(config)#

[Provisional-PE]ICX7450-24P Router(config)# show running-config
Current configuration:
!
ver 08.0.40bT213
!
spx pe-enable
spx unit 1
  module 1 icx7450-24p-poe-port-management-module
  module 2 icx7400-xgf-4port-40g-module
  module 3 icx7400-qsfp-1port-40g-module
  module 4 icx7400-qsfp-1port-40g-module
  spx-port 1/2/1
  spx-port 1/2/3
!
end
```


PE-19

```
ICX7450-24 Router(config)# spx pe-enable  
Enter provisional PE mode. CLI is limited to spx unit 1.  
After finishing all configuration, please "write memory" and reload this unit to be a PE.
```

```
[Provisional-PE]ICX7450-24 Router(config)# show run  
Current configuration:  
!  
ver 08.0.40bT213  
!  
spx pe-enable  
spx unit 1  
  module 1 icx7450-24-port-management-module  
  module 2 icx7400-qsfp-lport-40g-module  
  module 3 icx7400-qsfp-lport-40g-module  
  module 4 icx7400-qsfp-lport-40g-module  
  spx-port 1/2/1  
  spx-port 1/3/1  
!  
end
```

2. Configure the SPX port or LAG on the PE.

- Use the **spx-port** or **spx-lag** configuration command for the PE-CB link (in this case, PE 17 and 19).
- Use the **spx-port** or **spx-lag** configuration command for the PE-PE link (in this case, PE 18).

PE 17

PE 17 1/2/1 and 1/2/2 are connected to CB unit 1, and 1/2/3 is connected to PE unit 18. spx-port 1/2/3 is already created by default. Therefore, configure **spx-lag** with ports 1/2/1 and 1/2/2 in "spx unit 1".

```
[Provisional-PE]ICX7450-48P Router(config)# spx unit 1
[Provisional-PE]ICX7450-48P Router(config-spx-unit-1)# spx-lag 1/2/1 1/2/2
[Provisional-PE]ICX7450-48P Router(config-spx-unit-1)# show running-config
Current configuration:
!
ver 08.0.40bT213
!
spx pe-enable
spx unit 1
  module 1 icx7450-48p-poe-management-module
  module 2 icx7400-xgf-4port-40g-module
  module 3 icx7400-qsfp-lport-40g-module
  module 4 icx7400-qsfp-lport-40g-module
  spx-lag 1/2/1 to 1/2/2
  spx-port 1/2/3
!
end
```

PE 18

PE 18 port 1/2/1 is connected to PE 17, which is already present as the default SPX port. Therefore, no **spx-port** update is required.

PE 19

PE 19 is connected to a CB unit with ports 1/2/1, 1/3/1, and 1/4/1. Therefore, **spx-lag** must be configured with these ports. Because 1/2/1 and 1/3/1 are default ports, you must remove them before you configure **spx-lag**.

```
[Provisional-PE]ICX7450-24 Router# configure terminal
[Provisional-PE]ICX7450-24 Router(config)# spx unit 1
[Provisional-PE]ICX7450-24 Router(config-spx-unit-1)# no spx-port 1/2/1
spx-port 1/2/1 is removed
[Provisional-PE]ICX7450-24 Router(config-spx-unit-1)# no spx-port 1/3/1
spx-port 1/3/1 is removed
WARNING!!! === This PE has no spx-port/lag configuration.
[Provisional-PE]ICX7450-24 Router(config-spx-unit-1)# spx-lag 1/2/1 1/3/1 1/4/1
[Provisional-PE]ICX7450-24 Router(config-spx-unit-1)# show running-config
Current configuration:
!
ver 08.0.40bT213
!
spx pe-enable
spx unit 1
  module 1 icx7450-24-port-management-module
  module 2 icx7400-qsfp-lport-40g-module
  module 3 icx7400-qsfp-lport-40g-module
  module 4 icx7400-qsfp-lport-40g-module
  spx-lag 1/2/1 1/3/1 1/4/1
!
end
```

3. Save the configuration and reload.

- Once a PE is enabled and the appropriate SPX port or LAG is configured, you must use the **write memory** and **reload** commands to complete initialization.
- The ICX 7450 or ICX 7250 enters PE mode with the assigned PE ID from the CB.
- The PE ID ranges from 17 to 56 (1 to 16 are reserved for the CB).

PE 17, 18, 19

Save the configuration and reload the unit to bring the PE into 802.1BR mode.

```
[Provisional-PE]ICX7450-48P Router(config-spx-unit-1)# write memory
Flash Memory Write (123 bytes)
Write PE startup file done.
[Provisional-PE]ICX7450-48P Router(config-spx-unit-1)# end
[Provisional-PE]ICX7450-48P Router# reload
Are you sure? (enter 'y' or 'n'): y
[Provisional-PE]ICX7450-48P Router# Unmounting the External USB
Sent SIGTERM to all processes
Sent SIGKILL to all processes
Requesting system reboot
```

4. After the SPX system is up, verify the configuration.

NOTE

From FastIron 08.0.70 and later, the ICX 7150 is allowed to be used as a port extender (PE). Refer to [Port Extenders](#) on page 9 for more details.

```
ICX7750-48F Router# show spx
T=22d5h16m24.5: alone: standalone, D: dynamic cfg, S: static
ID   Type           Role      Mac Address   Pri State  Comment
1   S ICX7750-48XGF active    cc4e.24d0.3500 128 local  Ready
2   S ICX7750-48XGC standby  609c.9f1f.df00 128 remote Ready
3   S ICX7750-48XGF member   cc4e.246e.d580 0 remote Ready
17  S ICX7450-48GF spx-pe   cc4e.246d.1178 N/A remote Ready
18  S ICX7450-48P  spx-pe   cc4e.246d.22b8 N/A remote Ready
19  S ICX7250-48P  spx-pe   cc4e.24b4.32e8 N/A remote Ready
```

```

      active                standby
      +----+                +----+
-3/1| 1 |3/4--3/1| 3 |3/4--3/1| 2 |3/4-
|   +----+                +----+   |
|-----|
      +----+                +----+
1/1/1==2/1| 17 |2/3--2/1| 18 |
      +----+                +----+

      +----+
1/2/6--2/1| 19 |
      +----+
```

5. From FastIron 08.0.70 and later, all models of the ICX 7150 can be added as a port extender.

```
ICX7750-48F Router# show spx
T=22d5h16m24.5: alone: standalone, D: dynamic cfg, S: static
ID   Type           Role      Mac Address      Pri State  Comment
1   S ICX7750-48XGF  active    cc4e.24d0.3500  128 local  Ready
2   S ICX7750-48XGC  standby   609c.9f1f.df00  128 remote Ready
3   S ICX7750-48XGF  member    cc4e.246e.d580   0 remote Ready
17  S ICX7150-48ZP   spx-pe    cc4e.246d.1078  N/A remote Ready
18  S ICX7150-24P    spx-pe    cc4e.246d.2ab8  N/A remote Ready
19  S ICX7150-C12    spx-pe    cc4e.24b4.3ee8  N/A remote Ready
    active          standby
      +----+        +----+        +----+
-3/1| 1 |3/4--3/1| 3 |3/4--3/1| 2 |3/4-
| +----+        +----+        +----+ |
|-----|
      +----+        +----+
3/1/1==2/1| 17 |2/3--3/1| 18 |
      +----+        +----+

      +----+
2/1/6--3/1| 19 |
      +----+
```

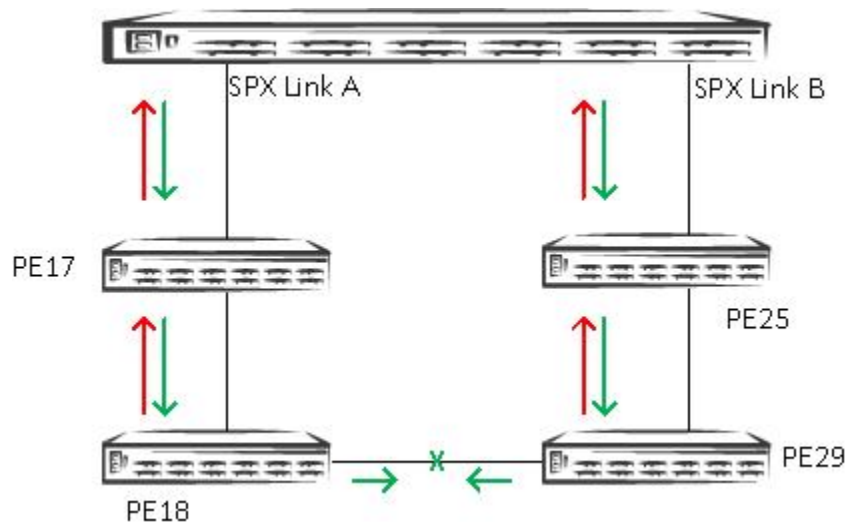
SPX PE Ring

- Overview..... 37
- How a PE Ring Works with Different Types of Traffic..... 38

Overview

SPX (802.1BR) was introduced to the ICX system in FastIron 08.0.40. SPX includes a CB and a chain of PEs attached to the CB (for example, 1 CB with 4 PEs attached to it in a chain). The caveat here is that if a transit PE from the chain fails, the downlink PEs attached to it lose communication with the CB, thereby affecting traffic on the downlink PEs. An SPX PE provides a redundant connection for the PEs to communicate to the CB in the event of an upstream PE failure, with minimal impact on traffic.

FIGURE 16 Redundant Connection for the PEs

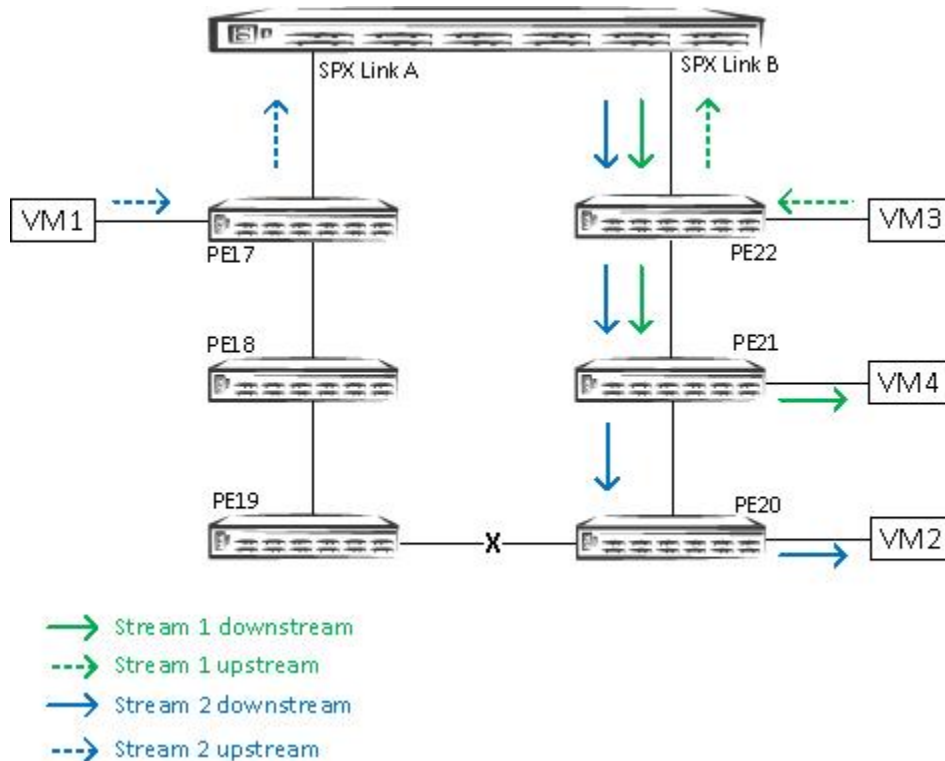


In the figure, red arrows indicate the upstream traffic, and green arrows indicate the downstream traffic. The green X indicates the location of the logical block for data flow through the ring. The logical block is placed on the link that comes up last during the SPX (PE) ring formation. In this case, the link between PE 29 and PE 18 came up last. The logically blocked link in a PE ring remains up but intentionally blocks data traffic through it to prevent loops in the system.

How a PE Ring Works with Different Types of Traffic

Unicast Traffic

FIGURE 17 PE Ring in Unicast Traffic



Stream 1 [S1]

- Ingress traffic from VM3: Takes the shortest upstream path to the CB, SPX Link B.
- Egress out of VM4: Takes the shortest downstream path to PE5, selects SPX Link B.

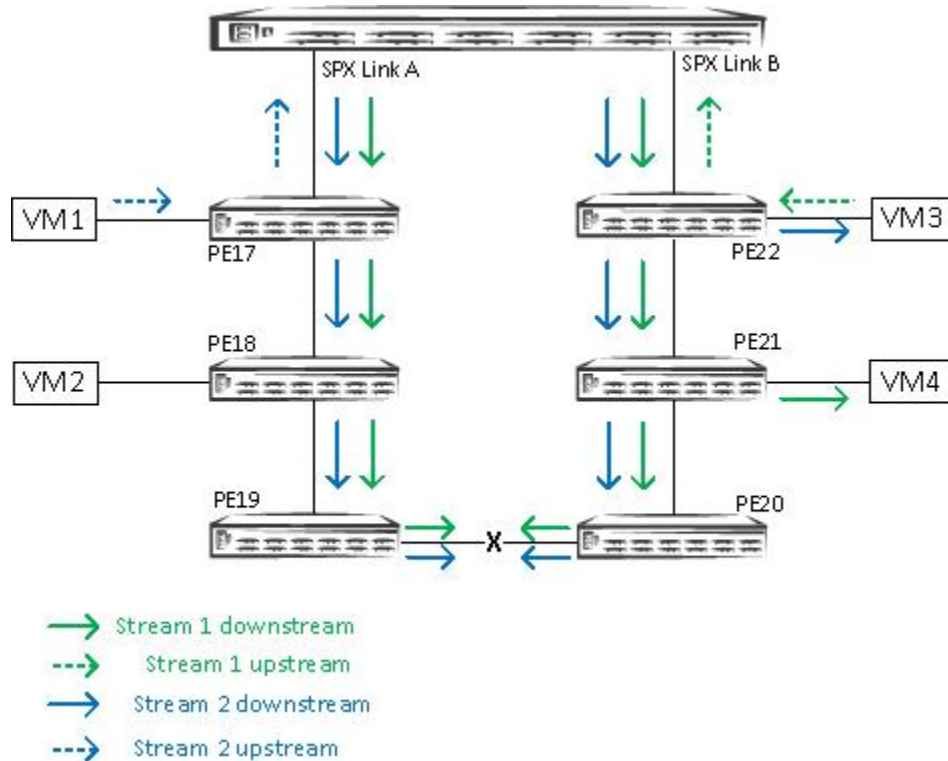
Stream 2 [S2]

- Ingress traffic from VM1: Takes the shortest upstream path to the CB, SPX Link A.
- Egress out of VM2: Takes the shortest downstream path to PE4, selects SPX Link B.

When the ring is in the Active state, each PE unit is mapped to one of the SPX links (either SPX Link A or SPX Link B) to carry both upstream and downstream traffic. Any known unicast traffic flowing in and out of that PE uses the same SPX link until the ring breaks or there is a change in the ring topology. If the ring breaks at a point where the mapped SPX link cannot be reached by this PE, the PE unit is remapped to the alternate SPX link (if it is reachable). This will cause some minimal traffic loss until the remapping is complete. The convergence time depends on the number of PE data ports and traffic streams to be moved from the existing SPX link to the newer SPX link.

Multicast/Broadcast and Unknown Unicast Traffic

FIGURE 18 PE Ring in Multicast/Broadcast and Unknown Unicast Traffic



Stream 1 [S1]

- Ingress traffic from VM3: Takes the shortest upstream path to the CB, SPX Link B.
- Egress out of VM4, VM2: Downstream traffic takes both SPX Link A and SPX Link B.

Stream 2 [S2]

- Ingress traffic from VM1: Takes the shortest upstream path to the CB, SPX Link A.
- Egress out of VM3: Downstream traffic takes both SPX Link A and SPX Link B.

When the ring is active, each PE unit is mapped to one of the SPX links (either SPX Link A or SPX Link B) to carry the upstream traffic. Downstream traffic is carried over both SPX links (SPX Link A and SPX Link B) to achieve fast reconvergence. If the ring breaks at a point where the mapped SPX link cannot be reached from this PE, the PE unit is remapped to the alternate SPX link (if it is reachable) to carry the upstream traffic. This causes traffic loss only until the remapping is complete. Reprogramming the SPX link for downstream traffic is not required. This helps in achieving faster reconvergence and reducing traffic loss to a minimum in most failover scenarios.

NOTE

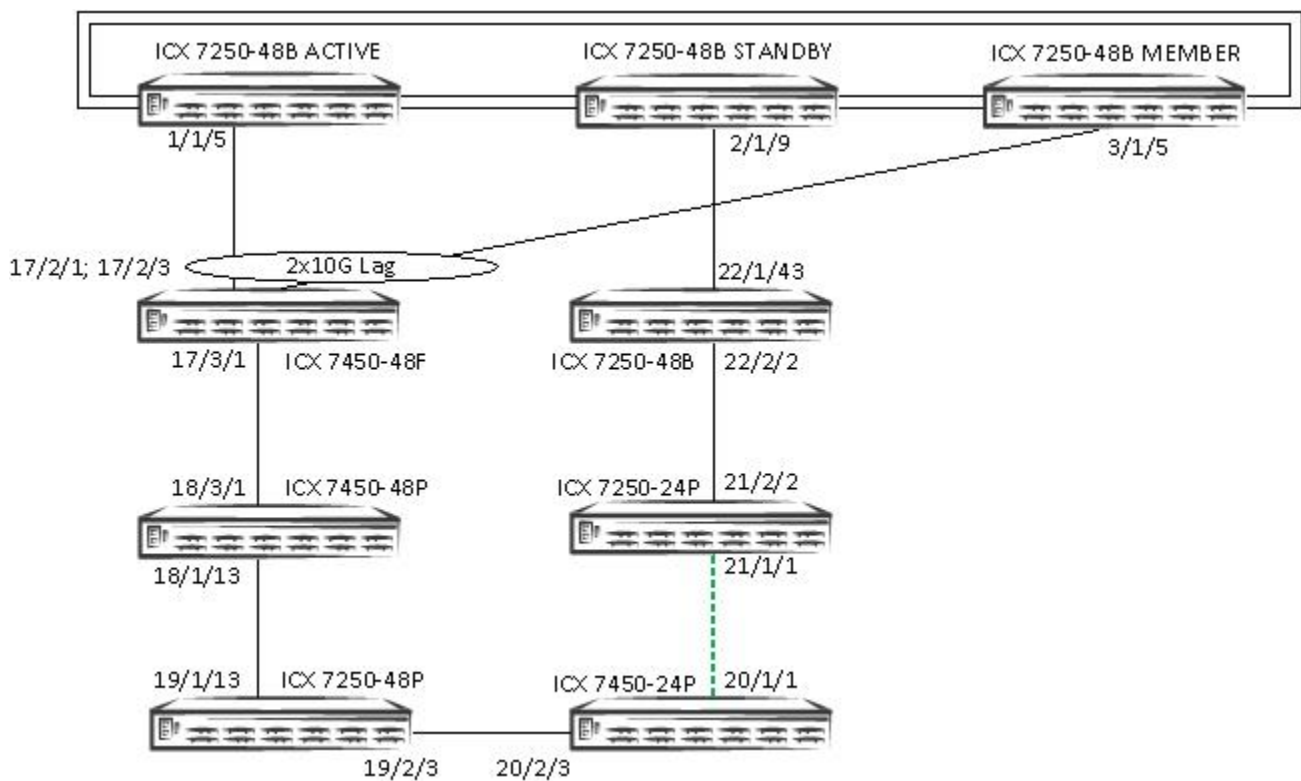
The black X in the link in the figure represents the location of the logical block in the PE ring. The link connecting PE 3 to PE 4 drops downstream traffic, which prevents the VMs from receiving duplicate traffic.

Deployment Scenarios

- Reference Topology..... 41
- Deployment Scenario 1: Deploying a PE Ring in an Existing Campus Fabric Domain..... 42
- Deployment Scenario 2: Deploying a PE Ring Using ZTP..... 43
- Deployment Scenario 3: Adding a New PE Unit to an Existing PE Ring..... 44
- Deployment Scenario 4: Replacing a PE in an Existing PE Ring..... 48
- Deployment Scenario 5: Moving SPX Links Between Modules in a PE Ring..... 51
- Deployment Scenario 6: Adding More Links to a Live SPX Link Using the multi-spx-lag Command..... 54
- Deployment Scenario 7: Removing Links from a Live SPX LAG and Converting the LAG to an SPX Port..... 56
- Deployment Scenario 8: Changing a PE Ring to a Linear PE Chain..... 59

Reference Topology

FIGURE 19 Reference Topology for Deployment Scenarios



Deployment Scenario 1: Deploying a PE Ring in an Existing Campus Fabric Domain

Follow the instructions in [SPX Construction Methods](#) on page 21 to create a Campus Fabric domain with CB and PE chains. The following steps explain how to form a PE ring after a Campus Fabric domain with PE chains comes up.

- The following SPX setup is based on the reference topology. This is a 3-unit CB stack. There are 2 PE chains, PEs 17–20 and PEs 21–22. To start, there is no SPX link between PE 20 and PE 21.

```
ICX7750-48F Router# show spx
T=13d9h32m53.9: alone: standalone, D: dynamic cfg, S: static
ID  Type      Role      Mac Address  Pri State  Comment
1   S ICX7750-48XGF active    cc4e.24d0.3500 128 local  Ready
2   S ICX7750-48XGC standby  609c.9f1f.df00 128 remote Ready
3   S ICX7750-48XGF member   cc4e.246e.d580 5 remote Ready
17  S ICX7450-48GF spx-pe   cc4e.246d.1178 N/A remote Ready
18  S ICX7450-48P  spx-pe   cc4e.246d.22b8 N/A remote Ready
19  S ICX7250-48P  spx-pe   cc4e.24b4.32e8 N/A remote Ready
20  S ICX7450-24P  spx-pe   cc4e.248b.11e0 N/A remote Ready
21  S ICX7250-24P  spx-pe   cc4e.24b4.7f20 N/A remote Ready
22  S ICX7250-48   spx-pe   cc4e.24b4.4350 N/A remote Ready
```

```

      active                standby
      +----+                +----+
-3/1| 1 |3/4--3/1| 3 |3/4--3/1| 2 |3/4-
| +----+                +----+
|-----|
|-----|
1/1/5==2/1| 17 |3/1==2/1| 18 |1/13==1/13| 19 |2/3--2/3| 20 |
      +----+                +----+
2/1/9--1/43| 22 |2/2--2/2| 21 |
      +----+                +----+

```

- The PE ID configuration in the running configuration displays two PE chains.

```
ICX7750-48F Router# show running-config | include pe-id
pe-id 1/1/5 17 18 19 20 21
pe-id 2/1/9 22 21
```

- Physically connect PE 20 and 21. In this case, make a connection between ports 20/1/1 and 21/1/1.
- Enable the ports if they are disabled.

```
ICX7750-48F Router(config)# interface ethernet 20/1/1
ICX7750-48F Router(config-if-pe-e1000-20/1/1)# enable
ICX7750-48F Router(config)# interface ethernet 21/1/1
ICX7750-48F Router(config-if-pe-e1000-21/1/1)# enable
ICX7750-48F Router(config-if-pe-e1000-21/1/1)# show interfaces brief ethernet 20/1/1 ethernet 21/1/1
```

Port	Link	State	Dupl	Speed	Trunk	Tag	Pvid	Pri	MAC	Name
20/1/1	Up	Forward	Full	1G	None	No	1	0	cc4e.248b.11e0	
21/1/1	Up	Forward	Full	1G	None	No	1	0	cc4e.24b4.7f20	

- Configure SPX ports (or an SPX LAG). In this example, SPX ports 20/1/1 and 21/1/1 are configured.

```
ICX7750-48F Router(config)# spx unit 20
ICX7750-48F Router(config-spx-unit-20)# spx-port 20/1/1
ICX7750-48F Router(config-spx-unit-20)# spx unit 21
ICX7750-48F Router(config-spx-unit-21)# spx-port 21/1/1
```

6. A syslog message confirms that the PE ring has been deployed. You can also use SPX (PE) ring-related **show** commands to verify the status of the PE ring as described in [Verification Commands: SPX PE Ring](#) on page 72.

```
SYSLOG: <13> Nov 8 16:28:19 SPX Ring Instance 1 state change to IN-PROGRESS (CB1/1/5 - CB2/1/9).
Logical block: PE20x--xPE21
SYSLOG: <13> Nov 8 16:28:19 SPX Ring Instance 1 state change to ACTIVE (CB1/1/5 - CB2/1/9). Logical
block: PE20x--xPE21
```

7. Once the PE ring is formed, the relevant PE ID configuration is automatically generated in the running configuration. The new PE ID configuration merges the two PE ID chains into one PE ID ring configuration.

```
ICX7750-48F Router# show running-config | include pe-id
pe-id 1/1/5 17 18 19 20 21 22 2/1/9
```

8. Review the **show spx** command output after the PE ring is formed.

```
ICX7750-48F Router# show spx
T=22d5h16m24.5: alone: standalone, D: dynamic cfg, S: static
ID   Type   Role      Mac Address   Pri State  Comment
1   S ICX7750-48XGF active  cc4e.24d0.3500 128 local  Ready
2   S ICX7750-48XGC standby 609c.9f1f.df00 128 remote Ready
3   S ICX7750-48XGF member  cc4e.246e.d580 5 remote Ready
17  S ICX7450-48GF spx-pe  cc4e.246d.1178 N/A remote Ready
18  S ICX7450-48P  spx-pe  cc4e.246d.22b8 N/A remote Ready
19  S ICX7250-48P  spx-pe  cc4e.24b4.32e8 N/A remote Ready
20  S ICX7450-24P  spx-pe  cc4e.248b.11e0 N/A remote Ready
21  S ICX7250-24P  spx-pe  cc4e.24b4.7f20 N/A remote Ready
22  S ICX7250-48   spx-pe  cc4e.24b4.4350 N/A remote Ready
```

```

      active                standby
      +---+                +---+
-3/1| 1 |3/4--3/1| 3 |3/4--3/1| 2 |3/4-
|  +---+                +---+
|                                     |
|-----|
|                                     |
      +---+                +---+                +---+                +---+
1/1/5==2/1| 17 |3/1--3/1| 18 |2/3--2/1| 19 |2/3--2/3| 20 |1/1--1/1| 21 |2/2-
      +---+                +---+                +---+                +---+
                                                    +---+
                                                    2/1/9--1/43| 22 |2/2-
                                                    +---+

```

9. Enter the **write memory** command to save the configuration.

```
ICX7750-48F Router# write memory
Send "write mem" to 6 PEs: 17-22

Automatic copy to member units: 2 3
SYSLOG: <14> Nov 9 13:40:01 Security: startup-config was changed by operator from console
Flash Memory Write (8192 bytes per dot)
...
Copy Done.
```

Deployment Scenario 2: Deploying a PE Ring Using ZTP

Refer to [Zero-Touch Provisioning](#) on page 85.

3. The **show spx ring all** command indicates that the PE ring is in the break state, and the **show spx** command displays the broken PE ring.

```
ICX7750-48F Router# show spx
T=22d5h54m16.0: alone: standalone, D: dynamic cfg, S: static
ID  Type      Role      Mac Address  Pri State  Comment
1   S ICX7750-48XGF active    cc4e.24d0.3500 128 local  Ready
2   S ICX7750-48XGC standby  609c.9f1f.df00 128 remote Ready
3   S ICX7750-48XGF member   cc4e.246e.d580 5 remote Ready
17  S ICX7450-48GF spx-pe   cc4e.246d.1178 N/A remote Ready
18  S ICX7450-48P  spx-pe   cc4e.246d.22b8 N/A remote Ready
19  S ICX7250-48P  spx-pe   cc4e.24b4.32e8 N/A remote Ready
20  S ICX7450-24P  spx-pe   cc4e.248b.11e0 N/A remote Ready
21  S ICX7250-24P  spx-pe   cc4e.24b4.7f20 N/A remote Ready
```

```

      active                standby
      +---+                +---+
-3/1| 1 |3/4--3/1| 3 |3/4--3/1| 2 |3/4-
| +---+                +---+ |
|-----|
|
      +---+                +---+                +---+                +---+                +---+
1/1/5==2/1| 17 |3/1--3/1| 18 |2/3--2/1| 19 |2/3--2/3| 20 |1/1--1/1| 21 |2/3-
      +---+                +---+                +---+                +---+                +---+

```

```
ICX7750-48F Router# show spx ring all
```

```
-----
Ring Id |FSM State |CB port  Lag  |Remote CB port  Lag  |Log Block Link
-----
1       BREAK   1/1/5   3079 1/1/23          3072  Ring is broken - No Logical Block
-----
```

4. Unconfigure SPX ports 1/1/23 and 21/2/3.

```
ICX7750-48F Router# configure terminal
ICX7750-48F Router(config)# spx cb-configure
ICX7750-48F Router(config-spx-cb)# no spx-port 1/1/23
```

```
SYSLOG: <13> Nov 17 11:24:29 SPX Ring Instance 1 is unconfigured (CB1/1/5 - CB1/1/23)
ICX7750-48F Router(config-spx-cb)#
SYSLOG: <14> Nov 17 11:24:29 PORT: 1/1/23 disabled by un-authenticated user from console session.
```

```
ICX7750-48F Router(config-spx-cb)# spx unit 21
ICX7750-48F Router(config-spx-unit-21)# no spx-port 21/2/3
spx-port 21/2/3 is removed
ICX7750-48F Router(config-spx-unit-21)#
SYSLOG: <14> Nov 17 11:24:58 PORT: 21/2/3 disabled by un-authenticated user from console session.
```

```
ICX7750-48F Router(config-spx-unit-21)# show spx
T=22d5h56m34.4: alone: standalone, D: dynamic cfg, S: static
ID  Type      Role      Mac Address  Pri State  Comment
1   S ICX7750-48XGF active    cc4e.24d0.3500 128 local  Ready
2   S ICX7750-48XGC standby  609c.9f1f.df00 128 remote Ready
3   S ICX7750-48XGF member   cc4e.246e.d580 5 remote Ready
17  S ICX7450-48GF spx-pe   cc4e.246d.1178 N/A remote Ready
18  S ICX7450-48P  spx-pe   cc4e.246d.22b8 N/A remote Ready
19  S ICX7250-48P  spx-pe   cc4e.24b4.32e8 N/A remote Ready
20  S ICX7450-24P  spx-pe   cc4e.248b.11e0 N/A remote Ready
21  S ICX7250-24P  spx-pe   cc4e.24b4.7f20 N/A remote Ready
```

```

      active                standby
      +---+                +---+
-3/1| 1 |3/4--3/1| 3 |3/4--3/1| 2 |3/4-
| +---+                +---+ |
|-----|
|
      +---+                +---+                +---+                +---+                +---+
1/1/5==2/1| 17 |3/1--3/1| 18 |2/3--2/1| 19 |2/3--2/3| 20 |1/1--1/1| 21 |
      +---+                +---+                +---+                +---+                +---+

```

Deployment Scenarios

Deployment Scenario 3: Adding a New PE Unit to an Existing PE Ring

5. Bring up the new unit as a PE.

```
ICX7250-48 Router> enable
No password has been assigned yet...
ICX7250-48 Router# configure terminal
ICX7250-48 Router(config)# spx pe-enable
Enter provisional PE mode. CLI is limited to spx unit 1.
After finishing all configuration, please "write memory" and reload this unit to be a PE.
[Provisional-PE]ICX7250-48 Router(config)# show running-config
Current configuration:
!
ver 08.0.50B14T213
!
spx pe-enable
spx unit 1
  module 1 icx7250-48-port-management-module
  module 2 icx7250-sfp-plus-8port-80g-module
  spx-port 1/2/1          |_____These are default spx-ports. Change them
  spx-port 1/2/3          |_____if required. One spx-port connecting to CB
                          |_____and another connecting to PE21.
!
end
[Provisional-PE]ICX7250-48 Router(config)# spx unit 1
[Provisional-PE]ICX7250-48 Router(config-spx-unit-1)# no spx-port1/2/3
spx-port 1/2/3 is removed
[Provisional-PE]ICX7250-48 Router(config-spx-unit-1)# spx-port 1/2/2
[Provisional-PE]ICX7250-48 Router(config-spx-unit-1)# show running-config
Current configuration:
!
ver 08.0.50B14T213
!
spx pe-enable
spx unit 1
  module 1 icx7250-48-port-management-module
  module 2 icx7250-sfp-plus-8port-80g-module
  spx-port 1/2/1
  spx-port 1/2/2
!
end
```

6. Make the physical connection between the new PE and the CB, and bring up the ports.

```
[Provisional-PE]ICX7250-48 Router(config-spx-unit-1)# show interfaces brief ethernet 1/2/1 ethernet
1/2/2
Port      Link      State Dupl Speed Trunk Tag Pvid Pri MAC      Name
1/2/1     Disable  None  None None  None No  1   0   cc4e.24b4.4381
1/2/2     Up       Forward Full 10G  None No  1   0   cc4e.24b4.4382
[Provisional-PE]ICX7250-48 Router(config-spx-unit-1)#
[Provisional-PE]ICX7250-48 Router(config-spx-unit-1)# int e 1/2/1
[Provisional-PE]ICX7250-48 Router(config-if-spx-e10000-1/2/1)# enable
[Provisional-PE]ICX7250-48 Router(config-if-spx-e10000-1/2/1)# show interfaces brief ethernet 1/2/1
ethernet 1/2/2
Port      Link      State Dupl Speed Trunk Tag Pvid Pri MAC      Name
1/2/1     Up       Forward Full 10G  None No  1   0   cc4e.24b4.4381
1/2/2     Up       Forward Full 10G  None No  1   0   cc4e.24b4.4382
[Provisional-PE]ICX7250-48 Router(config-if-spx-e10000-1/2/1)#
```

7. Verify that the SPX ports on the CB and PE 21 are up, and configure the ports.

```
ICX7750-48F Router(config)# show interfaces brief ethernet 1/1/23 ethernet 21/2/2
Port      Link      State Dupl Speed Trunk Tag Pvid Pri MAC      Name
1/1/23    Up       Forward Full 10G  3072 No  1   0   cc4e.24d0.350c
21/2/2    Up       Forward Full 10G  None No  1   0   cc4e.24b4.7f3a

ICX7750-48F Router(config)# spx cb-configure
ICX7750-48F Router(config-spx-cb)# spx-port 1/1/13
ICX7750-48F Router(config-spx-cb)# spx unit 21
ICX7750-48F Router(config-spx-unit-21)# spx-port 21/2/2
```

8. Save the configuration, and reload the PE.

```
[Provisional-PE]ICX7250-48 Router(config-if-spx-e10000-1/2/1)# end
[Provisional-PE]ICX7250-48 Router# write memory
Flash Memory Write (133 bytes)
[Provisional-PE]ICX7250-48 Router#
Write PE startup file done.

[Provisional-PE]ICX7250-48 Router# reload
Are you sure? (enter 'y' or 'n'): y
```

9. After the new PE reboots, the SPX system adds the PE as part of the new six-PE ring.

```
ICX7750-48F Router# show spx
T=22d6h28m19.2: alone: standalone, D: dynamic cfg, S: static
ID   Type           Role      Mac Address      Pri  State  Comment
1   S ICX7750-48XGF  active    cc4e.24d0.3500  128  local  Ready
2   S ICX7750-48XGC  standby   609c.9f1f.df00  128  remote Ready
3   S ICX7750-48XGF  member    cc4e.246e.d580   5    remote Ready
17  S ICX7450-48GF   spx-pe    cc4e.246d.1178  N/A   remote Ready
18  S ICX7450-48P    spx-pe    cc4e.246d.22b8  N/A   remote Ready
19  S ICX7250-48P    spx-pe    cc4e.24b4.32e8  N/A   remote Ready
20  S ICX7450-24P    spx-pe    cc4e.248b.11e0  N/A   remote Ready
21  S ICX7250-24P    spx-pe    cc4e.24b4.7f20  N/A   remote Ready
22  D ICX7250-48      spx-pe    cc4e.24b4.4350  N/A   remote Ready
```

```

      active                standby
      +----+                +----+
      -3/1| 1 |3/4--3/1| 3 |3/4--3/1| 2 |3/4-
      | +----+                +----+ |
      |-----|
      |-----+ +----+ +----+ +----+ +----+
      1/1/5==2/1| 17 |3/1--3/1| 18 |2/3--2/1| 19 |2/3--2/3| 20 |1/1--1/1| 21 |2/2-
      +----+ +----+ +----+ +----+ +----+ |
                                                    +----+ |
                                                    1/1/23--2/1| 22 |2/2-
                                                    +----+

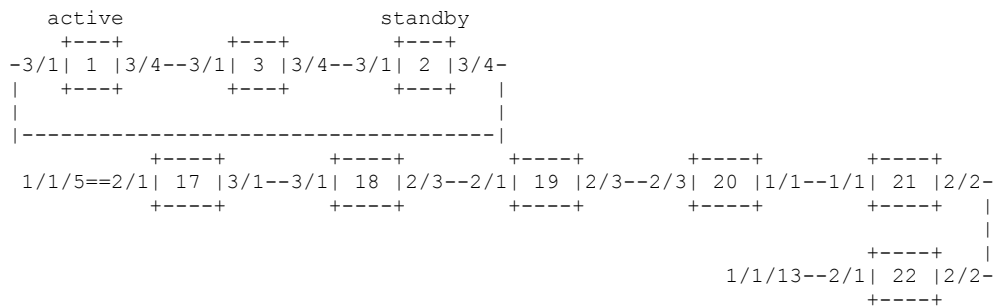
```

Deployment Scenario 4: Replacing a PE in an Existing PE Ring

Follow this procedure when a PE in an existing PE ring must be replaced. In this example, PE 22 is replaced with a new PE unit.

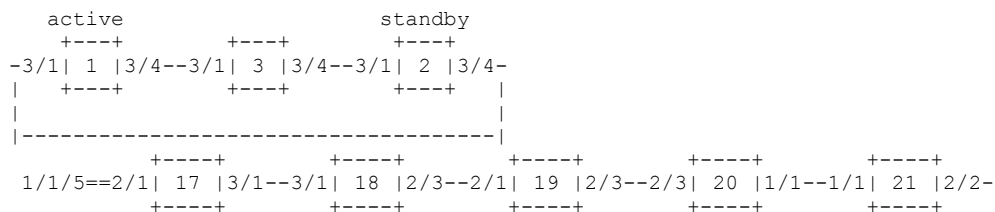
- Suppose that you are working with the following PE ring topology.

```
ICX7750-48F Router# show spx
T=22d6h45m2.4: alone: standalone, D: dynamic cfg, S: static
ID   Type           Role      Mac Address      Pri State  Comment
1   S ICX7750-48XGF active  cc4e.24d0.3500  128 local  Ready
2   S ICX7750-48XGC standby 609c.9f1f.df00  128 remote Ready
3   S ICX7750-48XGF member  cc4e.246e.d580   5 remote Ready
17  S ICX7450-48GF spx-pe  cc4e.246d.1178  N/A remote Ready
18  S ICX7450-48P  spx-pe  cc4e.246d.22b8  N/A remote Ready
19  S ICX7250-48P  spx-pe  cc4e.24b4.32e8  N/A remote Ready
20  S ICX7450-24P  spx-pe  cc4e.248b.11e0  N/A remote Ready
21  S ICX7250-24P  spx-pe  cc4e.24b4.7f20  N/A remote Ready
22  D ICX7250-48   spx-pe  cc4e.24b4.4350  N/A remote Ready
```



- Physically remove the link between PE 22 and PE 21 and the link between PE 22 and the CB. In this case, cables are removed from ports 22/2/2 and 22/2/1. The ports go down, the PE ring breaks, and PE 22 is removed from the PE ring.

```
ICX7750-48F Router# show spx
T=22d8h47m12.0: alone: standalone, D: dynamic cfg, S: static
ID   Type           Role      Mac Address      Pri State  Comment
1   S ICX7750-48XGF active  cc4e.24d0.3500  128 local  Ready
2   S ICX7750-48XGC standby 609c.9f1f.df00  128 remote Ready
3   S ICX7750-48XGF member  cc4e.246e.d580   5 remote Ready
17  S ICX7450-48GF spx-pe  cc4e.246d.1178  N/A remote Ready
18  S ICX7450-48P  spx-pe  cc4e.246d.22b8  N/A remote Ready
19  S ICX7250-48P  spx-pe  cc4e.24b4.32e8  N/A remote Ready
20  S ICX7450-24P  spx-pe  cc4e.248b.11e0  N/A remote Ready
21  S ICX7250-24P  spx-pe  cc4e.24b4.7f20  N/A remote Ready
```



3. Bring up the new replacement unit as a PE.

```

ICX7250-48 Router> enable
No password has been assigned yet...
ICX7250-48 Router# configure terminal
ICX7250-48 Router(config)# spx pe-enable
Enter provisional PE mode. CLI is limited to spx unit 1.
After finishing all configuration, please "write memory" and reload this unit to be a PE.
[Provisional-PE]ICX7250-48 Router(config)# show running-config
Current configuration:
!
ver 08.0.50B14T213
!
spx pe-enable
spx unit 1
  module 1 icx7250-48-port-management-module
  module 2 icx7250-sfp-plus-8port-80g-module
  spx-port 1/2/1          |_____These are default spx-ports. Change them
  spx-port 1/2/3          |_____if required. One spx-port connects to the CB
                          |_____and another connects to PE 21.
!
end
[Provisional-PE]ICX7250-48 Router(config)# spx unit 1
[Provisional-PE]ICX7250-48 Router(config-spx-unit-1)# no spx-port1/2/3
spx-port 1/2/3 is removed
[Provisional-PE]ICX7250-48 Router(config-spx-unit-1)# spx-port 1/2/2
[Provisional-PE]ICX7250-48 Router(config-spx-unit-1)# show running-config
Current configuration:
!
ver 08.0.50B14T213
!
spx pe-enable
spx unit 1
  module 1 icx7250-48-port-management-module
  module 2 icx7250-sfp-plus-8port-80g-module
  spx-port 1/2/1
  spx-port 1/2/2
!
end

```

4. Reconnect the cable between the PE 22 replacement and the CB and between PE 22 and PE 21, and bring up the ports.

```

[Provisional-PE]ICX7250-48 Router(config-spx-unit-1)# show interfaces brief ethernet 1/2/1 ethernet
1/2/2
Port      Link      State Dupl Speed Trunk Tag Pvid Pri MAC      Name
1/2/1     Disable  None  None None  None No  1   0   cc4e.24b4.4381
1/2/2     Up       Forward Full 10G  None No  1   0   cc4e.24b4.4382
[Provisional-PE]ICX7250-48 Router(config-spx-unit-1)#
[Provisional-PE]ICX7250-48 Router(config-spx-unit-1)# int e 1/2/1
[Provisional-PE]ICX7250-48 Router(config-if-spx-e10000-1/2/1)# enable
[Provisional-PE]ICX7250-48 Router(config-if-spx-e10000-1/2/1)# show interfaces brief ethernet 1/2/1
ethernet 1/2/2
Port      Link      State Dupl Speed Trunk Tag Pvid Pri MAC      Name
1/2/1     Up       Forward Full 10G  None No  1   0   cc4e.24b4.4381
1/2/2     Up       Forward Full 10G  None No  1   0   cc4e.24b4.4382
[Provisional-PE]ICX7250-48 Router(config-if-spx-e10000-1/2/1)#

```

5. Verify that the SPX ports on the CB and PE 21 are up.

```

ICX7750-48F Router(config)# show interfaces brief ethernet 1/1/13 ethernet 21/2/2
Port      Link      State Dupl Speed Trunk Tag Pvid Pri MAC      Name
1/1/13    Up       Forward Full 10G  3072 No  1   0   cc4e.24d0.350c
21/2/2    Up       Forward Full 10G  None No  1   0   cc4e.24b4.7f3a

```

Deployment Scenarios

Deployment Scenario 4: Replacing a PE in an Existing PE Ring

6. Save the configuration, and reload the PE 22 replacement.

```
[Provisional-PE]ICX7250-48 Router(config-if-spx-e10000-1/2/1)# end
[Provisional-PE]ICX7250-48 Router# write memory
Flash Memory Write (133 bytes)
[Provisional-PE]ICX7250-48 Router#
Write PE startup file done.

[Provisional-PE]ICX7250-48 Router# reload
Are you sure? (enter 'y' or 'n'): y
```

7. After the reload, the PE replacement unit becomes part of the SPX domain.

```
ICX7750-48F Router# show spx
T=22d9h2m39.6: alone: standalone, D: dynamic cfg, S: static
ID  Type      Role      Mac Address  Pri State  Comment
1   S ICX7750-48XGF active    cc4e.24d0.3500 128 local  Ready
2   S ICX7750-48XGC standby   609c.9f1f.df00 128 remote Ready
3   S ICX7750-48XGF member    cc4e.246e.d580 5 remote Ready
17  S ICX7450-48GF spx-pe   cc4e.246d.1178 N/A remote Ready
18  S ICX7450-48P  spx-pe   cc4e.246d.22b8 N/A remote Ready
19  S ICX7250-48P  spx-pe   cc4e.24b4.32e8 N/A remote Ready
20  S ICX7450-24P  spx-pe   cc4e.248b.11e0 N/A remote Ready
21  S ICX7250-24P  spx-pe   cc4e.24b4.7f20 N/A remote Ready
22  D ICX7250-48    spx-pe   cc4e.24b4.4350 N/A remote Ready
```

```
      active          standby
      +----+          +----+
-3/1| 1 |3/4--3/1| 3 |3/4--3/1| 2 |3/4-
|   +----+          +----+          |
|-----|
      +----+          +----+          +----+          +----+          +----+
1/1/5==2/1| 17 |3/1--3/1| 18 |2/3--2/1| 19 |2/3--2/3| 20 |1/1--1/1| 21 |2/2-
      +----+          +----+          +----+          +----+          +----+
                                                    +----+          |
                                                    1/1/13--2/1| 22 |2/2-
                                                    +----+          |
```


Deployment Scenarios

Deployment Scenario 5: Moving SPX Links Between Modules in a PE Ring

- The **show spx ring all** command confirms that the PE ring is in the break state. The **show spx** command shows two PE chains.

```
ICX7750-48F Router# show spx ring all
```

```
-----  
Ring Id |FSM State |CB port  Lag  |Remote CB port  Lag  |Log Block Link  
-----  
1       BREAK      2/1/9   3075  1/1/5           3079  Ring is broken - No Logical Block
```

```
ICX7750-48F Router# show spx
```

```
T=15d5h19m42.7: alone: standalone, D: dynamic cfg, S: static  
ID  Type      Role      Mac Address  Pri State  Comment  
1   S ICX7750-48XGF active     cc4e.24d0.3500 128 local Ready  
2   S ICX7750-48XGC standby   609c.9f1f.df00 128 remote Ready  
3   S ICX7750-48XGF member    cc4e.246e.d580 5 remote Ready  
17  S ICX7450-48GF spx-pe    cc4e.246d.1178 N/A remote Ready  
18  S ICX7450-48P  spx-pe    cc4e.246d.22b8 N/A remote Ready  
19  S ICX7250-48P  spx-pe    cc4e.24b4.32e8 N/A remote Ready  
20  S ICX7450-24P  spx-pe    cc4e.248b.11e0 N/A remote Ready  
21  S ICX7250-24P  spx-pe    cc4e.24b4.7f20 N/A remote Ready  
22  S ICX7250-48   spx-pe    cc4e.24b4.4350 N/A remote Ready
```

```
active          standby  
+----+         +----+  
-3/1| 1 |3/4--3/1| 3 |3/4--3/1| 2 |3/4-  
| +----+         +----+         |  
|-----|  
1/1/5==2/1| 17 |3/1--3/1| 18 |1/13-  
+----+         +----+  
  
+----+         +----+         +----+         +----+  
2/1/9--1/43| 22 |2/2--2/2| 21 |1/1--1/1| 20 |2/3--2/3| 19 |1/13-  
+----+         +----+         +----+         +----+
```

- Unconfigure SPX ports 18/1/13 and 19/1/13.

```
ICX7750-48F Router# configure terminal  
ICX7750-48F Router(config)# spx unit 18  
ICX7750-48F Router(config-spx-unit-18)# no spx-port 18/1/13  
spx-port 18/1/13 is removed  
ICX7750-48F Router(config-spx-unit-18)#  
SYSLOG: <14> Nov 10 10:48:57 PORT: 18/1/13 disabled by un-authenticated user from console session.
```

```
ICX7750-48F Router(config-spx-unit-18)# spx unit 19  
ICX7750-48F Router(config-spx-unit-19)# no spx-port 19/1/13  
spx-port 19/1/13 is removed  
ICX7750-48F Router(config-spx-unit-19)#  
SYSLOG: <14> Nov 10 10:49:05 PORT: 19/1/13 disabled by un-authenticated user from console session.
```

```
ICX7750-48F Router(config-spx-unit-19)#
```

- Unconfiguring the SPX ports automatically disables them.

```
ICX7750-48F Router(config-spx-unit-19)# show interfaces brief ethernet 18/1/13 ethernet 19/1/13
```

```
Port      Link      State Dupl Speed Trunk Tag Pvid Pri MAC      Name  
18/1/13   Disable  None  None None  None No  1  0  cc4e.246d.22c4  
19/1/13   Disable  None  None None  None No  1  0  cc4e.24b4.32f4
```

6. Ports 18/1/13 and 19/1/13 no longer appear in the **show spx** command output.

```
ICX7750-48F Router(config-spx-unit-19)# show spx
T=15d5h21m39.8: alone: standalone, D: dynamic cfg, S: static
ID   Type           Role      Mac Address      Pri State  Comment
1    S ICX7750-48XGF active    cc4e.24d0.3500  128 local  Ready
2    S ICX7750-48XGC standby  609c.9f1f.df00  128 remote Ready
3    S ICX7750-48XGF member   cc4e.246e.d580   5 remote Ready
17   S ICX7450-48GF spx-pe   cc4e.246d.1178  N/A remote Ready
18   S ICX7450-48P  spx-pe   cc4e.246d.22b8  N/A remote Ready
19   S ICX7250-48P  spx-pe   cc4e.24b4.32e8  N/A remote Ready
20   S ICX7450-24P  spx-pe   cc4e.248b.11e0  N/A remote Ready
21   S ICX7250-24P  spx-pe   cc4e.24b4.7f20  N/A remote Ready
22   S ICX7250-48   spx-pe   cc4e.24b4.4350  N/A remote Ready
```

```

      active                standby
    +----+                +----+
-3/1| 1 |3/4--3/1| 3 |3/4--3/1| 2 |3/4-
|   +----+                +----+
|   |   |   |   |   |   |   |
|-----|
      +----+                +----+
1/1/5==2/1| 17 |3/1--3/1| 18 |
      +----+                +----+

      +----+                +----+                +----+                +----+
2/1/9--1/43| 22 |2/2--2/2| 21 |1/1--1/1| 20 |2/3--2/3| 19 |
      +----+                +----+                +----+                +----+

```

7. At this stage, the PE ID configuration is still retained in the running configuration. The last step is to remove the PE ID configuration from the running configuration. To do so, revise the PE ID configuration for port 1/1/5, as shown. The alternative configuration PE ID 2/1/9 22 21 20 19 also works.
8. A syslog message confirms that the PE ring has been removed. The **show spx ring all** command also shows that the PE ring has been removed. The PE ID configuration now shows two PE chains.

```
SYSLOG: <13> Nov 10 10:51:09 SPX Ring Instance 1 is unconfigured (CB2/1/9 - CB1/1/5)
ICX7750-48F Router# show spx ring all
```

```
ICX7750-48F Router(config)# show interfaces brief ethernet 18/2/3 ethernet 19/2/1
```

Port	Link	State	Dupl	Speed	Trunk	Tag	Pvid	Pri	MAC	Name
18/2/3	Up	Forward	Full	10G	None	No	1	0	cc4e.246d.22eb	
19/2/1	Up	Blocked	Full	10G	None	No	1	0	cc4e.24b4.3319	

```
pe-id 2/1/9 22 21 20 19
```

9. Bring up the ports on PE 18 and PE 19, in this case, ports 18/2/3 and 19/2/1. Enable the ports first if they are already disabled.
10. Configure ports 18/2/3 and 19/2/1 as SPX ports.
11. A syslog message confirms that the PE ring has been deployed. You can also use the PE-ring-related **show** commands to verify the status of the PE ring as described in [Verification Commands: SPX PE Ring](#) on page 72.

```
SYSLOG: <13> Nov 10 10:57:38 SPX Ring Instance 1 state change to IN-PROGRESS (CB1/1/5 - CB2/1/9).
Logical block: PE18x--xPE19
```

```
SYSLOG: <13> Nov 10 10:57:38 SPX Ring Instance 1 state change to ACTIVE (CB1/1/5 - CB2/1/9). Logical
block: PE18x--xPE19
```

```
ICX7750-48F Router(config-spx-unit-19)#
```

```
SYSLOG: <13> Nov 10 10:57:38 SPX Ring Instance 1 state change to IN-PROGRESS (CB1/1/5 - CB2/1/9).
Logical block: PE18x--xPE19
```

```
SYSLOG: <13> Nov 10 10:57:38 SPX Ring Instance 1 state change to ACTIVE (CB1/1/5 - CB2/1/9). Logical
block: PE18x--xPE19
```

Deployment Scenarios

Deployment Scenario 6: Adding More Links to a Live SPX Link Using the multi-spx-lag Command

12. Once the PE ring is formed, the relevant PE ID configuration is automatically generated in the running configuration. The new PE ID configuration merges the two PE ID chains into one PE ID ring configuration.

```
ICX7750-48F Router# show running-config | include pe-id
pe-id 1/1/5 17 18 19 20 21 22 2/1/9
```

13. The **show spx** command displays the new 10-Gbps SPX link.

```
ICX7750-48F Router# show spx
T=15d5h32m33.0: alone: standalone, D: dynamic cfg, S: static
ID  Type      Role      Mac Address  Pri State  Comment
1   S ICX7750-48XGF active    cc4e.24d0.3500 128 local  Ready
2   S ICX7750-48XGC standby  609c.9f1f.df00 128 remote Ready
3   S ICX7750-48XGF member    cc4e.246e.d580 5 remote Ready
17  S ICX7450-48GF spx-pe   cc4e.246d.1178 N/A remote Ready
18  S ICX7450-48P  spx-pe   cc4e.246d.22b8 N/A remote Ready
19  S ICX7250-48P  spx-pe   cc4e.24b4.32e8 N/A remote Ready
20  S ICX7450-24P  spx-pe   cc4e.248b.11e0 N/A remote Ready
21  S ICX7250-24P  spx-pe   cc4e.24b4.7f20 N/A remote Ready
22  S ICX7250-48   spx-pe   cc4e.24b4.4350 N/A remote Ready
```

```

      active                standby
      +----+                +----+
-3/1| 1 |3/4--3/1| 3 |3/4--3/1| 2 |3/4-
|   +----+                +----+
|   |-----|
|   +----+                +----+
1/1/5==2/1| 17 |3/1--3/1| 18 |2/3--2/1| 19 |2/3--2/3| 20 |1/1--1/1| 21 |2/2-
      +----+                +----+
                                           +----+
                                           |
                                           +----+
                                           |
                                           2/1/9--1/43| 22 |2/2-
                                           +----+
                                           |
                                           +----+
```

14. Enter the **write memory** command to save the configuration.

```
ICX7750-48F Router# write memory
Send "write mem" to 6 PEs: 17-22

Automatic copy to member units: 2 3
SYSLOG: <14> Nov 10 11:02:26 Security: startup-config was changed by operator from console
Flash Memory Write (8192 bytes per dot)
...
Copy Done.
```

Deployment Scenario 6: Adding More Links to a Live SPX Link Using the multi-spx-lag Command

The following **show spx** command output shows one SPX link between PE 17 and PE 18 (17/3/1-18/3/1). Use the following procedure to add more links. The example adds 17/3/2-18/3/2 and 17/3/3-18/3/3 to existing SPX links.

```
ICX7750-48F Router# show spx
T=22d10h11m52.0: alone: standalone, D: dynamic cfg, S: static
ID  Type      Role      Mac Address  Pri State  Comment
1   S ICX7750-48XGF active    cc4e.24d0.3500 128 local  Ready
2   S ICX7750-48XGC standby  609c.9f1f.df00 128 remote Ready
3   S ICX7750-48XGF member    cc4e.246e.d580 5 remote Ready
17  S ICX7450-48GF spx-pe   cc4e.246d.1178 N/A remote Ready
18  S ICX7450-48P  spx-pe   cc4e.246d.22b8 N/A remote Ready
19  S ICX7250-48P  spx-pe   cc4e.24b4.32e8 N/A remote Ready
20  S ICX7450-24P  spx-pe   cc4e.248b.11e0 N/A remote Ready
21  S ICX7250-24P  spx-pe   cc4e.24b4.7f20 N/A remote Ready
22  S ICX7250-48   spx-pe   cc4e.24b4.4350 N/A remote Ready
```

```
22 D ICX7250-48      spx-pe  cc4e.24b4.4350 N/A remote  Ready
```

```

      active                standby
      +----+                +----+
-3/1| 1 |3/4--3/1| 3 |3/4--3/1| 2 |3/4-
|   +----+                +----+   |
|-----|
|
      +----+                +----+                +----+                +----+                +----+
1/1/5==2/1| 17 |3/1--3/1| 18 |2/3--2/1| 19 |2/3--2/3| 20 |1/1--1/1| 21 |2/2-
      +----+                +----+                +----+                +----+                +----+
                                                                +----+
                                                                1/1/13--2/1| 22 |2/2-
                                                                +----+

```

1. Output from the **show running-config** command shows the existing SPX port link between PE 17 and PE 18.

```
ICX7750-48F Router# show running-config
Current configuration:
!
ver 08.0.50B14T203
!
stack unit 1
  module 1 icx7750-48-xgf-port-management-module
  module 2 icx7750-qsfp-6port-qsfp-240g-module
  module 3 icx7750-6q-6port-qsfp-240g-module
  priority 128
  default-ports 1/3/1 1/3/4
  stack-port 1/3/1 1/3/4
stack unit 2
  module 1 icx7750-48-xgc-port-management-module
  module 2 icx7750-qsfp-6port-qsfp-240g-module
  module 3 icx7750-6q-6port-qsfp-240g-module
  priority 128
  default-ports 2/3/1 2/3/4
  stack-port 2/3/1 2/3/4
stack unit 3
  module 1 icx7750-48-xgf-port-management-module
  module 2 icx7750-qsfp-6port-qsfp-240g-module
  module 3 icx7750-6q-6port-qsfp-240g-module
  priority 5
  default-ports 3/3/1 3/3/4
  stack-port 3/3/1 3/3/4
spx unit 17
  module 1 icx7450-48f-sf-port-management-module
  module 2 icx7400-xgf-4port-40g-module
  module 3 icx7400-xgf-4port-40g-module
  module 4 icx7400-xgf-4port-40g-module
  spx-lag 17/2/1 17/2/3
  spx-port 17/3/1|--spx port connected to PE18
spx unit 18
  module 1 icx7450-48p-poe-management-module
  module 2 icx7400-xgf-4port-40g-module
  module 3 icx7400-xgf-4port-40g-module
  module 4 icx7400-qsfp-1port-40g-module
  spx-port 18/2/3
  spx-port 18/3/1
```

2. Physically connect PE 17 and PE 18 to bring up the links between 17/3/2 and 18/3/2 and between 17/3/3 and 18/3/3.

```
ICX7750-48F Router# show interfaces brief ethernet 17/3/1 to 17/3/3 ethernet 18/3/1 to 18/3/3
```

Port	Link	State	Dupl	Speed	Trunk	Tag	Pvid	Pri	MAC	Name
17/3/1	Up	Forward	Full	10G	None	No	1	0	cc4e.246d.11ad	
17/3/2	Up	Forward	Full	10G	None	No	1	0	cc4e.246d.11ae	
17/3/3	Up	Forward	Full	10G	None	No	1	0	cc4e.246d.11af	
18/3/1	Up	Forward	Full	10G	None	No	1	0	cc4e.246d.22ed	
18/3/2	Up	Blocked	Full	10G	None	No	1	0	cc4e.246d.22ee	
18/3/3	Up	Blocked	Full	10G	None	No	1	0	cc4e.246d.22ef	

3. Enter the **multi-spx-lag** command to convert the SPX port to an SPX LAG.

```
ICX7750-48F Router# configure terminal
ICX7750-48F Router(config)# spx unit 17
ICX7750-48F Router(config-spx-unit-17)# multi-spx-lag 17/3/1 to 17/3/3 and 18/3/1 to 18/3/3
Warning! multi-spx-lag may cause some PEs to be unreachable. Please verify topology after change.
spx-port 18/3/1 is replaced by spx-lag 18/3/1 to 18/3/3.
spx-port 17/3/1 is replaced by spx-lag 17/3/1 to 17/3/3.
ICX7750-48F Router(config-spx-unit-17)#
```

4. Output for the **show running-config** command reflects the SPX port to SPX LAG conversion.

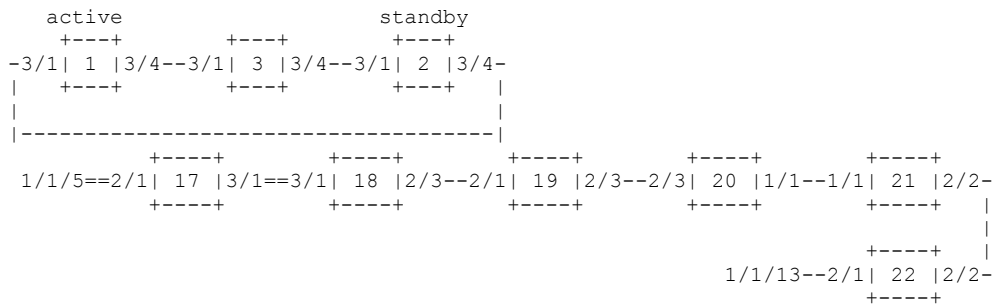
```
ICX7750-48F Router# show running-config
Current configuration:
!
ver 08.0.50B14T203
!
stack unit 1
  module 1 icx7750-48-xgf-port-management-module
  module 2 icx7750-qsfp-6port-qsfp-240g-module
  module 3 icx7750-6q-6port-qsfp-240g-module
  priority 128
  default-ports 1/3/1 1/3/4
  stack-port 1/3/1 1/3/4
stack unit 2
  module 1 icx7750-48-xgc-port-management-module
  module 2 icx7750-qsfp-6port-qsfp-240g-module
  module 3 icx7750-6q-6port-qsfp-240g-module
  priority 128
  default-ports 2/3/1 2/3/4
  stack-port 2/3/1 2/3/4
stack unit 3
  module 1 icx7750-48-xgf-port-management-module
  module 2 icx7750-qsfp-6port-qsfp-240g-module
  module 3 icx7750-6q-6port-qsfp-240g-module
  priority 5
  default-ports 3/3/1 3/3/4
  stack-port 3/3/1 3/3/4
spx unit 17
  module 1 icx7450-48f-sf-port-management-module
  module 2 icx7400-xgf-4port-40g-module
  module 3 icx7400-xgf-4port-40g-module
  module 4 icx7400-xgf-4port-40g-module
  spx-lag 17/2/1 17/2/3
  spx-lag 17/3/1 to 17/3/3|--spx lag connected to PE18
spx unit 18
  module 1 icx7450-48p-poe-management-module
  module 2 icx7400-xgf-4port-40g-module
  module 3 icx7400-xgf-4port-40g-module
  module 4 icx7400-qsfp-1port-40g-module
  spx-port 18/2/3
  spx-lag 18/3/1 to 18/3/3|--spx lag connected to PE17
```

Deployment Scenario 7: Removing Links from a Live SPX LAG and Converting the LAG to an SPX Port

The following **show spx** output shows one SPX LAG between PE 17 and PE 18 (17/3/1, 17/3/2, 17/3/3 = 18/3/1, 18/3/2, 18/3/3). Use the following procedure to convert an SPX LAG to an SPX port link, in this case, between 17/3/1 and 18/3/1.

```
ICX7750-48F Router# show spx
T=22d10h11m52.0: alone: standalone, D: dynamic cfg, S: static
```


ID	Type	Role	Mac Address	Pri	State	Comment
1	S ICX7750-48XGF	active	cc4e.24d0.3500	128	local	Ready
2	S ICX7750-48XGC	standby	609c.9f1f.df00	128	remote	Ready
3	S ICX7750-48XGF	member	cc4e.246e.d580	5	remote	Ready
17	S ICX7450-48GF	spx-pe	cc4e.246d.1178	N/A	remote	Ready
18	S ICX7450-48P	spx-pe	cc4e.246d.22b8	N/A	remote	Ready
19	S ICX7250-48P	spx-pe	cc4e.24b4.32e8	N/A	remote	Ready
20	S ICX7450-24P	spx-pe	cc4e.248b.11e0	N/A	remote	Ready
21	S ICX7250-24P	spx-pe	cc4e.24b4.7f20	N/A	remote	Ready
22	D ICX7250-48	spx-pe	cc4e.24b4.4350	N/A	remote	Ready



- Output for the **show running-config** command shows the existing SPX port link between PE 17 and PE 18.

```

ICX7750-48F Router# show running-config
Current configuration:
!
ver 08.0.50B14T203
!
stack unit 1
  module 1 icx7750-48-xgf-port-management-module
  module 2 icx7750-qsfp-6port-qsfp-240g-module
  module 3 icx7750-6q-6port-qsfp-240g-module
  priority 128
  default-ports 1/3/1 1/3/4
  stack-port 1/3/1 1/3/4
stack unit 2
  module 1 icx7750-48-xgc-port-management-module
  module 2 icx7750-qsfp-6port-qsfp-240g-module
  module 3 icx7750-6q-6port-qsfp-240g-module
  priority 128
  default-ports 2/3/1 2/3/4
  stack-port 2/3/1 2/3/4
stack unit 3
  module 1 icx7750-48-xgf-port-management-module
  module 2 icx7750-qsfp-6port-qsfp-240g-module
  module 3 icx7750-6q-6port-qsfp-240g-module
  priority 5
  default-ports 3/3/1 3/3/4
  stack-port 3/3/1 3/3/4
spx unit 17
  module 1 icx7450-48f-sf-port-management-module
  module 2 icx7400-xgf-4port-40g-module
  module 3 icx7400-xgf-4port-40g-module
  module 4 icx7400-xgf-4port-40g-module
  spx-lag 17/2/1 17/2/3
  spx-lag 17/3/1 to 17/3/3|--spx lag connected to PE 18
spx unit 18
  module 1 icx7450-48p-poe-management-module
  module 2 icx7400-xgf-4port-40g-module
  module 3 icx7400-xgf-4port-40g-module
  module 4 icx7400-qsfp-lport-40g-module
  spx-port 18/2/3
  spx-lag 18/3/1 to 18/3/3|--spx lag connected to PE 17

```

Deployment Scenarios

Deployment Scenario 7: Removing Links from a Live SPX LAG and Converting the LAG to an SPX Port

2. Use the **multi-spx-port** command to convert the SPX LAG to an SPX port.

```
ICX7750-48F Router(config)# spx unit 17
ICX7750-48F Router(config-spx-unit-17)# multi-spx-port 17/3/1 and 18/3/1
Warning! multi-spx-port may cause some PEs to be unreachable. Please verify topology after change.
spx-lag 18/3/1 to 18/3/3 is replaced by spx-port 18/3/1.
spx-lag 17/3/1 to 17/3/3 is replaced by spx-port 17/3/1.
```

3. Output for the **show running-config** command reflects the SPX LAG-to-SPX port conversion.

```
ICX7750-48F Router# show running-config
Current configuration:
!
ver 08.0.50B14T203
!
stack unit 1
  module 1 icx7750-48-xgf-port-management-module
  module 2 icx7750-qsfp-6port-qsfp-240g-module
  module 3 icx7750-6q-6port-qsfp-240g-module
  priority 128
  default-ports 1/3/1 1/3/4
  stack-port 1/3/1 1/3/4
stack unit 2
  module 1 icx7750-48-xgc-port-management-module
  module 2 icx7750-qsfp-6port-qsfp-240g-module
  module 3 icx7750-6q-6port-qsfp-240g-module
  priority 128
  default-ports 2/3/1 2/3/4
  stack-port 2/3/1 2/3/4
stack unit 3
  module 1 icx7750-48-xgf-port-management-module
  module 2 icx7750-qsfp-6port-qsfp-240g-module
  module 3 icx7750-6q-6port-qsfp-240g-module
  priority 5
  default-ports 3/3/1 3/3/4
  stack-port 3/3/1 3/3/4
spx unit 17
  module 1 icx7450-48f-sf-port-management-module
  module 2 icx7400-xgf-4port-40g-module
  module 3 icx7400-xgf-4port-40g-module
  module 4 icx7400-xgf-4port-40g-module
  spx-lag 17/2/1 17/2/3
  spx-port 17/3/1|--spx port connected to PE 18
spx unit 18
  module 1 icx7450-48p-poe-management-module
  module 2 icx7400-xgf-4port-40g-module
  module 3 icx7400-xgf-4port-40g-module
  module 4 icx7400-qsfp-1port-40g-module
  spx-port 18/2/3
  spx-port 18/3/1|--spx port connected to PE 17
```

Deployment Scenario 8: Changing a PE Ring to a Linear PE Chain

Follow these steps to remove a PE ring and convert it to two PE chains.

1. [Reference Topology](#) on page 41 includes a PE ring. The PE ring is in the active state, and the PE ID configuration is present in the running configuration.

```
ICX7750-48F Router# show spx
T=14d8h21m54.3: alone: standalone, D: dynamic cfg, S: static
ID  Type      Role      Mac Address  Pri  State  Comment
1   S  ICX7750-48XGF  active  cc4e.24d0.3500 128  local  Ready
2   S  ICX7750-48XGC  standby 609c.9f1f.df00 128  remote Ready
3   S  ICX7750-48XGF  member  cc4e.246e.d580 5    remote Ready
17  S  ICX7450-48GF  spx-pe  cc4e.246d.1178 N/A  remote Ready
18  S  ICX7450-48P   spx-pe  cc4e.246d.22b8 N/A  remote Ready
19  S  ICX7250-48P   spx-pe  cc4e.24b4.32e8 N/A  remote Ready
20  S  ICX7450-24P   spx-pe  cc4e.248b.11e0 N/A  remote Ready
21  S  ICX7250-24P   spx-pe  cc4e.24b4.7f20 N/A  remote Ready
22  S  ICX7250-48    spx-pe  cc4e.24b4.4350 N/A  remote Ready
```

```

      active          standby
      +----+        +----+        +----+
-3/1| 1 |3/4--3/1| 3 |3/4--3/1| 2 |3/4-
|   +----+        +----+        +----+ |
|-----|
      +----+        +----+        +----+        +----+
1/1/5==2/1| 17 |3/1--3/1| 18 |1/13--1/13| 19 |2/3--2/3| 20 |1/1-
      +----+        +----+        +----+        +----+ |
                                                    +----+        +----+ |
                                                    2/1/9--1/43| 22 |2/2--2/2| 21 |1/1-
                                                    +----+        +----+

```

```
ICX7750-48F Router# show spx ring all
```

```
-----
Ring Id |FSM State |CB port  Lag  |Remote CB port  Lag  |Log Block Link
-----
1       ACTIVE   1/1/5    3079 2/1/9          3075  PE20x--xPE21
-----
```

```
ICX7750-48F Router# show running-config | include pe-id
pe-id 1/1/5 17 18 19 20 21 22 2/1/9
```

2. Break the PE ring at the appropriate place. An SPX port with a live link cannot be disabled, so you must first disconnect the cable from the port. In this example, the PE ring is split between PE 20 and PE 21.

```
ICX7750-48F Router#
SYSLOG: <14> Nov 9 13:55:37 System: Interface ethernet 20/1/1, state down

SYSLOG: <14> Nov 9 13:55:38 System: Interface ethernet 21/1/1, state down

SYSLOG: <13> Nov 9 13:55:39 SPX Ring Instance 1 state change to BREAK (CB1/1/5 - CB2/1/9). Logical
block: Ring is broken - No Logical Block
```

After the cable is removed from the live link, ports 20/1/1 and 21/1/1 go down, and the PE ring state changes to BREAK.

Deployment Scenarios

Deployment Scenario 8: Changing a PE Ring to a Linear PE Chain

- Enter the **show spx ring all** command to confirm that the PE ring is in the break state. Enter the **show spx** command to display the two PE chains.

```
ICX7750-48F Router# show spx ring all
```

```
-----  
Ring Id |FSM State |CB port  Lag  |Remote CB port  Lag  |Log Block Link  
-----  
1       BREAK      1/1/5    3079  2/1/9          3075  Ring is broken - No Logical Block
```

```
ICX7750-48F Router# show spx
```

```
T=14d8h37m38.2: alone: standalone, D: dynamic cfg, S: static  
ID  Type      Role      Mac Address  Pri State  Comment  
1   S ICX7750-48XGF active     cc4e.24d0.3500 128 local  Ready  
2   S ICX7750-48XGC standby    609c.9f1f.df00 128 remote Ready  
3   S ICX7750-48XGF member     cc4e.246e.d580 5 remote Ready  
17  S ICX7450-48GF spx-pe     cc4e.246d.1178 N/A remote Ready  
18  S ICX7450-48P  spx-pe     cc4e.246d.22b8 N/A remote Ready  
19  S ICX7250-48P  spx-pe     cc4e.24b4.32e8 N/A remote Ready  
20  S ICX7450-24P  spx-pe     cc4e.248b.11e0 N/A remote Ready  
21  S ICX7250-24P  spx-pe     cc4e.24b4.7f20 N/A remote Ready  
22  S ICX7250-48   spx-pe     cc4e.24b4.4350 N/A remote Ready
```

```
      active          standby  
      +----+        +----+  
-3/1| 1 |3/4--3/1| 3 |3/4--3/1| 2 |3/4-  
|   +----+        +----+   |  
|                               |  
|-----|  
      +----+        +----+        +----+        +----+  
1/1/5==2/1| 17 |3/1--3/1| 18 |1/13--1/13| 19 |2/3--2/3| 20 |1/1-  
      +----+        +----+        +----+        +----+  
  
      +----+        +----+  
2/1/9--1/43| 22 |2/2--2/2| 21 |1/1-  
      +----+        +----+
```

- Remove SPX ports 20/1/1 and 21/1/1.

```
ICX7750-48F Router(config)# spx unit 20  
ICX7750-48F Router(config-spx-unit-20)# no spx-port 20/1/1  
spx-port 20/1/1 is removed  
ICX7750-48F Router(config-spx-unit-20)#  
SYSLOG: <14> Nov 9 14:08:06 PORT: 20/1/1 disabled by un-authenticated user from console session.
```

```
ICX7750-48F Router(config-spx-unit-20)# spx unit 21  
ICX7750-48F Router(config-spx-unit-21)# no spx-port 21/1/1  
spx-port 21/1/1 is removed  
ICX7750-48F Router(config-spx-unit-21)#  
SYSLOG: <14> Nov 9 14:08:16 PORT: 21/1/1 disabled by un-authenticated user from console session.
```

- Removing the SPX ports from the configuration automatically disables them.

```
ICX7750-48F Router(config-spx-unit-21)# show interfaces brief ethernet 20/1/1 ethernet 21/1/1
```

```
Port      Link      State  Dupl Speed Trunk Tag Pvid Pri MAC      Name  
20/1/1    Disable  None   None None  None No 1 0 cc4e.248b.11e0  
21/1/1    Disable  None   None None  None No 1 0 cc4e.24b4.7f20
```

6. Enter the **show spx** command to confirm that SPX ports 20/1/1 and 21/1/1 are no longer present.

```
ICX7750-48F Router# show spx
T=14d8h44m0.8: alone: standalone, D: dynamic cfg, S: static
ID   Type           Role      Mac Address      Pri State  Comment
1   S ICX7750-48XGF active    cc4e.24d0.3500 128 local  Ready
2   S ICX7750-48XGC standby  609c.9f1f.df00 128 remote Ready
3   S ICX7750-48XGF member   cc4e.246e.d580 5 remote Ready
17  S ICX7450-48GF spx-pe   cc4e.246d.1178 N/A remote Ready
18  S ICX7450-48P  spx-pe   cc4e.246d.22b8 N/A remote Ready
19  S ICX7250-48P  spx-pe   cc4e.24b4.32e8 N/A remote Ready
20  S ICX7450-24P  spx-pe   cc4e.248b.11e0 N/A remote Ready
21  S ICX7250-24P  spx-pe   cc4e.24b4.7f20 N/A remote Ready
22  S ICX7250-48   spx-pe   cc4e.24b4.4350 N/A remote Ready
```

```

      active                standby
      +----+                +----+
-3/1| 1 |3/4--3/1| 3 |3/4--3/1| 2 |3/4-
|  +----+                +----+
|  +----+                +----+
|-----|
      +----+                +----+
1/1/5==2/1| 17 |3/1--3/1| 18 |1/13--1/13| 19 |2/3--2/3| 20 |
      +----+                +----+

      +----+                +----+
2/1/9--1/43| 22 |2/2--2/2| 21 |
      +----+                +----+

```

7. At this stage, the PE ID configuration is still retained in the running configuration. Remove the PE ID configuration from the running configuration as shown in the following example. As an alternative, you can enter the PE ID 2/1/9 22 21 configuration.
8. A syslog message confirms that the PE ring has been removed. Enter the **show spx ring all** command to confirm that the PE ring has been removed. The PE ID configuration now shows two PE chains.

```
SYSLOG: <13> Nov 9 14:15:21 SPX Ring Instance 1 is unconfigured (CB1/1/5 - CB2/1/9)
ICX7750-48F Router# show spx ring all
```

```
-----
Ring Id |FSM State |CB port  Lag  |Remote CB port  Lag  |Log Block Link
-----
```

```
ICX7750-48F Router# show running-config | include pe-id
pe-id 1/1/5 17 18 19 20
pe-id 2/1/9 22 21
```


Image Upgrade

- An 802.1BR system requires that all CB and PE units run the same image versions.
- An image copy requires two steps in an SPX system:
 1. Copy the image to the CB stack units.
 2. Copy the image to the PE units.

Both steps can be completed through a CB management session.

- If the CB is in a mismatch state, Image Auto-Copy is triggered, and the active controller pushes its image to the CB members that have a mismatched image.
- When there is a PE image mismatch, you are prompted to enter the TFTP server address where the PE images are stored. If the TFTP server has the correct image, the image is downloaded to the mismatched unit.

```
ICX7750-48F Router(config)# tftp-server 10.30.5.182
image-location /
```

- Once the correct image is copied, a reboot for the mismatched units is issued. At the end of the final Auto-Copy process, the system should be operational, and all units should be available for use.
- If ICX 7450 units are running FastIron 08.0.30 or earlier versions, the units should be manually upgraded to a FastIron 08.0.50 or later image before PE units are enabled to bring them up as SPX clients.
- If ICX 7250 units are running FastIron 08.0.30 or earlier versions, the units should be manually upgraded to a FastIron 08.0.50 or later image before PE units are enabled to bring them up as SPX clients.
- If an SPX domain is running FastIron 08.0.50 and needs an upgrade to FastIron 08.0.50a, either a manifest upgrade or a regular image copy to CB and PE units can be performed.

Refer to the *Ruckus Campus Fabric Configuration Guide* and the *Ruckus FastIron Software Upgrade Guide* for more information.

The following code sample shows the auto-image upgrade process.

NOTE

Auto-image upgrade is available in FastIron 08.0.70 and later. The CB and standalone PE candidates must be running FastIron 08.0.70 or later for auto-image upgrade to work.

```
ICX7750-20Q Router# spx interactive-setup
You can abort spx interactive-setup at any stage by <ctrl-c>
0: quit
1: change PE IDs
2: discover and convert new units (no startup-config flash) to PEs
3: discover and convert existing/new standalone units to PEs
2&3 can also find new links and convert chain(s) to ring.
Please type your selection: 2
Probing topology to find new units...
Horizontal bars link to discovered units. Vertical bars link to CB or PEs.
#1: icx7450-48p-poe-management 609C.9F2A.D460 (image mismatch: SPR08070b1TEST)
#2: icx7450-48p-poe-management 609C.9F2A.97E0
#3: icx7250-24-port-management 609C.9F04.6F90 (image mismatch: SPR08070b1TEST)
#4: icx7250-24-port-management 609C.9F04.68AC (image mismatch: SPR08070b1TEST)
#5: icx7250-24-port-management 609C.9F04.5E68
#6: icx7450-48f-sf-port-management CC4E.246C.F190
1/1/5
||
||
3/1
+-----+      +-----+      +-----+      +-----+      +-----+
```


If a TFTP server is not configured, the following errors show up for SPX interactive-setup or ZTP.

```
Zero-touch discovers 1 chain (valid#= 1)
ZTP detects 3 units running different images, but "tftp-server" is not configured. Abort
SYSLOG: <14> Mar 24 19:59:14 ZTP: zero-touch-enable detects total 1 chains (6 units). unstable=

spx interactive-setup discovers 1 chain (valid#= 1, selected#= 1)
Detects 3 units running different images but "tftp-server" is not configured.
You can abort (y) or proceed (n) without downloading images: (enter 'y' or 'n'): y
Exit spx interactive-setup, reason: User aborts
```


Debugging and Verification Commands

- Verification Commands: SPX PE Ring..... 72
- Debugging PE Ring Failures..... 74

Once the SPX domain is formed, you can use **show** commands to verify that the SPX is operational.

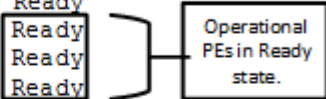
FIGURE 20 show spx Command

```

ICX7750-48F Router#show spx
T=17h10m46.7: alone: standalone, D: dynamic cfg, S: static
ID  Type      Role      Mac Address  Pri State
Comment
1  S ICX7750-48XGF active    cc4e.246e.3480 128 local  Ready
2  S ICX7750-20QXG standby  cc4e.2438.8780  0 remote Ready
3  S ICX7750-48XGC member   cc4e.2470.6000  0 remote Ready
17 S ICX7450-48P  spx-pe  cc4e.248a.8ba8 N/A remote Ready
18 S ICX7450-24P  spx-pe  cc4e.2489.a818 N/A remote Ready
19 S ICX7450-24G  spx-pe  cc4e.2489.c620 N/A remote Ready

      active                standby
      +----+      +----+      +----+
-2/1| 1 |2/4--2/1| 3 |2/4--2/4| 2 |2/1-
| +----+      +----+      +----+ |
|-----|
|
1/1/1==2/1| 17 |2/3--2/1| 18 |2/3-
      +----+      +----+
1/2/6==2/1| 19 |
      +----+

ICX7750-48F Router#
  
```



- The **show spx** command on the CB displays the CB stack and PE unit/PE chain with a cascade port.
- A PE in operational mode is seen in the "Ready" state.

FIGURE 21 show spx csp all Command



- The **show spx csp all** command can be used to indicate how far the CSP went forward.
- CSP Oper status "Yes" shows that CSP is operational and that the PE is attached and operational.
- CSP Oper status "No" indicates that the PE is not correctly attached to the CB.

FIGURE 22 show spx csp unit-id Command

```

ICX7750-48F Router#show spx csp 18

PE 18 MAC: cc4e.2489.a818
CSP Oper: yes, Attach time: 2h37m57.1, up time: 3 day(s) 19 hour(s) 58
minute(s) 54 second(s)
CB Spx Lag id: 3072, cur state up, IPC/ECP Port: 1/1/1
PE Spx Uplink Port: 18/2/1, cur state up
Number of Traffic Class: 8
Priority Flow Control: no
CSP control ECID handshake complete: yes
CSP control ECID: 76
Total number of configured ports 30
CSP number of allocated ECIDs (VPs created, exd Control VP): 30
port    ecid  spx-port-type  cascade-port  cascade-lag
-----
18/1/1  81    3             1/1/1         3072
18/1/2  82    3             1/1/1         3072
18/1/3  83    3             1/1/1         3072
18/1/4  84    3             1/1/1         3072
18/1/5  85    3             1/1/1         3072
18/1/6  86    3             1/1/1         3072
18/1/7  87    3             1/1/1         3072
18/1/8  88    3             1/1/1         3072
18/1/9  89    3             1/1/1         3072
18/1/10 90    3             1/1/1         3072
18/1/11 91    3             1/1/1         3072
18/1/12 92    3             1/1/1         3072
18/1/13 93    3             1/1/1         3072
18/1/14 94    3             1/1/1         3072
18/1/15 95    3             1/1/1         3072
18/1/16 96    3             1/1/1         3072
18/1/17 97    3             1/1/1         3072
18/1/18 98    3             1/1/1         3072
18/1/19 99    3             1/1/1         3072
18/1/20 100   3             1/1/1         3072
18/1/21 101   3             1/1/1         3072
18/1/22 102   3             1/1/1         3072
18/1/23 103   3             1/1/1         3072
18/1/24 104   3             1/1/1         3072
18/2/2  131   3             1/1/1         3072
18/2/3  156   3             1/1/1         3072
18/2/4  133   3             1/1/1         3072
18/3/1  140   3             1/1/1         3072
18/4/1  150   3             1/1/1         3072
CSP last Tx Trans ID=2, last Rx Trans ID=33
ECP txErrors=0, sequence=36 firstSeq=36 lastSeq=35 firstAckIdx=0 ackIdx=0
Next PE: None
Previous PE: 17
ICX7750-48F Router
    
```

Check the total number of PE ports

Check the ECID of the ports. For PE 17 it starts with 1, and every PE is assigned 80 ECIDs

The **show spx csp unit-id** command can be used to see whether VP port creation succeeded and whether the ECID is assigned to all PE ports.

Example show Commands on the PE

```
[PE]local-17@ICX7450-48P Router# show running-config
Current configuration:
!
ver 08.0.40bT213
!
spx pe-enable
spx unit 17
  module 1 icx7450-48p-poe-management-module
  module 2 icx7400-xgf-4port-40g-module
  module 3 icx7400-qsfp-lport-40g-module
  module 4 icx7400-qsfp-lport-40g-module
  spx-lag 17/2/1 to 17/2/2
  spx-port 17/2/3
!
end

[PE]local-17@ICX7450-48P Router# show spx csp all

CSP Oper: yes, Attach time: 1m5.1, up time: 16 hour(s) 31 minute(s) 27 second(s)
PE Spx Lag id: 1, cur state up, IPC/ECP Port: 17/2/1
Number of Traffic Class: 8
Priority Flow Control: no
CSP control ECID handshake complete: yes
CSP control ECID: 75
Total number of configured ports: 54
CSP number of create port requests sent: 54
CSP last Tx Trans ID=64, last Rx Trans ID=32
ECP txErrors=0, sequence=97 firstSeq=97 lastSeq=96 firstAckIdx=0 ackIdx=0
Next PE: None
Previous PE: None
[PE]local-17@ICX7450-48P Router#

[PE]local-18@ICX7450-24P Router# show running-config
Current configuration:
!
ver 08.0.40bT213
!
spx pe-enable
spx unit 18
  module 1 icx7450-24p-poe-port-management-module
  module 2 icx7400-xgf-4port-40g-module
  module 3 icx7400-qsfp-lport-40g-module
  module 4 icx7400-qsfp-lport-40g-module
  spx-port 18/2/1
  spx-port 18/2/3
!
end

[PE]local-18@ICX7450-24P Router# show spx csp all

CSP Oper: yes, Attach time: 40.4, up time: 16 hour(s) 24 minute(s) 19 second(s)
PE Spx Lag id: 1, cur state up, IPC/ECP Port: 18/2/1
Number of Traffic Class: 8
Priority Flow Control: no
CSP control ECID handshake complete: yes
CSP control ECID: 76
Total number of configured ports: 30
CSP number of create port requests sent: 30
CSP last Tx Trans ID=33, last Rx Trans ID=2
ECP txErrors=0, sequence=36 firstSeq=36 lastSeq=35 firstAckIdx=0 ackIdx=0
Next PE: None
Previous PE: None

[PE]local-19@ICX7450-24 Router# show running-config
Current configuration:
!
ver 08.0.40bT213
!
spx pe-enable
```

```

spx unit 19
  module 1 icx7450-24-port-management-module
  module 2 icx7400-qsfp-lport-40g-module
  module 3 icx7400-qsfp-lport-40g-module
  module 4 icx7400-qsfp-lport-40g-module
  spx-lag 19/2/1 19/3/1 19/4/1
!
end

[PE]local-19@ICX7450-24 Router# show spx csp all

CSP Oper: yes, Attach time: 30.1, up time: 16 hour(s) 49 minute(s) 9 second(s)
PE Spx Lag id: 1, cur state up, IPC/ECP Port: 19/4/1
Number of Traffic Class: 8
Priority Flow Control: no
CSP control ECID handshake complete: yes
CSP control ECID: 235
Total number of configured ports: 27
CSP number of create port requests sent: 27
CSP last Tx Trans ID=28, last Rx Trans ID=2
ECP txErrors=0, sequence=31 firstSeq=31 lastSeq=30 firstAckIdx=0 ackIdx=0
Next PE: None
Previous PE: None
[PE]local-19@ICX7450-24 Router#

```

Example show Commands on the CB Stack (To Check Stack Stability)

```

ICX7750-48F Router# show stack
T=17h11m34.9: alone: standalone, D: dynamic cfg, S: static
ID  Type      Role      Mac Address  Pri State  Comment
1  S ICX7750-48XGF active  cc4e.246e.3480 128 local  Ready
2  S ICX7750-20QXG standby cc4e.2438.8780  0 remote Ready
3  S ICX7750-48XGC member  cc4e.2470.6000  0 remote Ready

```

```

      active                standby
      +---+                +---+
-2/1| 1 |2/4--2/1| 3 |2/4--2/4| 2 |2/1-
|  +---+                +---+ |
|-----|
Standby u2 - protocols ready, can failover
Current stack management MAC is cc4e.246e.3480

```

There are 3 PEs. Please use "show spx" to display PE information.

```

ICX7750-48F Router# show stack con
Probing the topology. Please wait ...
ICX7750-48F Router#
      active                standby
      +---+                +---+
-2/1| 1 |2/4--2/1| 3 |2/4--2/4| 2 |2/1-
|  +---+                +---+ |
|-----|

```

```

trunk probe results: 3 links
Link 1: u1 -- u2, num=1
  1: 1/2/1 (P0) <---> 2/2/1 (P0)
Link 2: u1 -- u3, num=1
  1: 1/2/4 (P1) <---> 3/2/1 (P0)
Link 3: u2 -- u3, num=1
  1: 2/2/4 (P1) <---> 3/2/4 (P1)
CPU to CPU packets are fine between 3 units.
ICX7750-48F Router#
ICX7750-48F Router#
ICX7750-48F Router# show stack de
T=17h11m50.0: alone: standalone, D: dynamic cfg, S: static
ID  Type      Role      Mac Address  Pri State  Comment
1  S ICX7750-48XGF active  cc4e.246e.3480 128 local  Ready
2  S ICX7750-20QXG standby cc4e.2438.8780  0 remote Ready
3  S ICX7750-48XGC member  cc4e.2470.6000  0 remote Ready

```

Debugging and Verification Commands

Verification Commands: SPX PE Ring

```

      active                standby
      +----+                +----+
-2/1| 1 |2/4--2/1| 3 |2/4--2/4| 2 |2/1-
|   +----+                +----+   |
|-----|
Standby u2 - protocols ready, can failover
Current stack management MAC is cc4e.246e.3480

Image-Auto-Copy is Enabled.

```

Unit#	Stack-port1	Status	Stack-port2	Neighbors	Stack-port1	Stack-port2
1	up (1/2/1)		up (1/2/4)	U2 (2/2/1)	U3 (3/2/1)	
2	up (2/2/1)		up (2/2/4)	U1 (1/2/1)	U3 (3/2/4)	
3	up (3/2/1)		up (3/2/4)	U1 (1/2/4)	U2 (2/2/4)	

```

Unit# System uptime
1      17 hour(s) 11 minute(s) 50 second(s)
2      16 hour(s) 53 minute(s) 37 second(s)
3      16 hour(s) 53 minute(s) 41 second(s)
The system started at 15:59:15 Pacific Mon Dec 14 2015

```

ICX7750-48F Router#

For more information about SPX debugging, refer to the "SPX Troubleshooting" section of the *Ruckus FastIron Switch Port Extender Configuration Guide*.

Verification Commands: SPX PE Ring

Use the commands in this section to verify the PE ring status. A functional PE ring should be in an Active FSM state. For more information on FSM states, refer to [PE Ring FSM States](#) on page 77.

show spx ring all

The following command output confirms the presence of a single PE ring, Ring 1, and shows that it is in the Active state. The output indicates that the logical block for this ring is between PE 20 and PE 21.

```
ICX7750-48F Router# show spx ring all
```

```

-----
Ring Id |FSM State |CB port  Lag  |Remote CB port  Lag  |Log Block Link
-----
1       ACTIVE   1/1/5    3079 2/1/9          3075  PE20x--xPE21
-----

```

show spx ring chain

The following command output lists the chain of PEs connected to each CB port. It indicates the state of the PE ring. If the PE ring is in the Active state, the logical block location is indicated in the "Chain" section by the "x-x" symbol. If the PE ring is in the break state, the SPX PE chains do not have redundancy.

```
ICX7750-48F Router# show spx ring chain
```

```

-----
                        SPX CB [CASC PORT] CHAINS
-----
CB Port  Lag  | Epoch |Ring  Id    FSM State|Remote CB port  Lag  | Chain
-----
2/1/9    3075  142    YES   1     ACTIVE  1/1/5    3079  PE22--PE21x--xPE20--PE19--PE18--PE17
1/1/5    3079  142    YES   1     ACTIVE  2/1/9    3075  PE17--PE18--PE19--PE20x--xPE21--PE22
-----

```

```
ICX7750-48F Router# show spx ring chain
```


SPX CB [CASC PORT] CHAINS

CB Port	Lag	Epoch	Ring	Id	FSM State	Remote CB port	Lag	Chain
2/1/9	3075	123	YES	1	BREAK	1/1/5	3079	PE22--PE21
1/1/5	3079	123	YES	1	BREAK	2/1/9	3075	PE17--PE18--PE19--PE20

show spx ring ring-ID

The output lists all PE units in the ring (under "Chain"), identifies the upstream ("Uplink") and downstream ("Cascade") port for each PE unit in the ring, specifies the previous and next PE in the chain, identifies the logical block point, and displays the state of each PE.

ICX7750-48F Router# show spx ring 1

Ring Id	FSM State	CB port	Lag	Remote CB port	Lag	Log Block Link
1	ACTIVE	1/1/5	3079	1/1/13	3072	PE22x--xCB1/1/13

CB chains Information:

CB Port	Lag	Epoch	Ring	Id	FSM State	Remote CB port	Lag	Chain
1/1/5	3079	179	YES	1	ACTIVE	1/1/13	3072	PE17--PE18--PE19--PE20--PE21--PE22x--xCB1/1/13

PE chain information connecting to CB port 1/1/5 [Lag 3079]

PE Id	Epoch	FSM state	Uplink port	Casc port	Log Block	Prev PE	Next PE
PE17	179	ACTIVE	17/2/1	17/3/1	NO	--	PE18
PE18	179	ACTIVE	18/3/1	18/2/3	NO	PE17	PE19
PE19	179	ACTIVE	19/2/1	19/2/3	NO	PE18	PE20
PE20	179	ACTIVE	20/2/3	20/1/1	NO	PE19	PE21
PE21	179	ACTIVE	21/1/1	21/2/2	NO	PE20	PE22
PE22	179	ACTIVE	22/2/2	22/2/1	YES	PE21	x--x

PE chain information connecting to remote CB port 1/1/13 [Lag 3072]

PE Id	Epoch	FSM state	Uplink port	Casc port	Log Block	Prev PE	Next PE
-------	-------	-----------	-------------	-----------	-----------	---------	---------

show running-config | include pe-id

The following command output shows the PE ID configuration in the running configuration.

```
ICX7750-48F Router# show running-config | include pe-id
pe-id 1/1/5 17 18 19 20 21 22 2/1/9
ICX7750-48F Router#
```

NOTE

For more debugging information, refer to the troubleshooting chapter in the *Ruckus FastIron Campus Fabric Configuration Guide*.

Debugging PE Ring Failures

SPX (PE) Ring Is Not in the Active State

Enter the **show spx ring all** command to confirm that the PE ring is not in the Active state. In the following example, the PE ring is in the break state.

```
ICX7750-48F Router# show spx ring all

-----
Ring Id |FSM State |CB port  Lag  |Remote CB port  Lag  |Log Block Link
-----
1       BREAK   2/1/9    3075 1/1/5          3079  Ring is broken - No Logical Block
-----
```

1. Enter the **show interface brief Ethernetx/x/x** command to check that the link status is UP.
2. Enter the **show spx** command to verify that PEs are in the Ready state.
3. Enter the **show cpu-utilization** command to verify that CPU use is not high.
4. If the user is unable to debug further, use the **supportsave spx** command to collect data.

SPX Link Flaps

The logical block is placed on the SPX link that comes up last during PE ring formation. The logical block may move automatically when a link flap occurs in an active PE ring. For example, if the logical block is between PE 20 and PE 21 and the link between PE 18 and PE 19 flaps, the logical block moves between PE 18 and PE 19.

In the following example, the logical block moves from the PE 20-PE 21 link to the PE 17-PE 18 link.

1. The following output shows that the PE ring is active and that the logical block is present between PE 20 and PE 21.

```
ICX7750-48F Router# show spx
T=14d9h58m19.3: alone: standalone, D: dynamic cfg, S: static
ID  Type           Role      Mac Address  Pri State  Comment
1   S ICX7750-48XGF active    cc4e.24d0.3500 128 local Ready
2   S ICX7750-48XGC standby   609c.9f1f.df00 128 remote Ready
3   S ICX7750-48XGF member    cc4e.246e.d580 5 remote Ready
17  S ICX7450-48GF  spx-pe    cc4e.246d.1178 N/A remote Ready
18  S ICX7450-48P  spx-pe    cc4e.246d.22b8 N/A remote Ready
19  S ICX7250-48P  spx-pe    cc4e.24b4.32e8 N/A remote Ready
20  S ICX7450-24P  spx-pe    cc4e.248b.11e0 N/A remote Ready
21  S ICX7250-24P  spx-pe    cc4e.24b4.7f20 N/A remote Ready
22  S ICX7250-48   spx-pe    cc4e.24b4.4350 N/A remote Ready

      active                standby
      +----+                +----+
-3/1| 1 |3/4--3/1| 3 |3/4--3/1| 2 |3/4-
| +----+                +----+ |
|-----|
|
      +----+                +----+                +----+                +----+
1/1/5==2/1| 17 |3/1--3/1| 18 |1/13--1/13| 19 |2/3--2/3| 20 |1/1-
      +----+                +----+                +----+                +----+
                                                    +----+                +----+
                                                    2/1/9--1/43| 22 |2/2--2/2| 21 |1/1-
                                                    +----+                +----+
```

```
ICX7750-48F Router# show spx ring all

-----
Ring Id |FSM State |CB port  Lag  |Remote CB port  Lag  |Log Block Link
-----
1       ACTIVE   1/1/5    3079 2/1/9          3075  PE20x--xPE21 <-- Logical block between PE20
and PE21
-----
```

2. Port 17/3/1 flaps.

```
SYSLOG: <14> Nov 9 15:53:00 System: Interface ethernet 17/3/1, state down
SYSLOG: <13> Nov 9 15:53:01 SPX Ring Instance 1 state change to BREAK (CB2/1/9 - CB1/1/5). Logical
block: Ring is broken - No Logical Block
SYSLOG: <14> Nov 9 15:53:01 System: Interface ethernet 18/3/1, state down
SYSLOG: <14> Nov 9 15:53:03 System: Interface ethernet 17/3/1, state up
SYSLOG: <14> Nov 9 15:53:04 System: Interface ethernet 18/3/1, state up
SYSLOG: <13> Nov 9 15:53:15 SPX Ring Instance 1 state change to IN-PROGRESS (CB1/1/5 - CB2/1/9).
Logical block: PE17x--xPE18

SYSLOG: <13> Nov 9 15:53:16 SPX Ring Instance 1 state change to ACTIVE (CB1/1/5 - CB2/1/9). Logical
block: PE17x--xPE18
```

3. The logical block has moved between PE 17 and PE 18.
4. If the logical block moves, a minor traffic drop is expected. The PE ring should still be in the Active state. Use the PE ring **show** commands to verify the PE ring state.

PE Ring FSM States

There are four Finite State Machine (FSM) states for a PE ring:

- INIT: The PE chains are in the Init state when there is no PE ring in the setup.

```
ICX7750-48F Router# show spx ring all
```

```
-----  
Ring Id |FSM State |CB port  Lag  |Remote CB port  Lag  |Log Block Link  
-----
```

```
ICX7750-48F Router# show spx ring chain
```

```
-----  
SPX CB [CASC PORT] CHAINS  
-----  
CB Port   Lag  | Epoch |Ring  Id   | FSM State|Remote CB port  Lag  | Chain  
-----  
2/1/9     3075 126    NO    0    | INIT     |INVALID         0    | PE22--PE21  
1/1/5     3079 126    NO    0    | INIT     |INVALID         0    | PE17--PE18--PE19--PE20
```

- IN_PROGRESS: The PE ring is in the In Progress state when it transitions from Break to Active or vice versa.
- ACTIVE: Once the PE ring is formed, the FSM state changes to Active.

```
ICX7750-48F Router# show spx ring all
```

```
-----  
Ring Id |FSM State |CB port  Lag  |Remote CB port  Lag  |Log Block Link  
-----
```

```
1       ACTIVE   1/1/5    3079  2/1/9          3075  PE20x--xPE21
```

- BREAK: The PE ring is in the Break state when the CB-PE or PE-PE SPX link is broken or when a PE unit or a CB unit fails. For an SPX LAG, the PE ring state moves to Break only when all links in the LAG go down.

In an existing SPX setup, a PE ring can be formed in two ways:

```
ICX7750-48F Router# show interface brief ethernet 20/1/1 ethernet 21/1/1
```

```
Port      Link   State Dupl Speed Trunk Tag Pvid Pri MAC           Name  
20/1/1    Down  None  None None  None No  1   0   cc4e.248b.11e0  
21/1/1    Down  None  None None  None No  1   0   cc4e.24b4.7f20
```

```
ICX7750-48F Router# show spx ring all
```

```
-----  
Ring Id |FSM State |CB port  Lag  |Remote CB port  Lag  |Log Block Link  
-----  
1       BREAK   1/1/5    3079  2/1/9          3075  Ring is broken - No Logical Block
```

- Connect the edge PE to the CB.
- Connect the edge PE in a chain to the edge PE of another chain.

Restrictions on Forming a PE Ring

- You cannot form a ring by connecting a PE to another PE in the same chain.
- A maximum of six PEs is allowed in a PE ring.
- A new PE ring within an existing PE ring is not allowed.

Running Configuration

```
ICX7750-48F Router# show running-config
Current configuration:
!
ver 08.0.50B14T203
!
stack unit 1
  module 1 icx7750-48-xgf-port-management-module
  module 2 icx7750-qsfp-6port-qsfp-240g-module
  module 3 icx7750-6q-6port-qsfp-240g-module
  priority 128
  default-ports 1/3/1 1/3/4
  stack-port 1/3/1 1/3/4
stack unit 2
  module 1 icx7750-48-xgc-port-management-module
  module 2 icx7750-qsfp-6port-qsfp-240g-module
  module 3 icx7750-6q-6port-qsfp-240g-module
  priority 128
  default-ports 2/3/1 2/3/4
  stack-port 2/3/1 2/3/4
stack unit 3
  module 1 icx7750-48-xgf-port-management-module
  module 2 icx7750-qsfp-6port-qsfp-240g-module
  module 3 icx7750-6q-6port-qsfp-240g-module
  priority 5
  default-ports 3/3/1 3/3/4
  stack-port 3/3/1 3/3/4
spx unit 17
  module 1 icx7450-48f-sf-port-management-module
  module 2 icx7400-xgf-4port-40g-module
  module 3 icx7400-xgf-4port-40g-module
  module 4 icx7400-xgf-4port-40g-module
  spx-lag 17/2/1 17/2/3
  spx-port 17/3/1
spx unit 18
  module 1 icx7450-48p-poe-management-module
  module 2 icx7400-xgf-4port-40g-module
  module 3 icx7400-xgf-4port-40g-module
  module 4 icx7400-qsfp-1port-40g-module
  spx-port 18/2/3
  spx-port 18/3/1
spx unit 19
  module 1 icx7250-48p-poe-port-management-module
  module 2 icx7250-sfp-plus-8port-80g-module
  spx-port 19/2/1
  spx-port 19/2/3
spx unit 20
  module 1 icx7450-24p-poe-port-management-module
  module 2 icx7400-xgf-4port-40g-module
  module 3 icx7400-qsfp-1port-40g-module
  spx-port 20/1/1
  spx-port 20/2/3
spx unit 21
  module 1 icx7250-24p-poe-port-management-module
  module 2 icx7250-sfp-plus-8port-80g-module
  spx-port 21/1/1
  spx-port 21/2/2
spx unit 22
  module 1 icx7250-48-port-management-module
  module 2 icx7250-sfp-plus-8port-80g-module
  spx-port 22/1/43
  spx-port 22/2/2
stack enable
stack rconsole-off
stack mac cc4e.24d0.3500
!
```

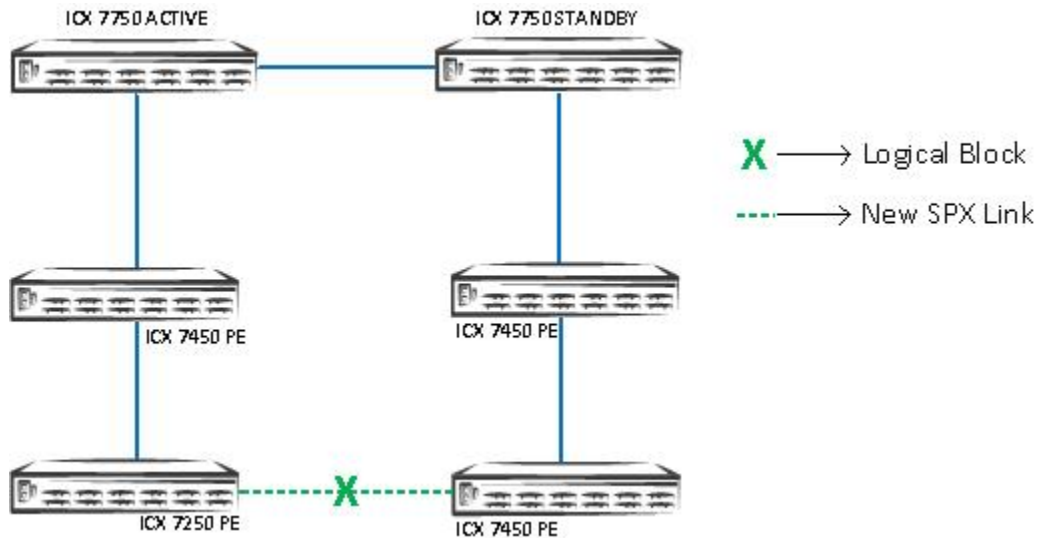
Running Configuration

```
!  
!  
spx cb-enable  
spx cb-configure  
  spx-port 2/1/9  
  spx-lag 1/1/5 3/1/5  
  pe-id 1/1/5 17 18 19 20 21 22 2/1/9  
!  
!  
!  
global-stp  
!  
!  
vlan 1 name DEFAULT-VLAN by port  
  spanning-tree  
!  
!  
!  
!  
!  
tftp-server 10.30.5.182 image-location /  
!  
!  
!  
!  
!  
!  
!  
hitless-failover enable  
!  
!  
!  
!  
!  
!  
!  
lldp run  
!  
!  
!  
end
```

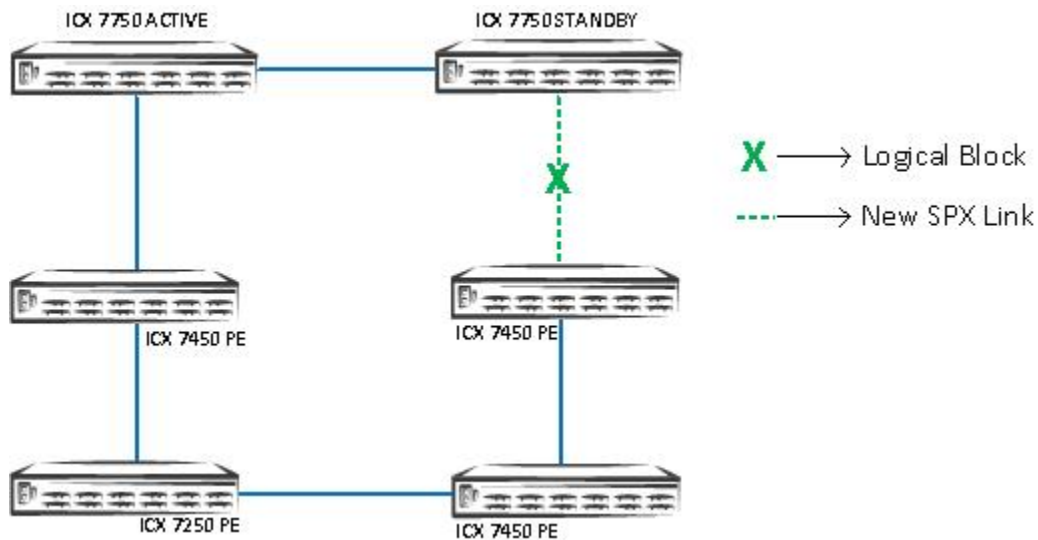

Best Practices

One recommended method for creating a PE ring is to connect two edge PEs in an existing SPX domain, as shown in the following figure. The procedure for forming an PE ring is explained in [Deployment Scenario 1: Deploying a PE Ring in an Existing Campus Fabric Domain](#) on page 42.

FIGURE 23 Connecting Two Edge PEs in an Existing SPX Domain



The second recommended method for creating a PE ring is to connect the edge PE of the existing PE chain to the CB, as shown in the following figure. The procedure for forming a PE ring is explained in [Deployment Scenario 1: Deploying a PE Ring in an Existing Campus Fabric Domain](#) on page 42.

FIGURE 24 Connecting the Edge PE of the Existing PE Chain to the CB


- Beginning with FastIron 08.0.70, SPX interactive-setup option 2&3 can detect new links between a CB unit and an edge PE or between two edge PE units. When these links are detected, the associated PE chain or, if present, both associated PE chains are converted into a ring. Refer to [Deployment Scenario 8: Adding a New Link Between CB-PE or PE-PE to Change Existing Linear Topology to Ring Topology](#) on page 128.
- To manage several PEs, you can configure a PE group (for example, for each PE chain) using the **pe-groupname** parameter with the **spx-port** or **spx-lag** command. The following example gives the name "ENG" to the SPX LAG formed by CB ports 1/1/1 and 1/1/2. The **show spx** command output for the group indicates that the LAG connects to a chain of two PEs (PE 17 and PE 18).

```
ICX7750-48F Router(config-spx-cb)# spx-lag 1/1/1 to 1/1/2 pe-groupENG
```

```
ICX7750-48F Router(config-spx-cb)# show spx pe-groupENG
Show PEs attached to pe-group ENG (port 1/1/1)
T=1d11h57m20.9: alone: standalone, D: dynamic cfg, S: static
ID  Type      Role      Mac Address  Pri State  Comment
1   S ICX7750-48XGF active    cc4e.246e.3480 128 local  Ready
2   S ICX7750-20QXG standby  cc4e.2438.8780 128 remote Ready
3   S ICX7750-48XGC member   cc4e.2470.6000 0 remote Ready
17  S ICX7450-48P  spx-pe   cc4e.248a.8ba8 N/A remote Ready
18  S ICX7450-24P  spx-pe   cc4e.2489.a818 N/A remote Ready
```

```

      active                standby
    +----+                +----+
-2/1| 1 |2/4--2/1| 3 |2/4--2/4| 2 |2/1-
|  +----+                +----+
|-----|

```

```

      +----+                +----+
1/1/1==2/1| 17 |2/3--2/1| 18 |2/3-
|  +----+                +----+

```

```
ICX7750-48F Router(config-spx-cb)#
```

- You can configure a PE name for individual PE units to manage a larger network.

```
ICX7750-48F Router(config)# spx unit 17
ICX7750-48F Router(config-spx-unit-17)# pe-name workstations
```

```
ICX7750-48F Router(config)# show run | beg spx unit
spx unit 17
  pe-name workstations
  module 1 icx7450-48p-poe-management-module
  module 2 icx7400-xgf-4port-40g-module
  module 3 icx7400-qsfp-1port-40g-module
  module 4 icx7400-qsfp-1port-40g-module
  spx-lag 17/2/1 to 17/2/2
  spx-port 17/2/3
```

- If a PE in jumbo mode does not match the CB mode (for example, if a PE is jumbo-disabled and the CB is jumbo-enabled), the PE will reload soon after joining the CB. To avoid the second reload, configure jumbo in provisional PE mode, if jumbo is enabled on the CB.

```
[Provisional-PE]ICX7450-48 Router(config)# jumbo
[Provisional-PE]ICX7450-48 Router(config)# show running-config
Current configuration:
!
ver 08.0.40bT213
!
spx pe-enable
spx suggested-id 56
spx unit 1
  module 1 icx7450-48-port-management-module
  module 3 icx7400-qsfp-1port-40g-module
  module 4 icx7400-qsfp-1port-40g-module
  spx-port 1/3/1
  spx-port 1/4/1
!
jumbo
!
end
```

- You can configure a suggested ID while adding a PE. This ID can be configured when the PE is SPX-enabled and in provisional PE mode. If a suggested ID is not configured, the CB assigns the first available ID to the PE.

```
[Provisional-PE]ICX7450-48 Router(config)# spx suggested-id 56
```

- You can bring the operational PE unit back to the ICX 7450 standalone unit by using the **spx unconfigure me** command.

```
[PE]local-18@ICX7450-24P Router# spx unconfigure me
This unit will remove the PE startup file and reload as a standalone. Are you sure? (enter 'y' or 'n'): y
remove PE startup file
[PE]local-18@ICX7450-24P Router#
```

- If an operational PE becomes detached from the CB, the non-SPX PE ports become disabled, but PoE on those ports remains up, making the access AP/phones up. The CB keeps the configuration of the PE ports. The SPX ports still stay admin up.
- Disable LLDP on user ports where it is not required for the FastIron system to scale and avoid high CPU issues.
- Do not configure one PE as a ring. If a single PE ring is detected in the topology, one of the SPX ports that forms the ring is moved to the ERR-DIS state.
- Client-facing LAGs are not supported over PE virtual ports.

Zero-Touch Provisioning

- ZTP Overview..... 85
- Zero-Touch Deployment Requirements.....85
- PE Candidate Requirements..... 86
- Topology Requirements.....87
- Supported Topologies for Zero-Touch..... 88
- Unsupported Topologies for Zero-Touch..... 89
- Zero-Touch Features..... 90
- SPX Interactive-Setup..... 93
- Managing PEs.....94
- Zero-Touch Deployment Considerations..... 95
- Deployment Scenarios.....96
- Deployment Recommendations for ZTP 130
- Best Practices.....131
- Debugging Notes.....132

ZTP Overview

Zero-touch provisioning (ZTP) is supported in FastIron 08.0.50 and later and allows you to deploy new devices in the network automatically, without manual intervention. Deploying a Campus Fabric (802.1BR SPX) network manually is a complicated process that requires considerable effort when a CB system with many PEs is deployed. Customers must prepare each PE. ZTP greatly simplifies the deployment process.

You can run either the zero-touch utility or the SPX interactive-setup utility to provision PEs. SPX interactive-setup is designed for users dealing with sophisticated deployment scenarios that cannot be handled directly by the zero-touch utility. SPX interactive-setup allows users to handle some invalid topologies, assign specific unit IDs, and select PE units. SPX interactive-setup also allows you to change PE IDs interactively without detaching cables or shutting down units.

Zero-Touch Deployment Requirements

When the zero-touch utility is enabled on the CB, it detects new units running in switch or router mode, assigns them IDs, and defines SPX LAGs and SPX ports before reloading them in PE mode.

FIGURE 25 ZTP on a CB Standalone Unit in a New or Existing Campus Fabric (SPX) Domain

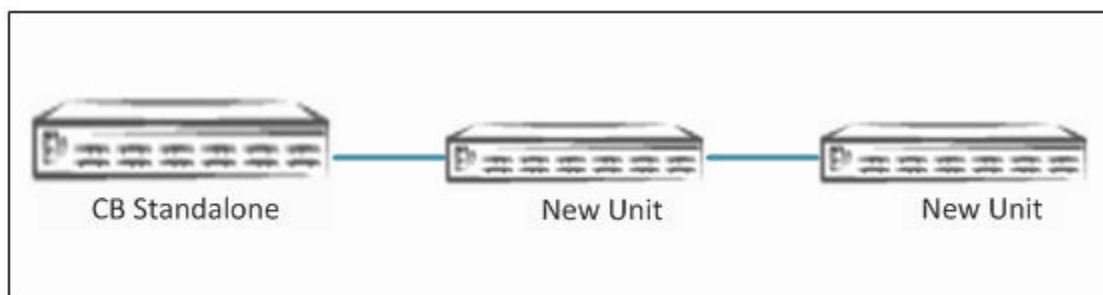


FIGURE 26 ZTP on a CB Stack in a New or Existing Campus Fabric (SPX) Domain

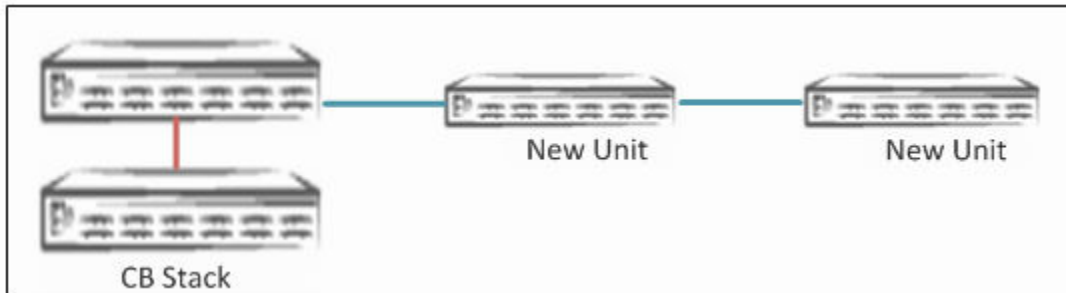
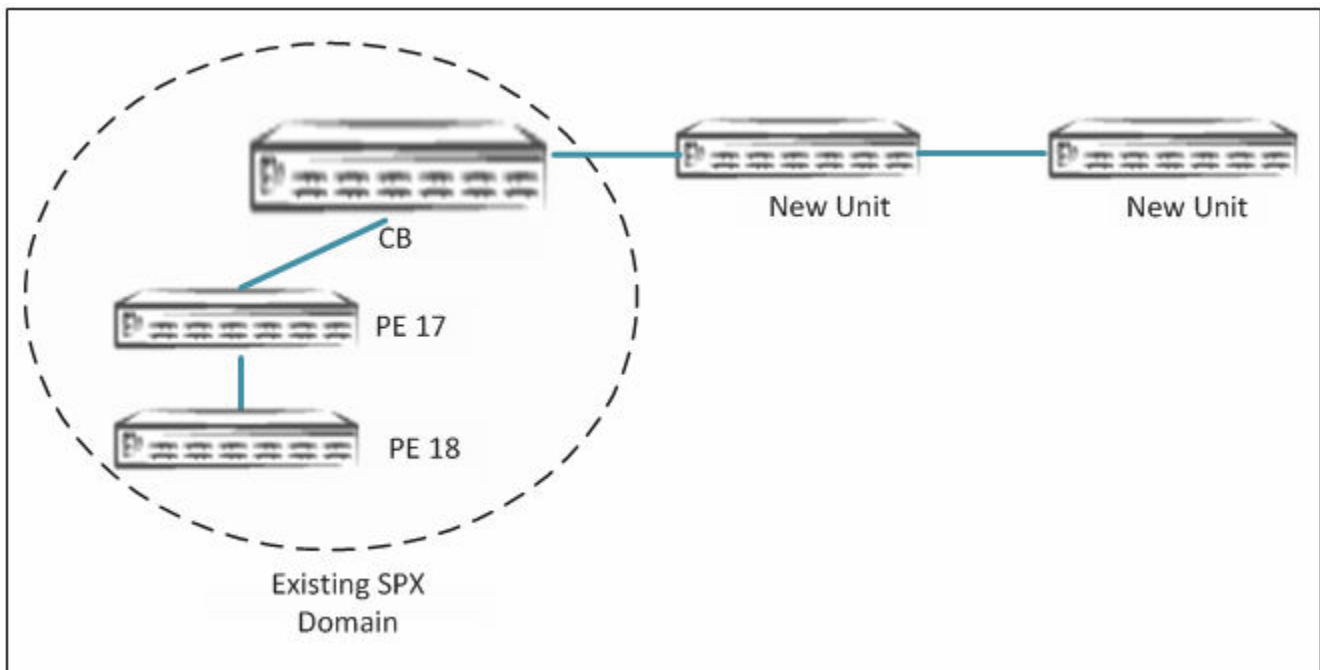


FIGURE 27 ZTP on an Existing SPX Domain



PE Candidate Requirements

- The new unit must be a clean standalone unit without any startup configuration.
- New units can run a router or switch image but must have the same major image version.

NOTE

If the CB and PE candidates are running FastIron 08.0.70 and later images, refer to [Image Upgrade](#) on page 63.

NOTE

A new unit has no startup-config flash during bootup and has no startup config. (The user has never performed **write memory** on the unit.) To create a new unit, the user must erase the startup-config and reload.

Topology Requirements

- New units can be added to a CB (an ICX 7750 standalone or stack) or to an existing Campus Fabric domain.
- PE units can be added in a linear or ring topology up to a cascade depth of six units. Refer to [Supported Topologies for Zero-Touch](#) on page 88 and [Unsupported Topologies for Zero-Touch](#) on page 89.

NOTE

Refer to [Port Extenders](#) on page 9 for the ICX 7450, ICX 7250, and ICX 7150 models that are eligible PE candidates.

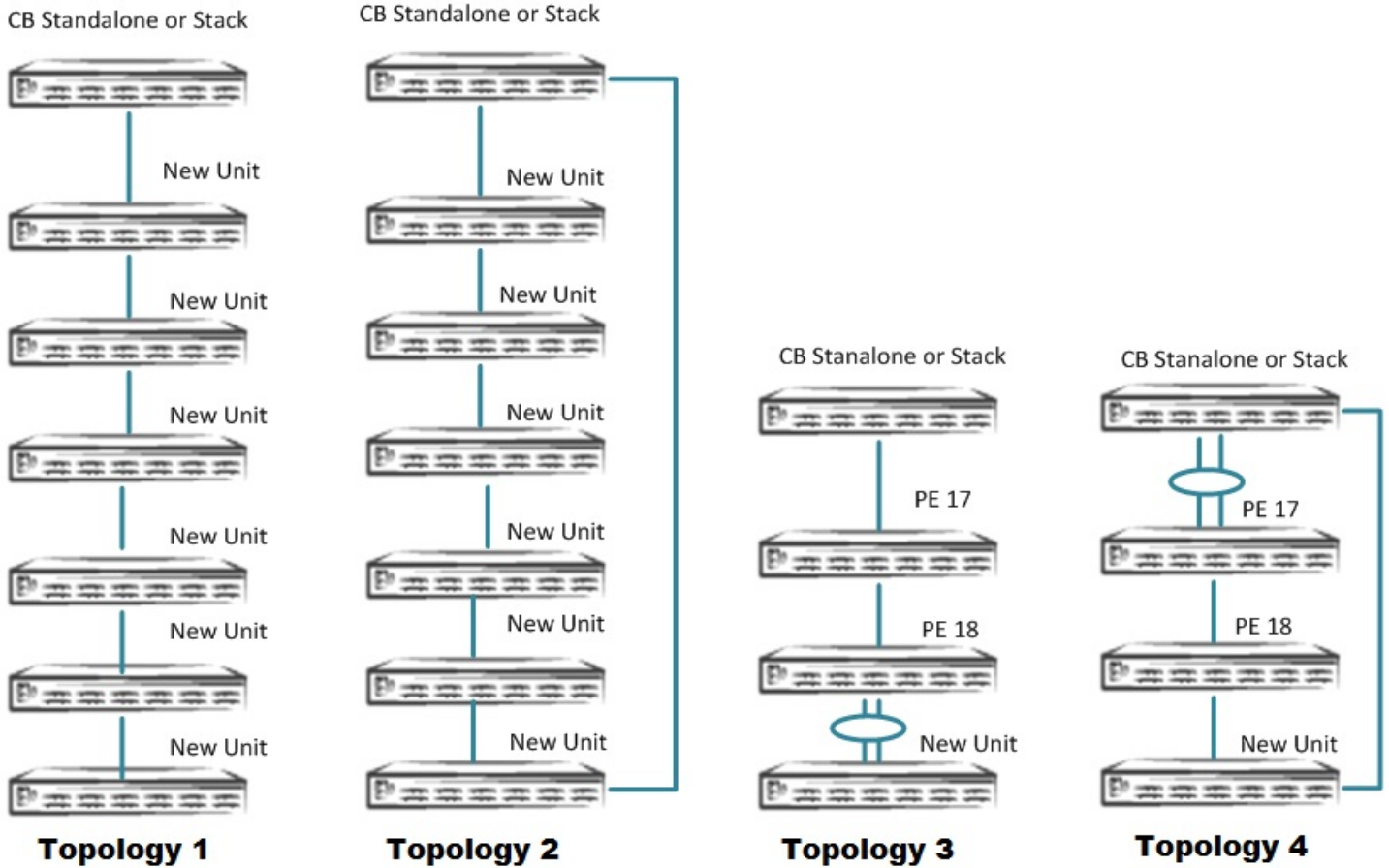
1. For the entire group of new units or for a single new unit to be detected, follow these connection requirements:
 - a. CB-PE port connections can be made between base and nonbase module ports of the CB, but only to the nonbase module ports of PE units.
 - b. PE-PE port connections must be between nonbase module ports.
2. Do not connect hosts or access points to PE candidates until zero-touch or SPX interactive-setup is complete. While adding hosts, make sure that the clients are added without LAGs. Client-facing LAGs are not supported on PE ports.

NOTE

Zero-touch is not enabled by default. Turn on the zero-touch with the **zero-touch-enable** command under **spx cb-configure** on the CB.

Supported Topologies for Zero-Touch

FIGURE 28 Supported Zero-Touch Topologies



Topology 1: New units up to a cascade depth of six can be added in a linear PE topology.

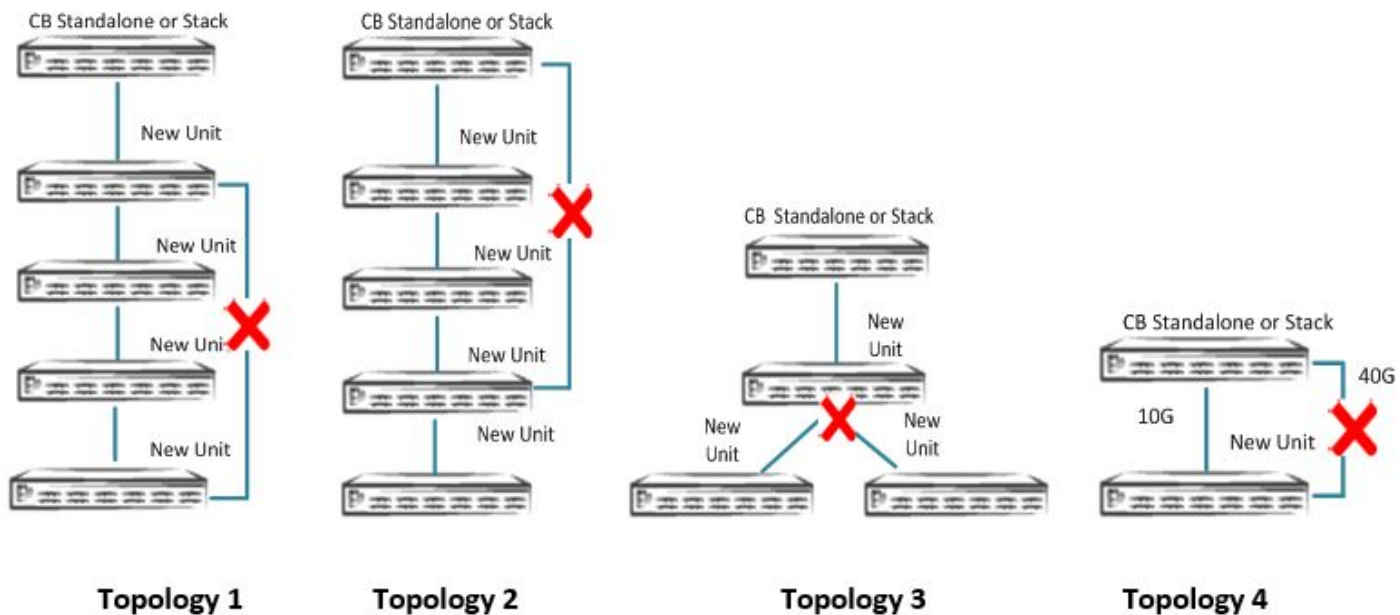
Topology 2: New units up to a cascade depth of six can be added in a ring PE topology.

Topology 3: New units can be added to the existing SPX domain in a linear PE topology.

Topology 4: New units can be added to the existing SPX domain in a ring PE topology.

Unsupported Topologies for Zero-Touch

FIGURE 29 Unsupported Zero-Touch Topologies



X ===== Not supported

Unsupported Topology 1: A set of new units cannot be discovered if there is a loop between PE units.

Unsupported Topology 2: A set of new units cannot be discovered if there is an improper loop between PEs and the CB.

Unsupported Topology 3: More than one unit cannot be added directly to an edge PE.

Unsupported Topology 4: A single new unit in a ring topology is not supported.

NOTE

Unsupported Topology 1 is a special case for SPX interactive-setup that is handled as a part of the deployment scenario.

Zero-Touch Features

Zero-Touch Probe Ports

When zero-touch is enabled on the CB, probe packets are sent from eligible ports to check the topology for potential PE candidates.

Any of the following ports may be SPX or ZTP probe ports for discovering new units:

- Configured zero-touch ports or a range of zero-touch ports.

```
SPX# configure terminal
SPX(config)# spx cb-configure
SPX(config-spx-cb)# zero-touch-ports 1/1/1 to 1/1/4 1/2/5
SPX(config-spx-cb)# end
```

==> zero touch range of ports

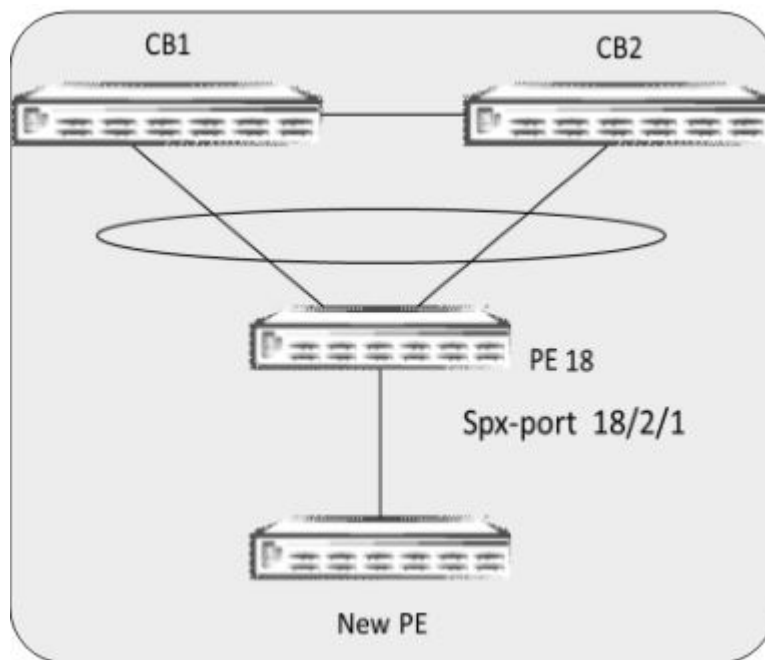
- CB SPX ports or SPX LAGs that are not live and that are not attached to existing PE units.

```
SPX# configure terminal
SPX(config)# spx cb-configure
SPX(config-spx-cb)# spx-lag 1/1/2 to 1/1/3
SPX(config-spx-cb)# spx-port 1/1/4
SPX(config-spx-cb)# end
```

==> spx-lag and spx-ports on a CB

- A downstream SPX port or SPX LAG on an edge PE unit.

FIGURE 30 Downstream SPX Port on an Edge PE Unit



```

SPX# configure terminal
SPX(config)# spx unit 18
SPX(config-spx-unit-18)# spx-port 18/2/1
SPX(config-spx-cb)# end
    
```

==> spx-port on the edge PE

- All nonbase module ports of an edge PE (all ports from modules 2, 3, and 4 of an edge PE).

SPX or ZTP probes for new units cannot be sent over the following ports, and attached units will not be discovered:

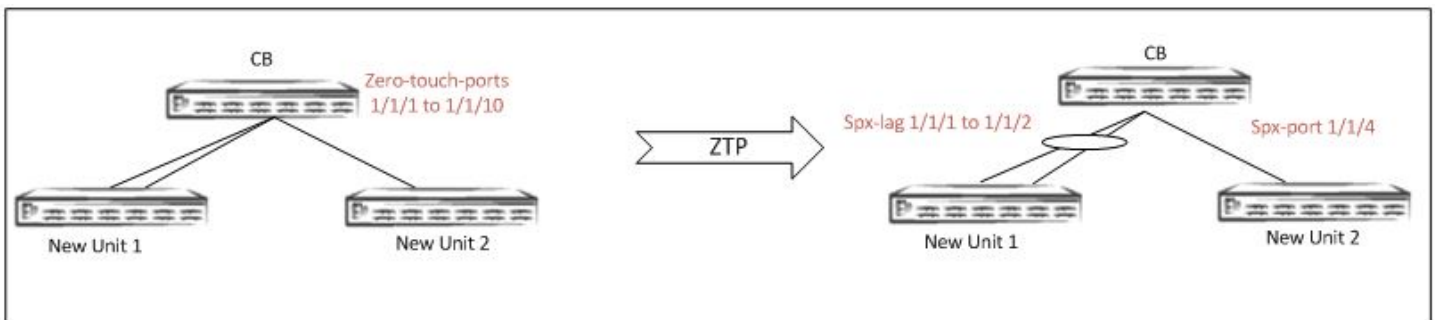
- Live SPX ports or SPX LAGs (whether the live ports are on a CB or PE unit)
- Any port that contains configuration

Zero-Touch Port Ranges

Zero-touch is capable of automatically generating SPX LAGs and SPX ports when a new PE unit is added through configured zero-touch port ranges.

Configured zero-touch-ports range: 1/1/1 to 1/1/10
 Detected ports by zero-touch between CB-PE 1: 1/1/1 to 1/1/2, CB-PE 2: 1/1/4
 ZTP-generated SPX LAGs and SPX ports: spx-lag 1/1/1 to 1/1/2, spx-port 1/1/4

FIGURE 31 Zero-Touch Port Ranges



NOTE

If ports are planned for dedicated use in a Campus Fabric domain, configure the ports as SPX LAGs or SPX ports rather than zero-touch ports. The zero-touch utility splits the ports into separate SPX LAGs as needed during the discovery process. This method avoids looping of packets, which causes high CPU utilization. Refer to [Zero-Touch Deployment Considerations](#) on page 95 for more information.

Auto-LAG Capability with Zero-Touch

For a PE candidate to join the Campus Fabric domain, both ends of the PE candidate's links must be SPX ports or SPX LAGs. A PE candidate's SPX port or SPX LAG is created when it receives related information from the CB before it is reloaded as a PE. The CB must create the corresponding new SPX port or SPX LAG on the CB or on an edge PE so that the new SPX port or SPX LAG on the CB or existing PE matches the joining PE candidate.

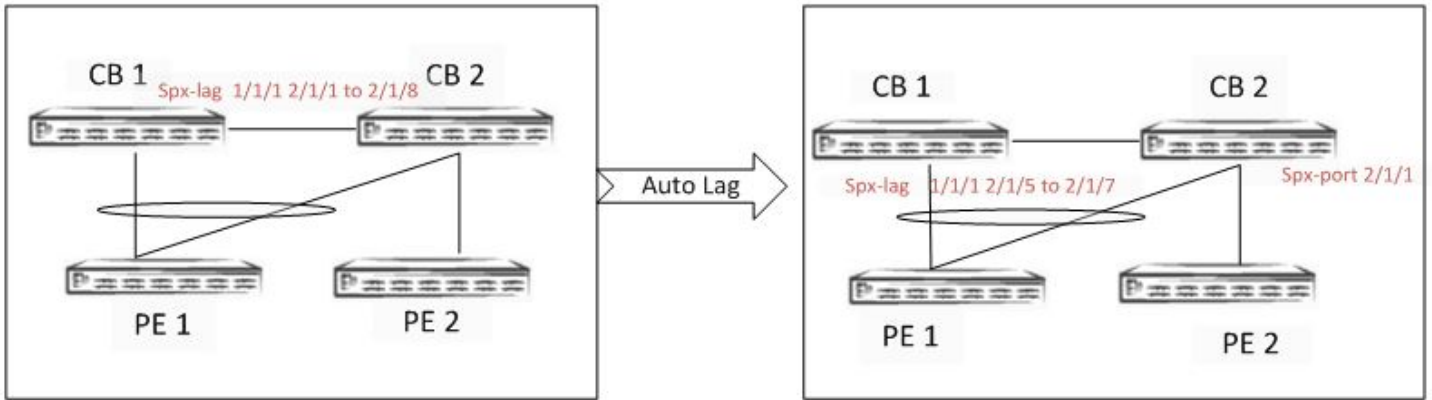
The new SPX port or SPX LAG is formed from detected links connected to a PE candidate. The detected links could be an existing SPX port or SPX LAG, zero-touch ports on a CB, or an SPX port or SPX LAG on a nonbase module on an edge PE.

If no corresponding SPX LAG or SPX port exists, a new SPX port or SPX LAG is created. If the new SPX port or SPX LAG has any ports that overlap with an existing SPX port or SPX LAG, the existing SPX port or SPX LAG is removed, and a new SPX port or SPX LAG is created. The ports in the removed SPX port or SPX LAG become data ports.

NOTE

If a previously configured SPX LAG differs from the ZTP-detected LAG and overlaps with it, the Auto-LAG utility deletes the previous LAG and creates a new LAG.

FIGURE 32 Auto-LAG with Zero-Touch



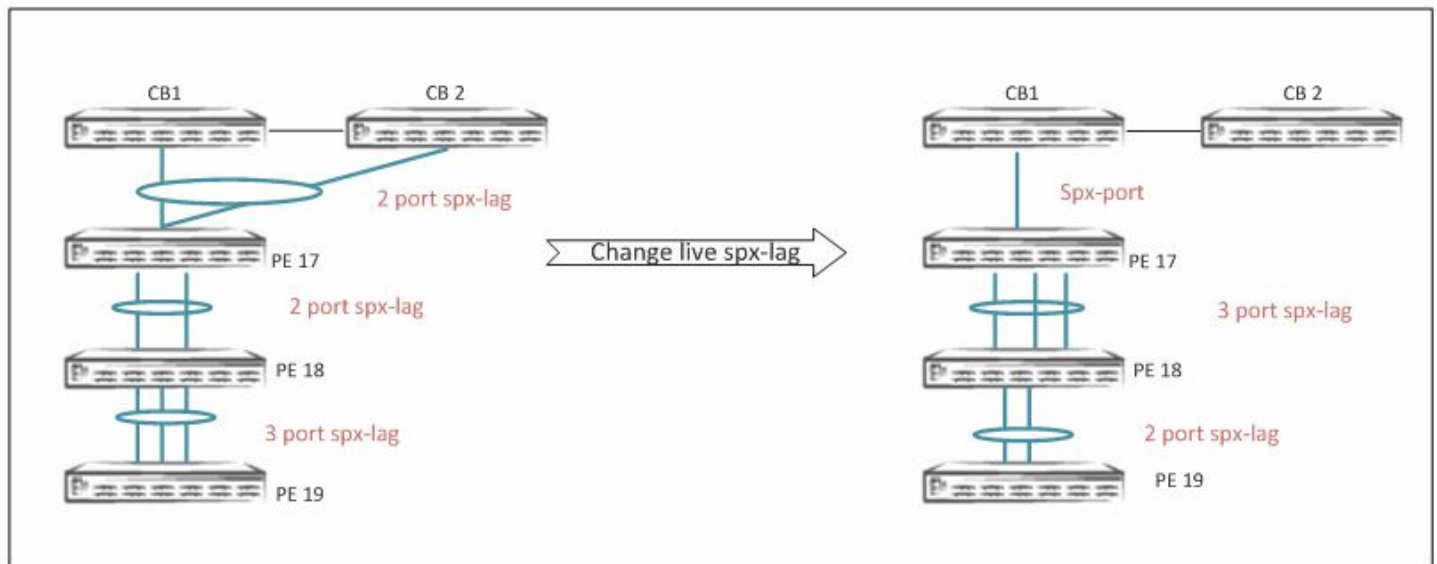
In this figure, 2/1/5 to 2/1/8 is represented as one link.

Modifying a Live Link with Zero-Touch

Zero-touch does not support the following functions:

- Changing live SPX ports or SPX LAGs: Once a new PE unit has been added and has joined the Campus Fabric domain, zero-touch does not manipulate existing SPX ports or SPX LAGs. SPX LAGs can be converted to SPX ports and vice versa only through manual configuration.
- Discovering new links on an existing live SPX LAG: When more links are added to an SPX LAG that already exists between the CB and a PE or between two PE units, zero-touch does not discover the additional links on the live SPX LAG.

FIGURE 33 ZTP Does Not Support Changing a Live SPX LAG or SPX Port



NOTE

Refer to [Deployment Scenario 6: Adding More Links to a Live SPX Link Using the multi-spx-lag Command](#) on page 54 and [Deployment Scenario 7: Removing Links from a Live SPX LAG and Converting the LAG to an SPX Port](#) on page 56 for information on using the **multi-spx-port** and **multi-spx-lag** commands for making changes to a live SPX link.

SPX Interactive-Setup

SPX interactive-setup allows users to perform tasks such as determining which units to include in the Campus Fabric domain and which IDs they will be assigned. SPX interactive-setup is a superset of zero-touch features.

Topologies

Certain topologies can be discovered and automatically configured in a Campus Fabric domain by the zero-touch utility. All topologies supported by zero-touch can also be handled by the SPX interactive-setup utility. In addition, the SPX interactive-setup utility handles a broad range of topologies that can be modified by user selections to become valid.

- All topologies supported by zero-touch are valid topologies for SPX interactive-setup.
- SPX interactive-setup can handle some special topologies that cannot be handled by the zero-touch utility. Refer to [Deployment Scenario 3: Migrating an Existing Stack to Campus Fabric](#) on page 108.

Options in SPX Interactive-Setup

```
SPX# spx interactive-setup
You can abort spx interactive-setup at any stage by <ctrl-c>
0: quit
1: change PE IDs
2: discover and convert new units (no startup-config flash) to PEs
3: discover and convert existing/new standalone units to PEs2&3 can also find new links and convert
chain(s) to ring.
Please type your selection:
```

Option 1: Change PE IDs without shutting the units down.

Option 2: Discover and convert new units: for units that are clean and have no startup configuration.

Option 3: Convert units with startup configuration to PEs.

Option 2&3: From FastIron 08.0.70, this option can be used to find new links and convert chains to a ring.

For option 1, refer to [Deployment Scenario 6: Changing PE IDs Using SPX Interactive-Setup](#) on page 122.

For option 2, refer to [Deployment Scenario 1: Bringing Up a Complete Campus Fabric Domain with Zero-Touch](#) on page 96 and for option 3, refer to [Deployment Scenario 2: Adding Units to a Ring or Linear Topology Using the SPX Interactive-Setup Utility](#) on page 103.

NOTE

To use the SPX interactive-setup utility, the zero-touch utility must be disabled. SPX interactive-setup cannot be used to bring up a CB stack. Refer to the *Ruckus ICX 7450, ICX 7750, and ICX 7250 Stacking Deployment Guide* for information on bringing up a CB stack.

Managing PEs

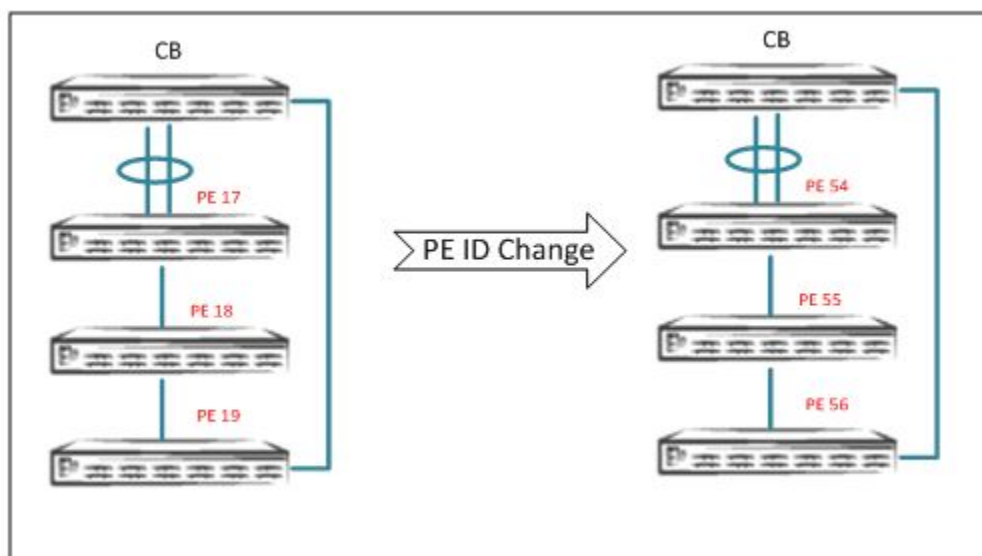
Once the Campus Fabric domain is deployed, you may want to optimize PEs in various ways. Zero-touch deployment provides two options for managing PE IDs.

Changing PE IDs

Previously, changing PE IDs required powering down the units and changing the PE ID configuration.

With option 1 of SPX interactive-setup, you can change PE IDs without shutting down the PEs or changing any connections or topology. Refer to [Deployment Scenario 6: Changing PE IDs Using SPX Interactive-Setup](#) on page 122.

FIGURE 34 Changing PE IDs



Recommendations for PE ID Changes

- PE ID changes are allowed when IDs are not already used in the topology.
- If any IDs are in the reserved configuration, they are not available for use when PE IDs are changed.
- Swapping PE IDs is not allowed.
- PE ID changes do not require any change to the topology or to existing connections.

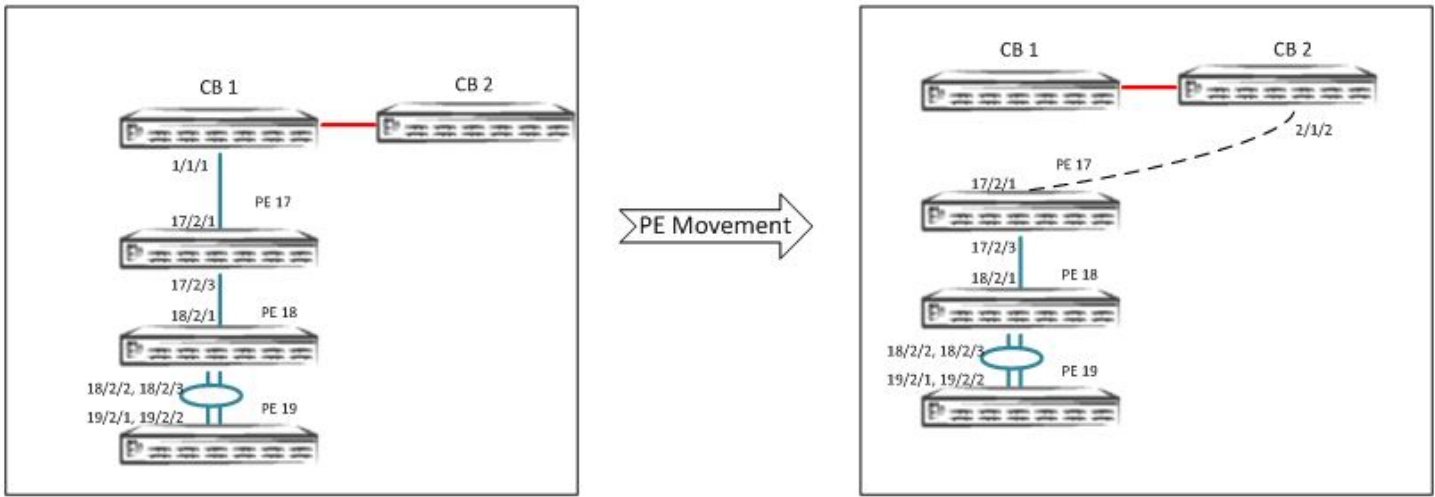
NOTE

If you want to change PE IDs, Ruckus recommends that you change them during the initial deployment of Campus Fabric before connecting hosts or configuring any protocols.

Customers may want to move PEs to other CB or PE SPX ports or SPX LAGs and still use the same PE IDs. SPX PE movement requires the **spx allow-pe-movement** option to be enabled in global configuration.

```
SPX# configure terminal
SPX(config)# spx allow-pe-movement
Please remove the spx allow-pe-movement configuration after the PEs are moved.
```

FIGURE 35 Moving PEs



Move PEs by changing connections or topology but retaining the old PE ID: This is achieved with the **spx allow-pe-movement** command. Refer to [Deployment Scenario 7: SPX PE Movement: Moving PEs Without Changing IDs](#) on page 126.

SPX Interactive-Setup Enhancement

Beginning with FastIron 08.0.70, SPX interactive-setup has an additional feature. Refer to [Deployment Scenario 8: Adding a New Link Between CB-PE or PE-PE to Change Existing Linear Topology to Ring Topology](#) on page 128.

Zero-Touch Deployment Considerations

- Connections may cause loops, especially if the CB is running Layer 2 protocols such as STP or RSTP.

NOTE

New units running with a router image do not run Spanning Tree Protocol (STP).

- To prevent loops when the CB is running Layer 2 protocols such as STP or RSTP, configure dedicated Campus Fabric ports as SPX ports or as SPX LAGs.
- Multiple links between any two units cause loops until they are converted to an SPX LAG.
- Loops may cause high CPU usage if looped packets are trapped to the CPU.
- The zero-touch utility does not run if the CPU use level is greater than 96 percent. Instead, the utility issues a warning that suggests using the SPX interactive-setup utility.
- The SPX interactive-setup utility can run under high CPU conditions, but the utility may not find all links.
- Loops should be resolved once the zero-touch or SPX interactive-setup utility has converted multiple links between any two units to SPX LAGs.
- After new units become PEs and join the Campus Fabric domain, check for loops by entering the **clear statistics** and then the **show statistics brief** commands on the CB. The packet counts displayed should be low. If packet counts are high, there may still be loops in the system.

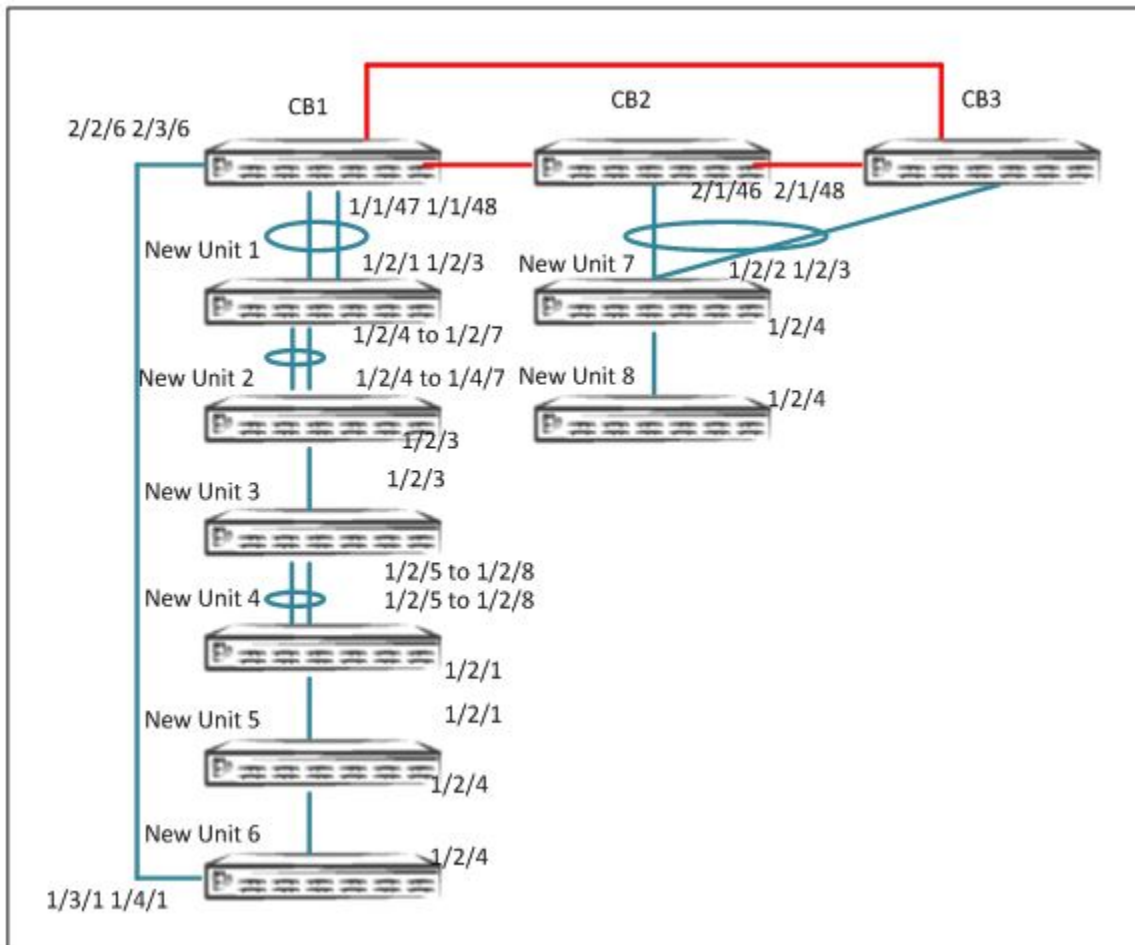
Deployment Scenarios

Deployment Scenario 1: Bringing Up a Complete Campus Fabric Domain with Zero-Touch

Initial Deployment Procedure Zero-Touch Provisioning

- The user must cable the connections per the topology and PE requirements.
- Refer to the *Ruckus ICX 7450, ICX 7750, and ICX 7250 Stacking Deployment Guide* for information on bringing up a CB (ICX 7750) stack.
- Multiple linear or ring chains can be discovered at the same time by zero-touch.

FIGURE 36 Reference Topology: Initial Deployment Using Zero-Touch



1. On an ICX 7750 stack or standalone unit, enter the **spx cb-enable** command.

```
SPX# configure terminal  
SPX(config)# spx cb-enable
```


2. Enable zero-touch under the CB configuration.

```
SPX# configure terminal
SPX(config)# spx cb-configure
SPX(config-spx-cb)# zero-touch-enable
```

3. Configure zero-touch ports or SPX ports or SPX LAGs that connect to the CB.

For a linear topology: Specify the zero-touch ports connecting from the CB to the transit PE.

For a ring topology: Specify the zero-touch ports connecting from the CB to a PE on both ends.

```
SPX# configure terminal
SPX(config)# spx cb-configure
SPX(config-spx-cb)# zero-touch-ports 1/1/47 2/1/46 2/1/48 2/2/6 3/2/6
```

4. All the new units are reloaded, a message displays the generated SPX ports and SPX LAGs, and the new units rejoin as PE units.

```
Zero-touch discovers 2 chain(s). # of valid chains: 2
Send reload to chain 0: #6 CC4E.24DF.0A72 ID=22, D0: 2/1 2/3, D1: 2/2 2/4 to 2/7
#5 CC4E.24DF.0CD6 ID=21, D0: 2/2 2/4 to 2/7, D1: 2/3
#4 CC4E.24DE.4C0A ID=20, D0: 2/3, D1: 2/5 to 2/8
#3 CC4E.24DF.0E3E ID=19, D0: 2/5 to 2/8, D1: 2/1
#2 CC4E.248B.AD08 ID=18, D0: 2/1, D1: 2/4
#1 609C.9F39.DAA8 ID=17, D0: 2/4, D1: 3/1 4/1
Send reload to chain 1: #7 CC4E.24F7.43F0 ID=23, D0: 2/3, D1: 2/4
#8 609C.9F1D.AF60 ID=24, D0: 2/4, D1:
T=27m40.6: Add spx-lag 2/2/6 3/2/6 for discovered units to join. Please do "write memory".
T=27m40.6: Add spx-lag 1/1/47 to 1/1/48 for discovered units to join. Please do "write memory".
T=27m40.7: Add spx-port 2/1/46 for a discovered unit to join. Please do "write memory".
```

NOTE

With zero-touch, ID assignment is automatic and is based on the pool of available IDs. If there are any invalid connections in the discovered topology, the zero-touch utility will abort.

5. All the new units are set to ready.

```
T=29m11.4: create spx u17, mac=609c.9f39.daa8 PE-port=17/4/1 CB-port=2/2/6
Debug: Oct 26 15:37:49 T=29m12.3: U1 sets spx u17 to ready.
Debug: Oct 26 15:37:49 T=29m12.6: create spx u18, mac=cc4e.248b.ad08 PE-port=18/2/4 CB-port=2/2/6
cascade-PE-port=17/2/4
Debug: Oct 26 15:37:50 T=29m13.3: U1 sets spx u18 to ready.
Start PE hot-swap for unit-id 17.Please do not enter any security configurations until complete.
Stack unit 17 Power supply 1 is down
Stack unit 17 Power supply 2 is up
PE hot-swap for unit-id 17 is complete.
Debug: Oct 26 15:38:19 T=29m42.9: create spx u22, mac=cc4e.24df.0a72 PE-port=22/2/1 CB-port=1/1/47
Sica Unit id:22, PoD License Capacity:2
Debug: Oct 26 15:38:20 T=29m43.5: U1 sets spx u22 to ready.
Start PE hot-swap for unit-id 22.Please do not enter any security configurations until complete.
Debug: Oct 26 15:38:23 T=29m46.0: create spx u23, mac=cc4e.24f7.43f0 PE-port=23/2/3 CB-port=2/1/46
PE hot-swap for unit-id 22 is complete.
Detect stack member 23 POE capable
Debug: Oct 26 15:38:23 T=29m47.0: U1 sets spx u23 to ready.
Start PE hot-swap for unit-id 23.Please do not enter any security configurations until complete.
PoE: Stack unit 23 Power supply 1 with 748000 mwatts capacity is up
Stack unit 23 Power supply 2 is down
Debug: Oct 26 15:38:26 T=29m49.8: create spx u21, mac=cc4e.24df.0cd6 PE-port=21/2/5 CB-port=1/1/47
cascade-PE-port=22/2/2
PE hot-swap for unit-id 23 is complete.
Stack unit 20 Power supply 1 is up
Stack unit 20 Power supply 2 is down
PE hot-swap for unit-id 19 is complete.
Start PE hot-swap for unit-id 18.Please do not enter any security configurations until complete.
PE hot-swap for unit-id 18 is complete.
Stack unit 18 Power supply 1 is down
Stack unit 18 Power supply 2 is up
Sica Unit id:21, PoD License Capacity:2
Debug: Oct 26 15:38:27 T=29m50.7: U1 sets spx u21 to ready.
Start PE hot-swap for unit-id 21.Please do not enter any security configurations until complete.
Debug: Oct 26 15:38:29 T=29m52.3: create spx u24, mac=609c.9f1d.af60 PE-port=24/2/4 CB-port=2/1/46
cascade-PE-port=23/2/4
Detect stack member 24 POE capable
Debug: Oct 26 15:38:29 T=29m52.8: U1 sets spx u24 to ready.
Stack unit 21 Power supply 1 is up
Stack unit 21 Power supply 2 is down
PE hot-swap for unit-id 21 is complete.
Stack unit 22 Power supply 1 is up
Stack unit 22 Power supply 2 is down
Start PE hot-swap for unit-id 24.Please do not enter any security configurations until complete.
PE hot-swap for unit-id 24 is complete.
PoE Info: PoE module 1 of Unit 24 on ports 24/1/1 to 24/1/32 detected. Initializing....
PoE Info: PoE module 1 of Unit 24 initialization is done.
PoE Info: PoE module 1 of Unit 23 on ports 23/1/1 to 23/1/32 detected. Initializing....
PoE Info: PoE module 1 of Unit 23 initialization is done.
PoE: Stack unit 24 Power supply 1 with 748000 mwatts capacity is up
PoE: Stack unit 24 Power supply 2 with 748000 mwatts capacity is up
Debug: Oct 26 15:38:41 T=30m4.1: create spx u20, mac=cc4e.24de.4c0a PE-port=20/2/3 CB-port=1/1/47
cascade-PE-port=21/2/3
Sica Unit id:20, PoD License Capacity:8
Debug: Oct 26 15:38:41 T=30m4.9: U1 sets spx u20 to ready.
Debug: Oct 26 15:38:42 T=30m5.7: create spx u19, mac=cc4e.24df.0e3e PE-port=19/2/8 CB-port=1/1/47
cascade-PE-port=20/2/5
Start PE hot-swap for unit-id 20.Please do not enter any security configurations until complete.
Sica Unit id:19, PoD License Capacity:8
Debug: Oct 26 15:38:43 T=30m6.6: U1 sets spx u19 to ready.
PE hot-swap for unit-id 20 is complete.
Start PE hot-swap for unit-id 19.Please do not enter any security configurations until complete.
Stack unit 19 Power supply 1 is up
Stack unit 19 Power supply 2 is down
```

6. Save the configuration.

```
SPX# write memory
Send "write mem" to 8 PEs: 17-24
Automatic copy to member units: 2 3
ICX7750-48F Router# Flash Memory Write (8192 bytes per dot)
```

7. Disable the zero-touch configuration.

```
SPX# configure terminal
SPX(config)# spx cb-configure
SPX(config-spx-cb)# no zero-touch-enable
```

8. When all PEs are ready, review the **show running-config** output to verify the SPX LAG configuration. Also verify that PE IDs have been correctly generated.

```
pe-id 1/1/47 22 21 20 19 18 17 2/2/6
pe-id 2/1/46 23 24
```

9. Verify the PE operational state.

```
SPX# show spx
T=20h16m21.5: alone: standalone, D: dynamic cfg, S: static
ID  Type      Role      Mac Address  Pri State  Comment
1   S ICX7750-48XGF active  cc4e.246e.db80 128 local  Ready
2   S ICX7750-48XGC standby 609c.9f1f.d900 128 remote Ready
3   S ICX7750-48XGC member 609c.9f1f.d180 0 remote Ready
17  S ICX7450-24G spx-pe 609c.9f39.daa8 N/A remote Ready
18  S ICX7450-24G spx-pe cc4e.248b.ad08 N/A remote Ready
19  S ICX7250-24 spx-pe cc4e.24df.0e3e N/A remote Ready
20  S ICX7250-24 spx-pe cc4e.24de.4c0a N/A remote Ready
21  S ICX7250-24 spx-pe cc4e.24df.0cd6 N/A remote Ready
22  S ICX7250-24 spx-pe cc4e.24df.0a72 N/A remote Ready
23  S ICX7450-32ZP spx-pe 609c.9f1d.afc0 N/A remote Ready
24  S ICX7450-32ZP spx-pe 609c.9f1d.af60 N/A remote Ready

      active      standby
+----+      +----+      +----+
-2/1| 1 |2/4--2/4| 2 |2/1==2/1| 3 |2/4-
| +----+      +----+      +----+ |
|-----|
|
1/1/47==2/1| 22 |2/2==2/2| 21 |2/3--2/3| 20 |2/5==2/5| 19 |2/1--2/1| 18 |2/4-
| +----+      +----+      +----+      +----+      +----+ |
|
2/2/6==3/1| 17 |2/4-
| +----+      +----+
2/1/46==2/2| 23 |2/4--2/4| 24 |
| +----+      +----+
```

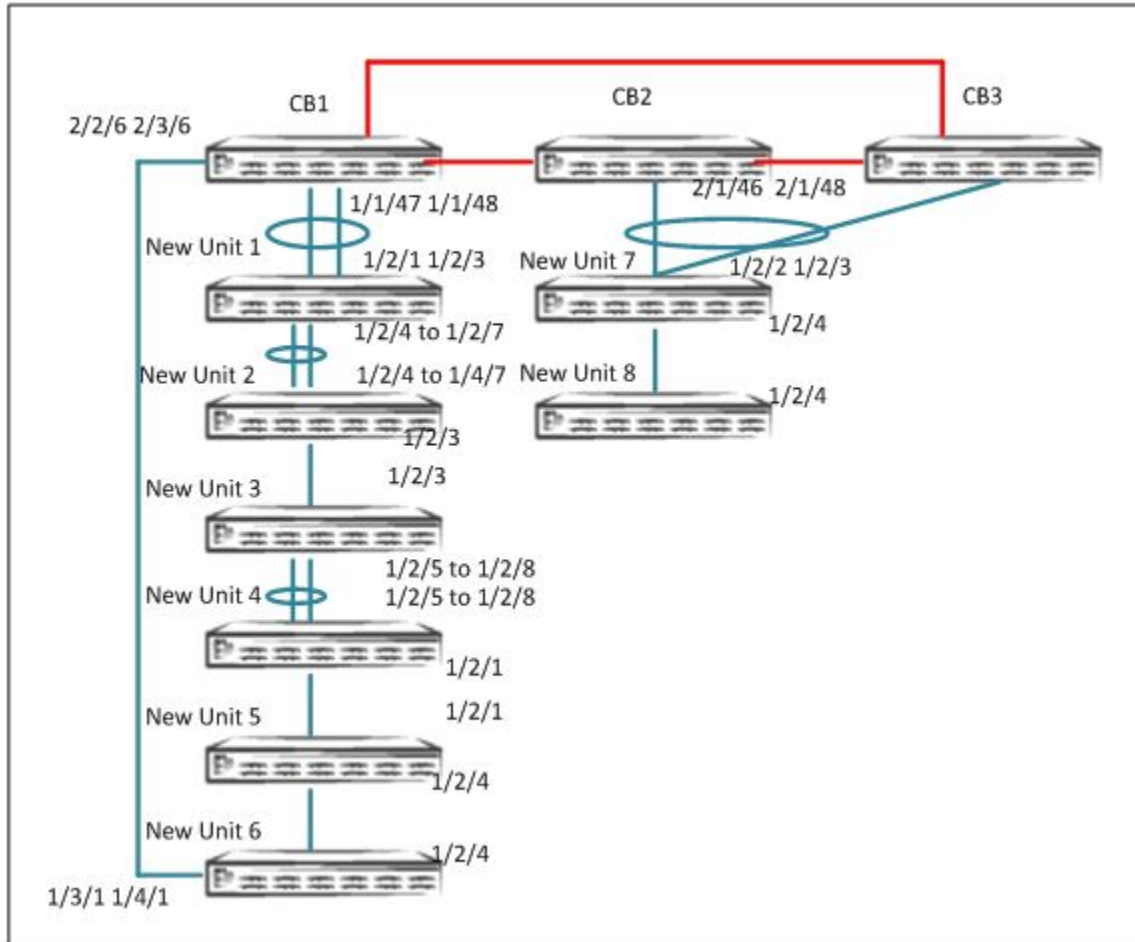
10. Once the topology is active, verify the CSP operational state using the **show spx csp all** command. If there is a ring in the topology, verify the ring operational state using the **show spx ring all** command.

NOTE

There are no specific **show** commands for ZTP. All commands that apply to SPX apply to ZTP. Refer to [Debugging and Verification Commands](#) on page 67.

System Deployment Procedure Using SPX Interactive-Setup

FIGURE 37 Reference Topology: Deployment Using SPX Interactive-Setup



- The user must cable the connections per the topology and PE requirements. Make sure that the connected PEs do not have a startup configuration.
- Multiple linear or ring chains can be discovered at the same time by zero-touch.
- Refer to the *Ruckus ICX 7450, ICX 7750, and ICX 7250 Stacking Deployment Guide* for information on bringing up an ICX 7750 stack.

1. On the ICX 7750 stack or standalone unit, enter the **spx cb-enable** command.

```
SPX# configure terminal
SPX (config)# spx cb-enable
```

2. If zero-touch is enabled, make sure that the utility is turned off before running SPX interactive-setup.

```
SPX# configure terminal
SPX(config)# spx cb-configure
SPX(config-spx-cb)# no zero-touch-enable
```

3. Configure zero-touch ports or SPX ports and SPX LAGs that connect to the CB.

For a linear topology: Specify the zero-touch ports that connect the CB to the transit PE.

For a ring topology: Specify the zero-touch ports that connect the CB to a PE on both ends.

```
SPX# configure terminal
SPX(config)# spx cb-configure
SPX (config-spx-cb)# zero-touch-ports 1/1/47 2/1/46 2/1/48 2/2/6 3/2/6
```

4. Run the SPX interactive-setup utility on the CB active controller. The discovered topology is displayed.

```
ICX7750-48F Router# spx interactive-setup
You can abort spx interactive-setup at any stage by <ctrl-c>
0: quit
1: change PE IDs
2: discover and convert new units (no startup-config flash) to PEs
3: discover and convert existing/new standalone units to PEs
Please type your selection: 2
Probing topology to find new units...
Horizontal bars link to discovered units. Vertical bars link to CB or PEs.
#1: icx7450-24-port-management-module 609C.9F39.DAA8
#2: icx7450-24-port-management-module CC4E.248B.AD08
#3: icx7250-24-port-management-module CC4E.24DF.0E3E
#4: icx7250-24-port-management-module CC4E.24DE.4C0A
#5: icx7250-24-port-management-module CC4E.24DF.0CD6
#6: icx7250-24-port-management-module CC4E.24DF.0A72
  2/2/6
  ||
  ||
  3/1
+-----+      +-----+      +-----+      +-----+      +-----+
|  1  |2/4--2/4|  2  |2/1==2/1|  3  |2/5==2/5|  4  |2/3--2/3|  5  |2/2=
+-----+      +-----+      +-----+      +-----+      +-----+
                                                                    |
                                                                    |
                                                                    +-----+
                                                                    |  6  |2/2=
                                                                    +-----+
                                                                    2/1
                                                                    ||
                                                                    ||
                                                                    1/1/47

Chain #1: =====
#7: icx7450-32zp-poe-management-module CC4E.24F7.43F0
#8: icx7450-32zp-poe-management-module 609C.9F1D.AF60

  2/1/46
  ||
  ||
  2/1
+-----+      +-----+
|  7  |2/4--2/4|  8  |
+-----+      +-----+
```

- Select the chains to be kept in the configuration. The system displays default IDs. Before the system is confirmed, the system prompts you to select or change the default IDs.

```
chain #0: Do you want to select this chain?(enter 'y' or 'n'): y
#1: icx7450-24-port-management 609C.9F39.DAA8, type an ID (No: 0, default: 17): 17
#2: icx7450-24-port-management CC4E.248B.AD08, type an ID (No: 0, default: 18): 18
#3: icx7250-24-port-management CC4E.24DF.0E3E, type an ID (No: 0, default: 19): 19
#4: icx7250-24-port-management CC4E.24DE.4C0A, type an ID (No: 0, default: 20): 20
#5: icx7250-24-port-management CC4E.24DF.0CD6, type an ID (No: 0, default: 21): 21
#6: icx7250-24-port-management CC4E.24DF.0A72, type an ID (No: 0, default: 22): 22

You selected 6 unit(s): #1: ID=17, #2: ID=18, #3: ID=19, #4: ID=20, #5: ID=21, #6: ID=22,
```

```

      #6          #5          #4          #3          #2
    +-----+    +-----+    +-----+    +-----+    +-----+
1/1/47==2/1| 22 |2/2==2/2| 21 |2/3--2/3| 20 |2/5==2/5| 19 |2/1==2/1| 18 |2/4-
    +-----+    +-----+    +-----+    +-----+    +-----+
                                                    #1
                                                    +-----+
                                                    |
                                                    2/2/6==3/1| 17 |2/4-
                                                    +-----+

Proceeding will produce the above topology. Do you accept it? (enter 'y' or 'n'): y
Chain #1: =====
#7: icx7450-32zp-poe-management-module CC4E.24F7.43F0
#8: icx7450-32zp-poe-management-module 609C.9F1D.AF60
```

```

2/1/46
  ||
  ||
  2/1
+-----+    +-----+
| 7 |2/4--2/4| 8 |
+-----+    +-----+
```

```
chain #1: Do you want to select this chain?(enter 'y' or 'n'): y
#7: icx7450-32zp-poe-management CC4E.24F7.43F0, type an ID (No: 0, default: 23): 23
#8: icx7450-32zp-poe-management 609C.9F1D.AF60, type an ID (No: 0, default: 24): 24
```

- When the proposed topology is displayed, confirm it.

```
You selected 2 unit(s): #7: ID=23, #8: ID=24,

      #7          #8
    +-----+    +-----+
2/1/46==2/1| 23 |2/4--2/4| 24 |
    +-----+    +-----+

Proceeding will produce the above topology. Do you accept it? (enter 'y' or 'n'): y

spx interactive-setup discovers 2 chain(s). valid #=2, selected #=2
```

- All new units are reloaded as indicated by a message and rejoin as PE units.

```
Send reload to chain 0: #6 CC4E.24DF.0A72 ID=22, D0: 2/1 2/3, D1: 2/2 2/4 to 2/7
#5 CC4E.24DF.0CD6 ID=21, D0: 2/2 2/4 to 2/7, D1: 2/3
#4 CC4E.24DE.4C0A ID=20, D0: 2/3, D1: 2/5 to 2/8
#3 CC4E.24DF.0E3E ID=19, D0: 2/5 to 2/8, D1: 2/1 2/3
#2 CC4E.248B.AD08 ID=18, D0: 2/1 2/3, D1: 2/4
#1 609C.9F39.DAA8 ID=17, D0: 2/4, D1: 3/1 4/1

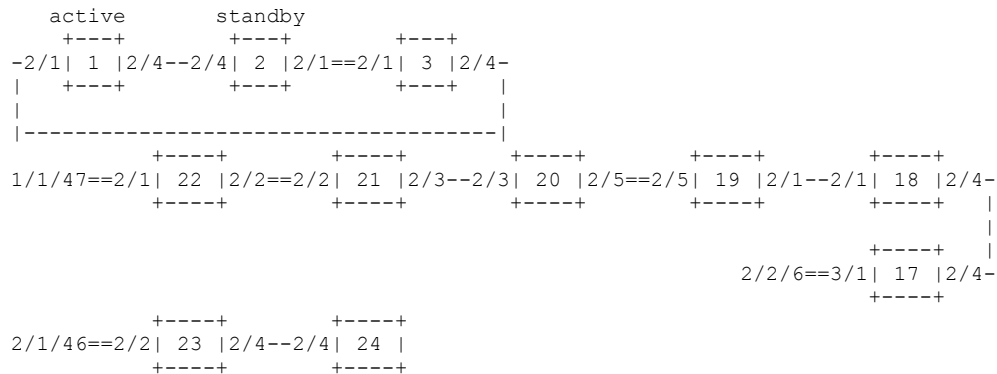
Send reload to chain 1: #7 CC4E.24F7.43F0 ID=23, D0: 2/1 to 2/3, D1: 2/4
#8 609C.9F1D.AF60 ID=24, D0: 2/4, D1:
```

- When all PEs are ready, use the **show running-config** command to verify the SPX LAG configuration and verify the PE IDs have been correctly generated.

```
pe-id 1/1/47 22 21 20 19 18 17 2/2/6
pe-id 2/1/46 23 24
```

9. Verify the PE operational state.

```
SPX# show spx
T=20h16m21.5: alone: standalone, D: dynamic cfg, S: static
ID   Type           Role      Mac Address      Pri State  Comment
1    S ICX7750-48XGF  active    cc4e.246e.db80   128 local  Ready
2    S ICX7750-48XGC  standby   609c.9f1f.d900   128 remote Ready
3    S ICX7750-48XGC  member    609c.9f1f.d180   0  remote Ready
17   S ICX7450-24G   spx-pe    609c.9f39.daa8   N/A remote Ready
18   S ICX7450-24G   spx-pe    cc4e.248b.ad08   N/A remote Ready
19   S ICX7250-24    spx-pe    cc4e.24df.0e3e   N/A remote Ready
20   S ICX7250-24    spx-pe    cc4e.24de.4c0a   N/A remote Ready
21   S ICX7250-24    spx-pe    cc4e.24df.0cd6   N/A remote Ready
22   S ICX7250-24    spx-pe    cc4e.24df.0a72   N/A remote Ready
23   S ICX7450-32ZP  spx-pe    609c.9f1d.afc0   N/A remote Ready
24   S ICX7450-32ZP  spx-pe    609c.9f1d.af60   N/A remote Ready
```



10. Once the topology is active, verify the CSP operational state using the **show spx csp all** command. If there is a ring in the topology, verify the ring operational state using the **show spx ring all** command.

NOTE

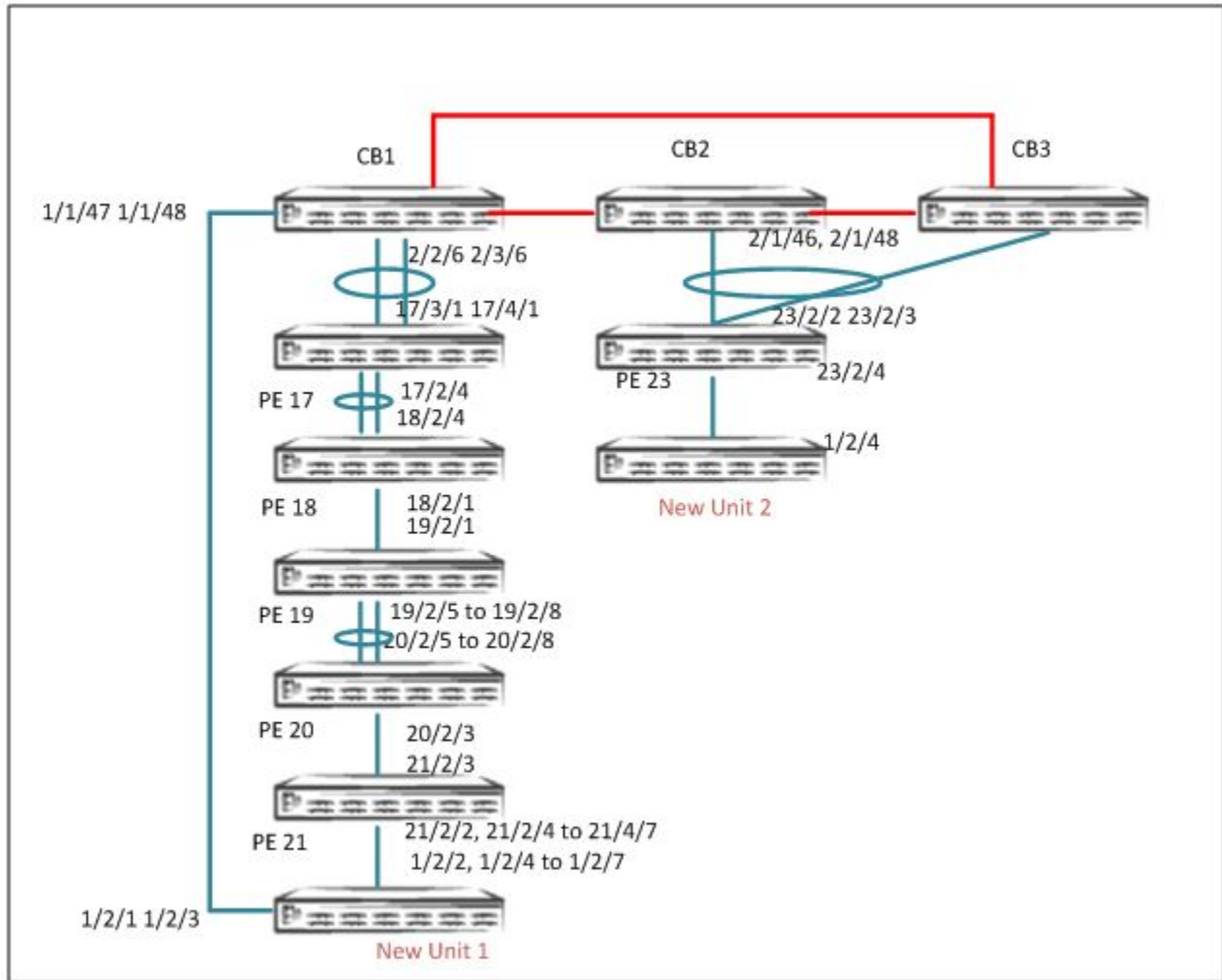
There are no specific **show** commands for ZTP. All commands that apply to SPX apply to ZTP. Refer to [Debugging and Verification Commands](#) on page 67.

Deployment Scenario 2: Adding Units to a Ring or Linear Topology Using the SPX Interactive-Setup Utility

Ruckus recommends the SPX interactive-setup utility for adding new units to an existing topology. New units can be added to form a linear or ring topology.

For example, in the following topology, a new unit is added to the PE 17-18-19-20-21 chain to make it a ring, and a new unit is added to chain 23.

FIGURE 38 Reference Topology: Adding Units Using SPX Interactive-Setup



```

active      standby
+----+      +----+      +----+
-2/1| 1 |2/4--2/4| 2 |2/1==2/1| 3 |2/4-
| +----+      +----+      +----+ |
|-----|
          +----+      +----+      +----+      +----+      +----+
2/2/6==3/1| 17 |2/4--2/4| 18 |2/1--2/1| 19 |2/5==2/5| 20 |2/3--2/3| 21 | <<< Add New Unit 1
+----+      +----+      +----+      +----+      +----+
          +----+
2/1/46==2/2| 23 | <<< Add New Unit 2
          +----+

```

The New Unit 1 is added in a PE Ring Topology:
Link 1: 1/2/2, 1/2/4 to 1/2/7 to 21/2/2, 21/2/4 to 21/2/7
Link2: 1/2/1, 1/2/3 to 1/1/47 1/1/48

The New Unit 2, is added in a PE Linear Topology
Link 1: 1/2/4 to 23/2/4

- Because the new units have a startup configuration, SPX interactive-setup option 3 is used.

- You must cable the connections to the new units per topology and PE requirements.

1. On an ICX 7750 stack or standalone unit, enter the **spx cb-enable** command.

```
SPX# configure terminal
SPX(config)# spx cb-enable
```

2. If zero-touch is enabled, make sure that the utility is turned off before running SPX interactive-setup.

```
SPX# configure terminal
SPX(config)# spx cb-configure
SPX(config-spx-cb)# no zero-touch-enable
```

3. Configure zero-touch ports or SPX ports or SPX LAGs that connect to the CB.

To add new units, Ruckus recommends configuring SPX ports or SPX LAGs when SPX ports are known.

Configuration on CB for Adding New Unit 1 (In Ring Topology)

```
SPX# configure terminal
SPX(config)# spx cb-config
SPX (config-spx-cb)# spx-lag 1/1/47 1/1/48
```

```
SPX(config)# spx unit 21
SPX(config-spx-unit-21)# spx-lag 21/2/2 21/2/4 to 21/2/7
```

```
Configuration on CB for adding New Unit 1 (In Linear Topology)
SPX(config)# spx unit 23
SPX(config-spx-unit-23)# spx-port 23/2/4
```

For a linear topology: Specify the SPX ports or SPX LAGs connecting from the new PE unit.

For a ring topology: Specify the SPX ports or the SPX LAG connecting the CB to the new unit and from the edge PE to the new unit that completes the ring.

- Run SPX interactive-setup on the CB master. Use option 3 because both new units have a startup configuration. The discovered topology is presented.

```

ICX7750-48F Router# spx interactive-setup
You can abort spx interactive-setup at any stage by <ctrl-c>
0: quit
1: change PE IDs
2: discover and convert new units (no startup-config flash) to PEs
3: discover and convert existing/new standalone units to PEs
Please type your selection: 3
Probing topology to find standalone units...

Horizontal bars link to discovered units. Vertical bars link to CB or PEs.

Chain #0: link to PE(s), so display PE chain(s). =====
#1: icx7450-32zp-poe-management-module 609C.9F1D.AF60
      +-----+
      2/1/46==2/2| 23 |2/4-
          +-----+

      23/2/4
        |
        |
        2/4
      +-----+
      | 1 |
      +-----+

Chain #1: link to PE(s), so display PE chain(s). =====
#2: icx7250-24-port-management-module CC4E.24DF.0A72
      +-----+ +-----+ +-----+ +-----+ +-----+
      2/2/6==3/1| 17 |2/4--2/4| 18 |2/1--2/1| 19 |2/5==2/5| 20 |2/3--2/3| 21 |2/2=
          +-----+ +-----+ +-----+ +-----+ +-----+

      1/1/47
        |
        |
        2/1
      +-----+
      | 2 |
      +-----+
        2/2
        ||
        ||
      21/2/2
  
```

- Accept the discovered topology when prompted. When prompted, accept the default PE ID for new units, or enter the desired PE ID.

```
chain #0: Do you want to select this chain?(enter 'y' or 'n'): y
#1: icx7450-32zp-poe-management 609C.9F1D.AF60, type an ID (No: 0, default: 24):
```

```
You selected 1 unit(s): #1: ID=24,
```

```

          #1
      +----+      +----+
2/1/46==2/2| 23 |2/4--2/4| 24 |
      +----+      +----+
```

```
Proceeding will produce the above topology. Do you accept it? (enter 'y' or 'n'): y
```

```
Chain #1: link to PE(s), so display PE chain(s). =====
#2: icx7250-24-port-management-module CC4E.24DF.0A72
```

```

      +----+      +----+      +----+      +----+      +----+
2/2/6==3/1| 17 |2/4--2/4| 18 |2/1--2/1| 19 |2/5==2/5| 20 |2/3--2/3| 21 |2/2=
      +----+      +----+      +----+      +----+      +----+
```

```

1/1/47
 |
 |
 2/1
+----+
|  2  |
+----+
  2/2
  ||
  ||
21/2/2
```

```
chain #1: Do you want to select this chain?(enter 'y' or 'n'): y
#2: icx7250-24-port-management CC4E.24DF.0A72, type an ID (No: 0, default: 22):
```

- Once you accept the topology, the new topology is displayed.

```
You selected 1 unit(s): #2: ID=22,
```

```

          #2
      +----+      +----+      +----+      +----+      +----+
1/1/47==2/1| 22 |2/2==2/2| 21 |2/3--2/3| 20 |2/5==2/5| 19 |2/1--2/1| 18 |2/4-
      +----+      +----+      +----+      +----+      +----+      |
                                                                +----+      |
                                                                2/2/6==3/1| 17 |2/4-
                                                                +----+
```

```
Proceeding will produce the above topology. Do you accept it? (enter 'y' or 'n'): y
```

- Confirm the topology with the specified PE IDs. After confirmation, the new units reload and join the Campus Fabric domain as PE units.

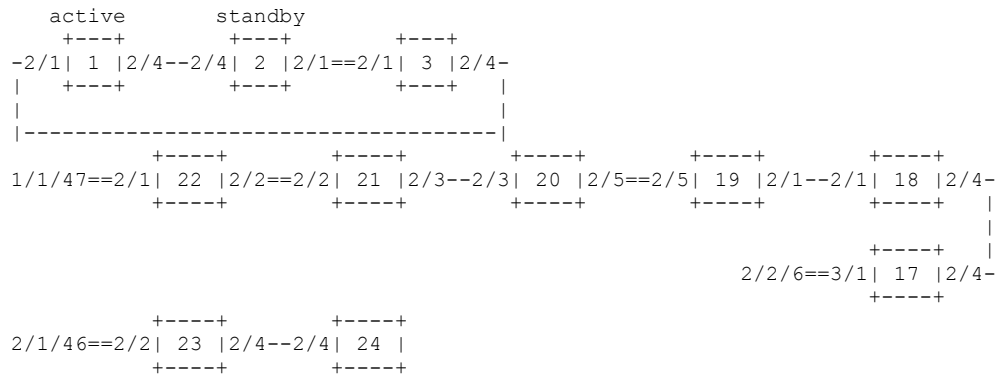
```
spx interactive-setup discovers 2 chain(s). valid #=2, selected #=2
Send reload to chain 0: #1 609C.9F1D.AF60 ID=24, D0: 2/4, D1:
Send reload to chain 1: #2 CC4E.24DF.0A72 ID=22, D0: 2/1, D1: 2/2 2/4 to 2/7
```

- Once all PEs are ready, enter the **show running-config** command to verify SPX LAG configurations and the new PE IDs.

```
ICX7750-48F Router# show running-config | include pe-id
pe-id 1/1/47 22 21 20 19 18 17 2/2/6
pe-id 2/1/46 23 24
```

9. Verify the PE operational state.

```
SPX# show spx
T=20h16m21.5: alone: standalone, D: dynamic cfg, S: static
ID   Type           Role      Mac Address      Pri State  Comment
1   S ICX7750-48XGF active    cc4e.246e.db80  128 local  Ready
2   S ICX7750-48XGC standby  609c.9f1f.d900  128 remote Ready
3   S ICX7750-48XGC member   609c.9f1f.d180   0 remote Ready
17  S ICX7450-24G   spx-pe   609c.9f39.daa8  N/A remote Ready
18  S ICX7450-24G   spx-pe   cc4e.248b.ad08  N/A remote Ready
19  S ICX7250-24    spx-pe   cc4e.24df.0e3e  N/A remote Ready
20  S ICX7250-24    spx-pe   cc4e.24de.4c0a  N/A remote Ready
21  S ICX7250-24    spx-pe   cc4e.24df.0cd6  N/A remote Ready
22  S ICX7250-24    spx-pe   cc4e.24df.0a72  N/A remote Ready
23  S ICX7450-32ZP  spx-pe   609c.9f1d.afc0  N/A remote Ready
24  S ICX7450-32ZP  spx-pe   609c.9f1d.af60  N/A remote Ready
```



10. Once the topology is active, verify the CSP operational state using the **show spx csp all** command. If there is a ring in the topology, verify the ring operational state using the **show spx ring all** command.

NOTE

There are no specific **show** commands for ZTP. All commands that apply to SPX apply to ZTP. Refer to [Debugging and Verification Commands](#) on page 67.

Deployment Scenario 3: Migrating an Existing Stack to Campus Fabric

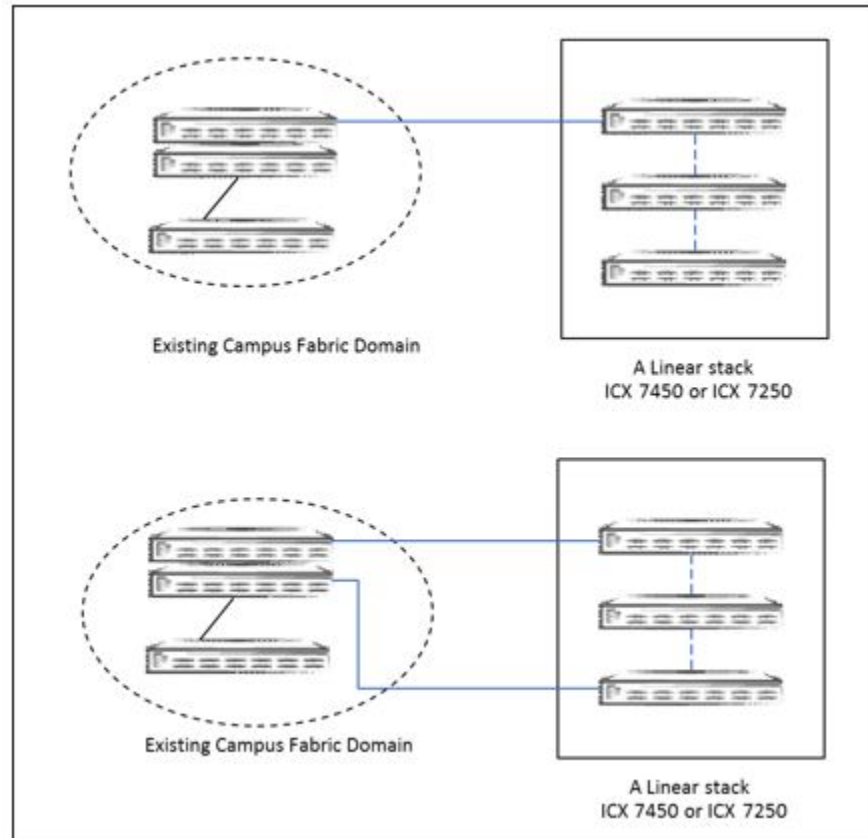
An existing ICX 7450 or ICX 7250 stack can be migrated into the Campus Fabric domain with ZTP. Both linear stacks and ring stacks can be migrated.

NOTE

Ruckus recommends using the SPX interactive-setup utility with option 2 to convert an existing linear or ring stack to PEs.

Migrating a Linear Stack to the Campus Fabric Domain

FIGURE 39 Migrating from a Linear Stack to Campus Fabric



From Top

Use Case 1: Migrating an existing linear stack to PEs in a linear topology

Use Case 2: Migrating an existing linear stack to PEs in a ring topology

Procedure Summary

1. The CB and the existing stack must be properly cabled.
2. The existing linear stack can be cabled to deploy either a linear PE topology or a ring PE topology.
3. On the active controller of the stack to be converted to PEs, erase the startup configuration and reload.
4. On the CB, run the SPX interactive-setup utility for this deployment scenario.
5. Default PE IDs are displayed, and you are given the opportunity to accept the default IDs or change them.
6. The discovered units reload, and the stack units become PE units in the Campus Fabric domain.
7. Once the topology is active, verify the CSP operational state using the **show spx csp all** command, and confirm that the handshake is complete. If there is a ring in the topology, verify the ring operational state using the **show spx ring all** command.

NOTE

Zero-touch or SPX interactive-setup works only if you erase the startup configuration on the existing stack units before attempting to convert them to PE units.

Illustration Topology

A two-unit ICX 7450 linear stack is cabled to the CB, and the stack units need to be converted to PE units.

- Existing stacking links between the stack units: 1/3/1 - 2/3/1.
 - Stack unit 1: Port 1/2/1 is connected to CB port 2/1/4.
 - Stack unit 2: Port 1/2/1 is connected to CB port 1/1/3.
1. Once the units are properly cabled to the CB, erase the startup configuration and reload the stack.
 2. Run the SPX interactive-setup utility on the CB. The discovered topology is displayed, and you are prompted to accept or change default PE ID assignments.
 3. Once you confirm the topology with selected PE IDs, the units reload and join the Campus Fabric domain.

```
# spx interactive-setup
You can abort spx interactive-setup at any stage by <ctrl-c>
0: quit
1: change PE IDs
2: discover and convert new units (no startup-config flash) to PEs
3: discover and convert existing/new standalone units to PEs
Please type your selection: 2
Probing topology to find new units...

Horizontal bars link to discovered units. Vertical bars link to CB or PEs.

Discovered 1 chain/ring, display chain #0 for processing
#1: icx7450-48f-sf-port-management CC4E.246C.F850
#2: icx7450-48f-sf-port-management CC4E.246D.10B8

      2/1/4          1/1/3
      |             |
      |             |
      2/1           2/1
+-----+         +-----+
| 1 |3/1--3/1| 2 |
+-----+         +-----+

chain #0: Do you want to select this chain?(enter 'y' or 'n'): y
#1: icx7450-48f-sf-port-management CC4E.246C.F850, type an ID (No: 0, default: 17):
#2: icx7450-48f-sf-port-management CC4E.246D.10B8, type an ID (No: 0, default: 18):

2 unit(s) selected: #1: ID=17, #2: ID=18,

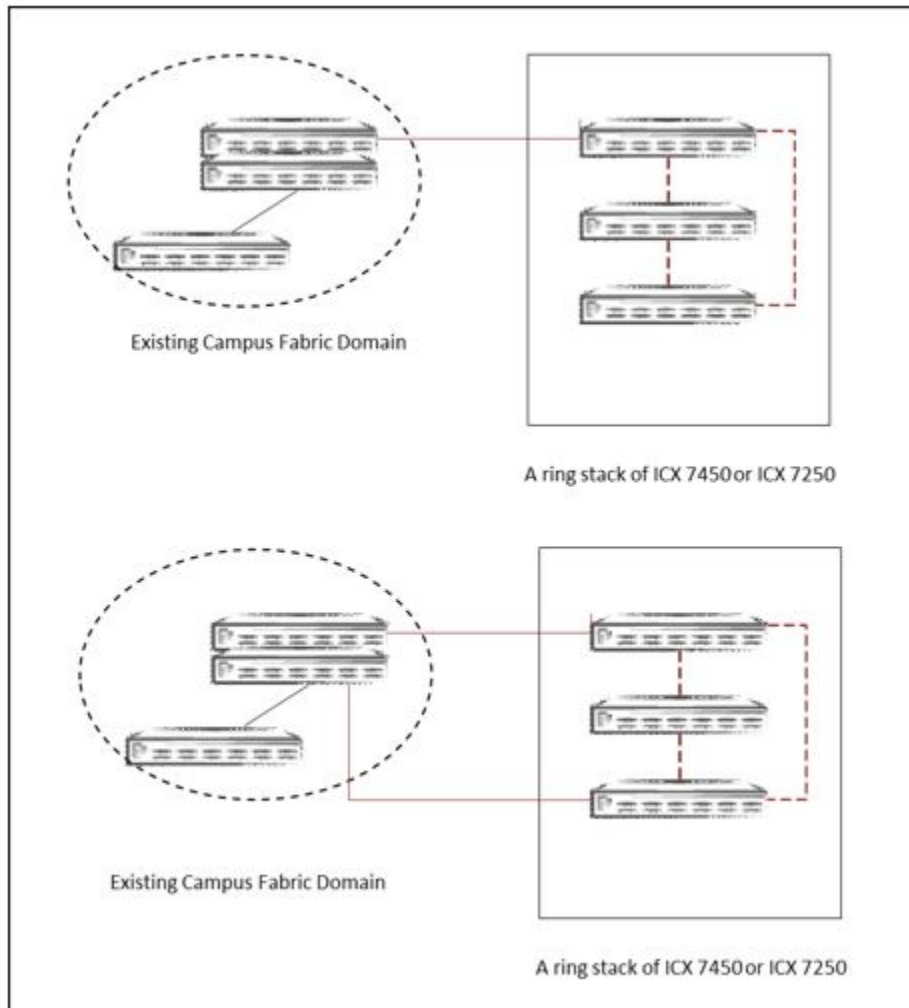
          #2          #1
        +-----+    +-----+
1/1/3--2/1| 18 |3/1--3/1| 17 |2/1--2/1/4
        +-----+    +-----+
Will produce the above topology. Do you accept it? (enter 'y' or 'n'): y
```

NOTE

Although you can also migrate a linear stack with the zero-touch utility, Ruckus recommends using SPX interactive-setup.

Migrating a Ring Stack to a Campus Fabric Domain

FIGURE 40 Migrating from a Ring Stack to Campus Fabric



From Top

Use Case 1: Converting an existing ring stack to PEs in a linear topology

Use Case 2: Converting an existing ring stack to PEs in a ring topology

Procedure Summary

1. Connect the CB and the existing stack.
2. An existing ring stack can be connected to bring up either a PE chain or a ring.
3. On the stack active controller, erase the startup configuration and reload.
4. Run the SPX interactive-setup utility.
5. When prompted, select a link to be removed to form a valid topology. When converting a ring stack, you can remove either of the pre-existing stacking links. Based on your selection, a valid topology is displayed for confirmation.
6. You are prompted to accept or change default PE ID assignments.

7. Discovered units reload, and the former stack units join the Campus Fabric domain as PEs.
8. Once the topology is active, verify the CSP operational state with the **show spx csp all** command, and confirm that the handshake is complete. If there is a ring in the topology, verify the ring operational state using the **show spx ring all** command.

Migrating a Three-Unit Ring Stack

1. After correctly cabling the stack, erase the startup configuration and reload.
2. Run the SPX interactive-setup utility on the CB to display the discovered topology.
3. Once you confirm the topology with the selected PE IDs, the units reload and join the Campus Fabric domain.

Select the topology to be added to the Campus Fabric domain and, if necessary, change the PE IDs assigned by default.

In a three-unit stack where all units are selected, there is only one link to remove.

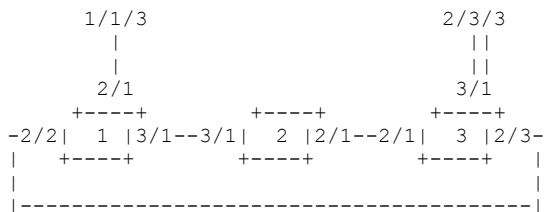
If you want to create a ring of only two units, you do not need to remove any link. You simply select two units, and type **0** when prompted to remove the third unit.

- Once you confirm your selections, the new units reload and join the Campus Fabric domain as PE units.

```
spx interactive-setup
You can abort spx interactive-setup at any stage by <ctrl-c>
0: quit
1: change PE IDs
2: discover and convert new units (no startup-config flash) to PEs
3: discover and convert existing/new standalone units to PEs
Please type your selection: 2
Probing topology to find new units...

Horizontal bars link to discovered units. Vertical bars link to CB or PEs.

#1: icx7450-48f-sf-port-management-module CC4E.246C.F850
#2: icx7450-48f-sf-port-management-module CC4E.246D.10B8
#3: icx7450-48-port-management-module CC4E.248E.2F90
```



Before confirming the topology, you have the option to choose three units or two units. You are prompted for your selections.

In the following example, only two units are added.

```
chain #0: Do you want to select this chain?(enter 'y' or 'n'): y

New units form a ring. If you want to select all units, you must remove a link.
Type the link to be removed: 0: no, 1: (#1 2/3 -- #3 2/2) (default: 0): 0

option 1 works great. option 0 takes 2 units as such.
If 1/2/3 == 3/2/2 s excluded (option 1) then 3 U ring results
If 1/2/3 == 3/2/2 is included a 2unit ring results.

#1: icx7450-48-port-management CC4E.248E.2F90, type an ID (No: 0, default: 19):
#2: icx7450-48f-sf-port-management CC4E.246D.10B8, type an ID (No: 0, default: 18):

2 unit(s) selected: #1: ID=19, #2: ID=18,
1 unit(s) not selected: #3,
```

```

      #1                #2
      +-----+        +-----+
2/3/3==3/1| 19 |2/1--2/1| 18 |
      +-----+        +-----+
Will produce the above topology. Do you accept it? (enter 'y' or 'n')
```

Migrating a Two-Unit Ring Stack

Illustration Topology

A two-unit ICX 7450 ring stack is cabled to the CB, and the ICX 7450 stack must be converted to PEs.

- Existing stacking links: 1/3/1 == 2/3/1, 1/2/2 == 2/2/3.
 - Stack unit 1: 1/2/1 is connected to CB 2/1/4.
 - Stack unit 2: 2/2/1 is connected to CB 1/1/3.
- After the stack has been properly cabled to the CB, erase the startup configuration and reload the new units.

2. Run the SPX interactive-setup utility on the CB to display the discovered topology.
3. Once you confirm the topology with the selected PE IDs, the units reload and join the Campus Fabric domain.

Select the topology to be included in the Campus Fabric domain and, if necessary, change the PE IDs assigned by default.

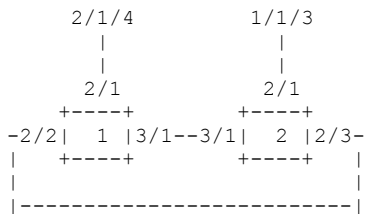
Because this is a ring stack, you have the option to remove either the stacking link 1/3/1 to 2/3/1 or the stacking link 1/3/1 == 2/3/1, 1/2/2 == 2/2/3.

4. Once you confirm your selections, the new units reload and join the Campus Fabric domain as PE units.

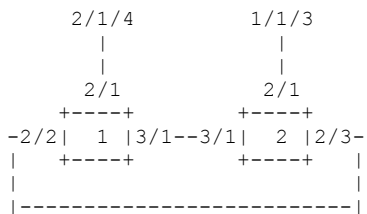
```
# spx interactive-setup
You can abort spx interactive-setup at any stage by <ctrl-c>
0: quit
1: change PE IDs
2: discover and convert new units (no startup-config flash) to PEs
3: discover and convert existing/new standalone units to PEs
Please type your selection: 2
Probing topology to find new units...
```

Horizontal bars link to discovered units. Vertical bars link to CB or PEs.

```
#1: icx7450-48f-sf-port-management-module CC4E.246C.F850
#2: icx7450-48f-sf-port-management-module CC4E.246D.10B8
```



```
Discovered 1 chain/ring, display chain #0 for processing
#1: icx7450-48f-sf-port-management-module CC4E.246C.F850
#2: icx7450-48f-sf-port-management-module CC4E.246D.10B8
```



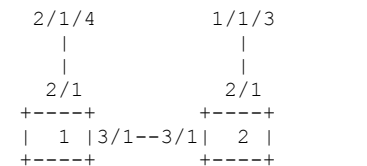
chain #0: Do you want to select this chain?(enter 'y' or 'n'): y

New units form a ring. If you want to select all units, you must remove a link.

-----User selects to remove 2/2/3 - 1/2/2

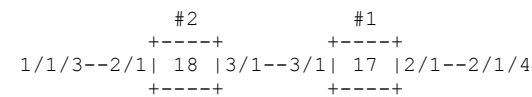
Type the link to be removed: 0: no, 1: (#2 2/3 -- #1 2/2), 2: (#1 3/1 -- #2 3/1) (default: 0): 1

```
#1: icx7450-48f-sf-port-management-module CC4E.246C.F850
#2: icx7450-48f-sf-port-management-module CC4E.246D.10B8
```



```
#1: icx7450-48f-sf-port-management CC4E.246C.F850, type an ID (No: 0, default: 17):
#2: icx7450-48f-sf-port-management CC4E.246D.10B8, type an ID (No: 0, default: 18):
```

2 unit(s) selected: #1: ID=17, #2: ID=18,



Will produce the above topology. Do you accept it? (enter 'y' or 'n'): y

In the following example, the stacking link 1/3/1 -2/3/1 has been removed.

```

chain #0: Do you want to select this chain?(enter 'y' or 'n'): y

New units form a ring. If you want to select all units, you must remove a link.

Type the link to be removed: 0: no, 1: (#2 2/3 -- #1 2/2), 2: (#1 3/1 -- #2 3/1) (default: 0): 2
#1: icx7450-48f-sf-port-management-module CC4E.246C.F850
#2: icx7450-48f-sf-port-management-module CC4E.246D.10B8

      2/1/4          1/1/3
      |             |
      |             |
      2/1           2/1
+-----+         +-----+
| 1 |2/2--2/3| 2 |
+-----+         +-----+

#1: icx7450-48f-sf-port-management CC4E.246C.F850, type an ID (No: 0, default: 17):
#2: icx7450-48f-sf-port-management CC4E.246D.10B8, type an ID (No: 0, default: 18):

2 unit(s) selected: #1: ID=17, #2: ID=18,

      #2           #1
      +-----+   +-----+
1/1/3--2/1| 18 |2/3--2/2| 17 |2/1--2/1/4
      +-----+   +-----+

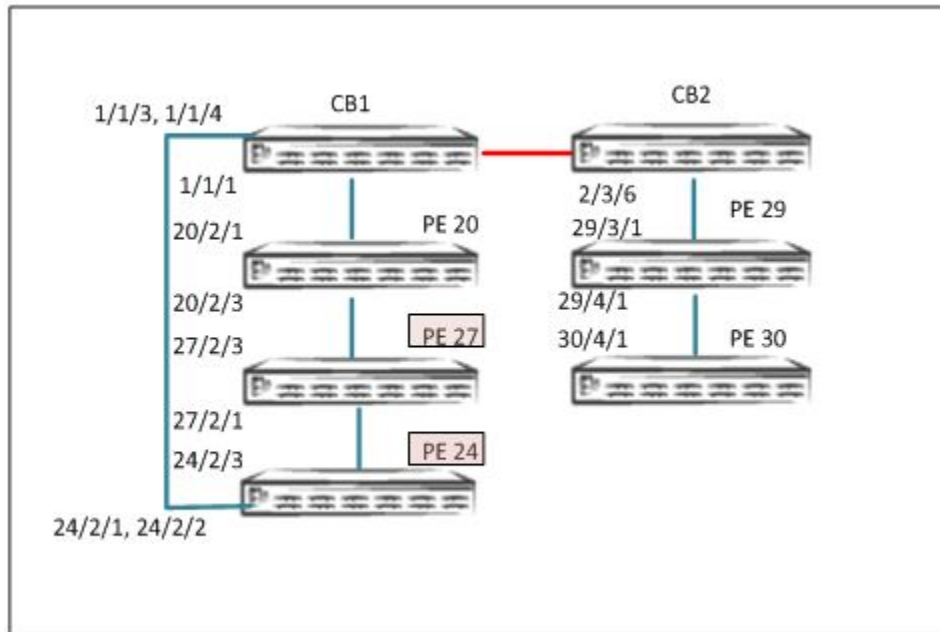
Will produce the above topology. Do you accept it? (enter 'y' or 'n'): y
Exit spx interactive-setup, reason: User enters ctrl-c

```

Deployment Scenario 4: Replacing a PE

A PE unit in an existing Campus Fabric domain can easily be replaced using the zero-touch or SPX interactive-setup utility. When the replacement unit has the same model as the original PE, the replacement PE retains the PE ID of the original unit. You can use zero-touch to replace PE units in a PE ring or chain.

FIGURE 41 Reference Topology: Replacing a PE



Unit Replacement Recommendations

- Save the running configuration before replacing any unit.
- Be sure that the replacement unit has the same model as the original and is connected the same way to the Campus Fabric domain.
- Be sure that the new unit is running the same image version as the original PE.
- Disconnect hosts before replacing the PE, and reconnect them after the unit is replaced.
- After one or more units are replaced, the configuration saved on the CB is pushed to the new PEs.

NOTE

Ruckus recommends using the SPX interactive-setup utility for PE unit replacements.

In the following example, two PEs in the reference topology, PE 24 and PE 27, are replaced.

1. Check the current topology, and save the configuration.

```

SPX# show spx
T=12m21.0: alone: standalone, D: dynamic cfg, S: static
ID  Type      Role      Mac Address  Pri State  Comment
1   S ICX7750-48XGF standby 609c.9f1f.9900 128 remote Ready
2   S ICX7750-48XGF active  cc4e.246d.9b00 128 local  Ready
20  D ICX7450-48GF spx-pe  cc4e.246d.10b8 N/A remote Ready
24  D ICX7450-48G  spx-pe  cc4e.248e.2f90 N/A remote Ready
27  D ICX7450-48GF spx-pe  cc4e.246c.f850 N/A remote Ready
29  S ICX7450-24G  spx-pe  cc4e.248b.ac90 N/A remote Ready
30  S ICX7450-24G  spx-pe  cc4e.248b.a8a8 N/A remote Ready

      active      standby
      +----+      +----+
      | 2 |2/4--2/1| 1 |2/4
      +----+      +----+
      +-----+   +-----+   +-----+   +-----+
1/1/1--2/1| 20 |2/3--2/3| 27 |2/1--2/3| 24 |2/1==1/1/3
      +-----+   +-----+   +-----+
      +-----+   +-----+
2/3/6--3/1| 29 |4/1--4/1| 30 |
      +-----+   +-----+

SPX# write memory
Send "write mem" to 5 PEs: 20, 24,27,29-30 =====save configuration

```

2. Verify the topology using the **show running-config** command.

```
SPX# show running-config
Current configuration:
!
ver 08.0.50b1T203
!
stack unit 1
  module 1 icx7750-48-xgf-port-management-module
  module 2 icx7750-qsfp-6port-qsfp-240g-module
  priority 128
  stack-port 1/2/1 1/2/4
stack unit 2
  module 1 icx7750-48-xgf-port-management-module
  module 2 icx7750-qsfp-6port-qsfp-240g-module
  module 3 icx7750-6q-6port-qsfp-240g-module
  priority 128
  stack-port 2/2/4
spx unit 20
  module 1 icx7450-48f-sf-port-management-module
  module 2 icx7400-xgf-4port-40g-module
  module 3 icx7400-xgf-4port-40g-module
  module 4 icx7400-xgf-4port-40g-module
  spx-port 20/2/1
  spx-port 20/2/3
spx unit 24
  module 1 icx7450-48-port-management-module
  module 2 icx7400-xgf-4port-40g-module
  module 3 icx7400-qsfp-lport-40g-module
  module 4 icx7400-qsfp-lport-40g-module
  spx-lag 24/2/1 to 24/2/2
  spx-port 24/2/3
spx unit 27
  module 1 icx7450-48f-sf-port-management-module
  module 2 icx7400-xgf-4port-40g-module
  module 3 icx7400-qsfp-lport-40g-module
  module 4 icx7400-qsfp-lport-40g-module
  spx-port 27/2/1
  spx-port 27/2/3
spx unit 29
  module 1 icx7450-24-port-management-module
  module 2 icx7400-qsfp-lport-40g-module
  module 3 icx7400-qsfp-lport-40g-module
  module 4 icx7400-qsfp-lport-40g-module
  spx-port 29/3/1
  spx-port 29/4/1
spx unit 30
  module 1 icx7450-24-port-management-module
  module 2 icx7400-qsfp-lport-40g-module
  module 3 icx7400-qsfp-lport-40g-module
  module 4 icx7400-qsfp-lport-40g-module
  spx-port 30/4/1
stack enable
stack rconsole-off
stack mac 609c.9f1f.9900
!
spx cb-enable
spx cb-configure
  spx-port 1/1/1
  spx-port 2/3/6
  spx-lag 1/1/3 to 1/1/4
  zero-touch-ports 1/2/6
  pe-id 1/1/1 20 27 24 1/1/3 =====(PEs in this ring will be replaced)
  pe-id 2/3/6 29 30
!
```

3. Units 24 and 27 no longer appear in the topology. These are the units being replaced.

```
SPX# show spx
T=16m0.6: alone: standalone, D: dynamic cfg, S: static
ID   Type           Role      Mac Address      Pri State  Comment
1    S ICX7750-48XGF  standby  609c.9f1f.9900  128 remote Ready
2    S ICX7750-48XGF  active   cc4e.246d.9b00  128 local  Ready
20   S ICX7450-48GF  spx-pe   cc4e.246d.10b8  N/A remote Ready
24   S ICX7450-48G   spx-pe   0000.0000.0000  N/A reserve =====units lost
27   S ICX7450-48GF  spx-pe   0000.0000.0000  N/A reserve =====units lost
29   S ICX7450-24G   spx-pe   cc4e.248b.ac90  N/A remote Ready
30   S ICX7450-24G   spx-pe   cc4e.248b.a8a8  N/A remote Ready
```

```

active          standby
+----+         +----+
| 2 |2/4--2/1| 1 |2/4
+----+         +----+
                +----+
1/1/1--2/1| 20 |2/3-
                +----+

                +----+         +----+
2/3/6--3/1| 29 |4/1--4/1| 30 |
                +----+         +----+
```

4. Replace PE 24 and 27 with matching units, and reconnect the replacements.

Be sure to reconnect the following ports:

- 20/2/3 – 27/2/3
- 27/2/1 – 24/2/3
- 24/2/1, 24/2/2 – 1/1/3 1/1/4

- Run the SPX interactive-setup utility to discover the replacement PE units. Once the units are discovered, you are prompted for PE IDs. Retain the PE IDs. The topology is displayed again for confirmation. When you confirm the topology, the full topology, including the replacement PE units, is displayed.

```

SPX# spx interactive-setup
You can abort spx interactive-setup at any stage by <ctrl-c>
0: quit
1: change PE IDs
2: discover and convert new units (no startup-config flash) to PEs
3: discover and convert existing/new standalone units to PEs
Please type your selection: 2
Probing topology to find new units...

Horizontal bars link to discovered units. Vertical bars link to CB or PEs.

Chain #0: link to PE(s), so display PE chain(s). =====
#1: icx7450-48f-sf-port-management-module CC4E.246C.F850
#2: icx7450-48-port-management-module CC4E.248E.2F90
      +-----+
      1/1/1--2/1| 20 |2/3-
      +-----+

      20/2/3          1/1/3
      |              ||
      |              ||
      2/3            2/1
+-----+          +-----+
| 1 |2/1--2/3| 2 |
+-----+          +-----+

Discovered 1 chain/ring
chain #0: Do you want to select this chain?(enter 'y' or 'n'): y
#2: icx7450-48-port-management CC4E.248E.2F90, type an ID (No: 0, default: 24): same ids will be
given
#1: icx7450-48f-sf-port-management CC4E.246C.F850, type an ID (No: 0, default: 27):

You selected 2 unit(s): #1: ID=27, #2: ID=24,

              #1          #2
      +-----+          +-----+
      1/1/1--2/1| 20 |2/3--2/3| 27 |2/1--2/3| 24 |2/1==1/1/3
      +-----+          +-----+

Proceeding will produce the above topology. Do you accept it? (enter 'y' or 'n'): y
spx interactive-setup discovers 1 chain(s). valid #=1, selected #=1

```


- The replacement PEs reload and join the Campus Fabric domain. Use the **show spx** command to verify the operational state of the PEs, and then save the configuration.

```
T=12m21.0: alone: standalone, D: dynamic cfg, S: static
ID   Type   Role   Mac Address   Pri State   Comment
1   S   ICX7750-48XGF   standby   609c.9f1f.9900 128 remote   Ready
2   S   ICX7750-48XGF   active    cc4e.246d.9b00 128 local    Ready
20  D   ICX7450-48GF   spx-pe    cc4e.246d.10b8 N/A remote   Ready
24  D   ICX7450-48G    spx-pe    cc4e.248e.2f90 N/A remote   Ready
27  D   ICX7450-48GF   spx-pe    cc4e.246c.f850 N/A remote   Ready
29  S   ICX7450-24G    spx-pe    cc4e.248b.ac90 N/A remote   Ready
30  S   ICX7450-24G    spx-pe    cc4e.248b.a8a8 N/A remote   Ready
```

```
active          standby
+----+         +----+
| 2 |2/4--2/1| 1 |2/4
+----+         +----+
+-----+     +-----+     +-----+     +-----+
1/1/1--2/1| 20 |2/3--2/3| 27 |2/1--2/3| 24 |2/1==1/1/3
+-----+     +-----+     +-----+
+-----+     +-----+
2/3/6--3/1| 29 |4/1--4/1| 30 |
+-----+     +-----+
```

```
SPX# write memory
Send "write mem" to 5 PEs: 20,24,27,29-30 =====save configuration
```

- Once the topology is active, verify the CSP operational state using the **show spx csp all** command, and confirm that the handshake is complete. If there is a ring in the topology, verify the ring operational state using the **show spx ring all** command.

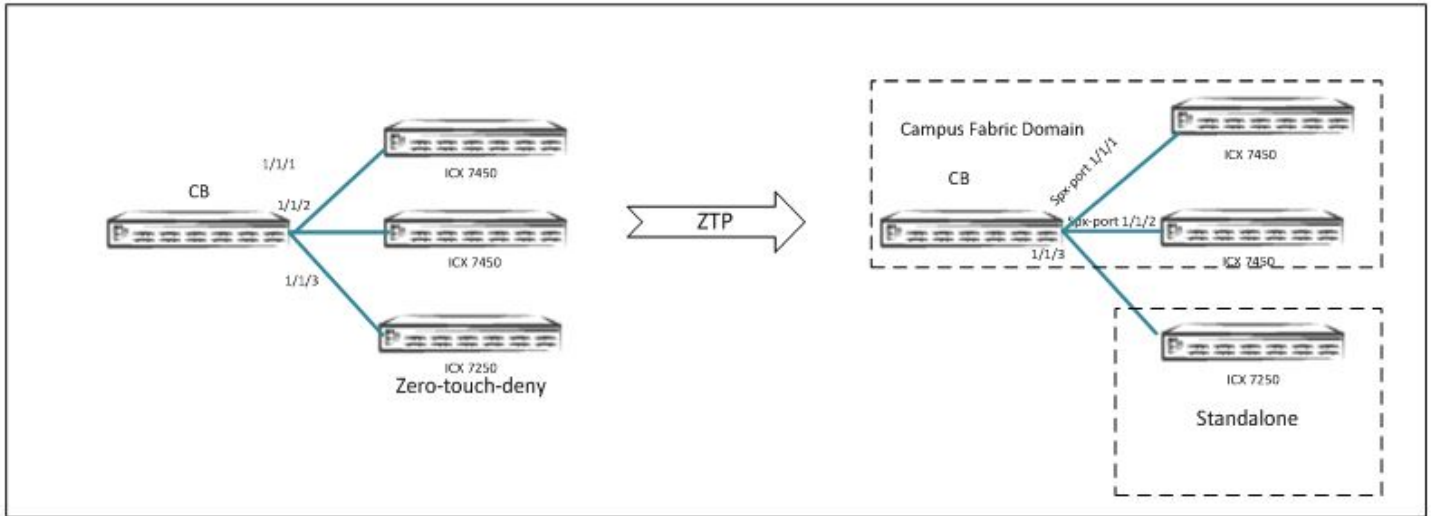
NOTE

There are no specific **show** commands for ZTP. All commands that apply to SPX also apply to ZTP. Refer to [Debugging and Verification Commands](#) on page 67.

Deployment Scenario 5: Preventing an ICX 7250 or ICX 7450 from Being Discovered by Zero-Touch

Any network may contain switches that should not join the Campus Fabric domain. The **spx zero-touch-deny** command can be configured on any traditional stack member or standalone device to prevent the unit from being converted to a PE unit accidentally by the zero-touch or SPX interactive-setup utility.

FIGURE 42 Using the `spx zero-touch-deny` Command



- Configure **spx zero-touch-deny** in global configuration mode on a standalone unit.
- To make units available for discovery again, enter the **no zero-touch-deny** command. The **zero-touch enable** or the **spx pe-enable** command also removes the **spx zero-touch-deny** setting.

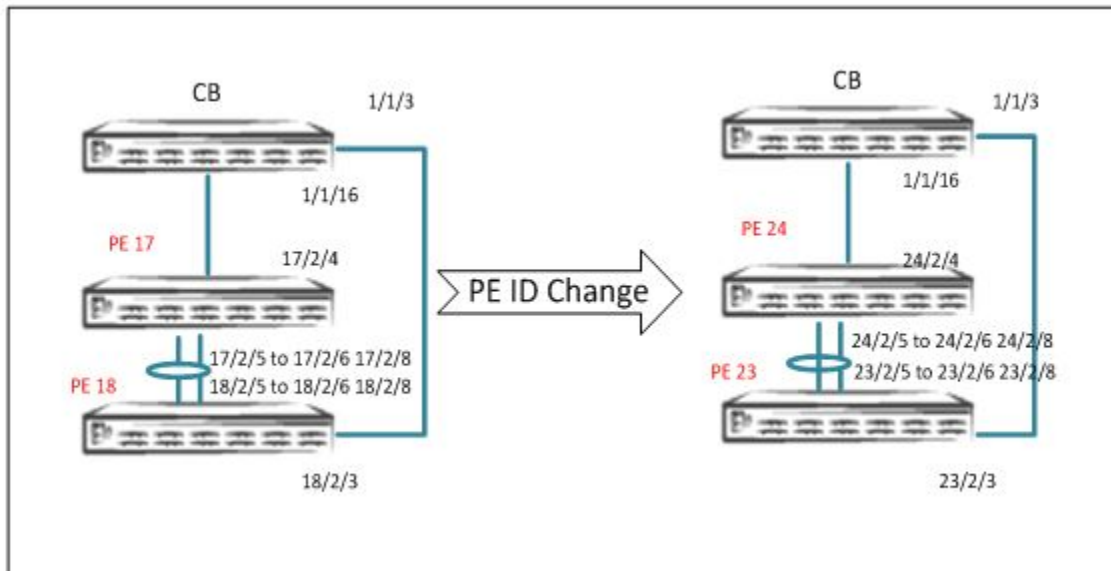
The following example protects an ICX 7450 from being discovered by a CB unit when the zero-touch utility or SPX interactive-setup utility is run.

```
ICX7450-48F Router>
ICX7450-48F Router> enable
No password has been assigned yet...
ICX7450-48F Router# configure terminal
ICX7450-48F Router(config)# spx zero-touch-deny
ICX7450-48F Router(config)# show running-config
Current configuration:
!
ver 08.0.50b1T213
!
stack unit 1
  module 1 icx7450-48f-sf-port-management-module
  module 2 icx7400-xgf-4port-40g-module
  module 4 icx7400-qsf-p-lport-40g-module
!
spx zero-touch-deny
!
```

Deployment Scenario 6: Changing PE IDs Using SPX Interactive-Setup

Use the SPX interactive-setup utility to make changing PE IDs simpler.

FIGURE 43 Reference Topology: Changing PE IDs with SPX Interactive-Setup



PE ID Change Considerations

- The new PE ID can be assigned only if the ID is not taken and if no reserve configuration is associated with the ID.
- The PE IDs cannot be changed or swapped on PE units that are physically present in the Campus Fabric domain.
- Ruckus recommends that you change PE IDs, if desired, when the Campus Fabric is initialized and before connecting hosts or configuring protocols.

ATTENTION

Proceed with caution when changing PE IDs. Only the SPX LAG and SPX port configuration is dynamically changed after a PE ID change. Once PE IDs are changed, the user is responsible for reconfiguring all the configurations applicable to the old PE ID ports.

In the following example, PE 17 becomes PE 24, and PE 18 becomes PE 23.

1. Use the **show running-config** command to verify the domain and the PE ID configuration.

```
ICX7750-48F Router(config)# show running-config
Current configuration:
!
ver 08.0.50b1T203
!
stack unit 1
  module 1 icx7750-48-xgf-port-management-module
  module 2 icx7750-qsfp-6port-qsfp-240g-module
  module 3 icx7750-6q-6port-qsfp-240g-module
spx unit 17
  module 1 icx7250-24-port-management-module
  module 2 icx7250-sfp-plus-8port-80g-module
  spx-port 17/2/4
  spx-lag 17/2/5 to 17/2/6 17/2/8
spx unit 18
  module 1 icx7250-24-port-management-module
  module 2 icx7250-sfp-plus-8port-80g-module
  spx-port 18/2/3
  spx-lag 18/2/5 to 18/2/6 18/2/8
!
!
spx cb-enable
spx cb-configure
  zero-touch-enable
  spx-port 1/1/3
  spx-port 1/1/16
  zero-touch-ports 1/1/3 to 1/1/16
  pe-id 1/1/3 18 17 1/1/16
!
!
no inline power non-pd-detection enable
ip ssl min-version tls_1_1
!
!
interface management 1
!
!
End
```

- Run the SPX interactive-setup utility, and choose option 1 to change PE IDs. When prompted, enter the desired PE IDs and confirm your changes.

```
ICX7750-48F Router# spx interactive-setup
You can abort spx interactive-setup at any stage by <ctrl-c>
0: quit
1: change PE IDs
2: discover and convert new units (no startup-config flash) to PEs
3: discover and convert existing/new standalone units to PEs
The example shows the options available when you start the interactive-setup utility.
4. When prompted, type "1" to change PE IDs.
Please type your selection: 1
      +----+      +----+
1/1/3--2/3| 18 |2/5==2/5| 17 |2/4--1/1/16
      +----+      +----+
You can type n to cancel. If you need to cancel later, type Cntrl-C at any time.
Type "done" to finish, or a new ID for PE 18 (default 18): 23
Type "done" to finish, or a new ID for PE 17 (default 17): 24
Change IDs: 18->23, 17->24,
Do you want to proceed? (enter 'y' or 'n'): y
```

NOTE

Be sure that the zero-touch utility is disabled before running the SPX interactive-setup utility.

```
ICX7750-48F Router(config-spx-cb)# no zero-touch-enable
ICX7750-48F Router(config-spx-cb)# end
In the example, the zero-touch utility is disabled as a precursor to enabling interactive-setup.
```

- The affected PEs are assigned new PE IDs and rejoin the network with the new IDs.

```
T=14m43.4: Sending new IDs to PE(s) 17-18...
power down ports to detach PEs: 1/1/3 1/1/16
power up ports: 1/1/3 1/1/16.
Affected PEs will join with new IDs.
Exit spx interactive-setup, reason: done ID changes
Sica Unit id:24, PoD License Capacity:8
Stack unit 24 Power supply 1 is up
Stack unit 24 Power supply 2 is down
Sica Unit id:23, PoD License Capacity:8
Stack unit 23 Power supply 1 is up
Stack unit 23 Power supply 2 is down
```

- Use the **show spx** command to verify the topology and the operational state of the PEs. Then enter the **write memory** command to save the configuration.

```
SPX# show spx
T=17m13.2: alone: standalone, D: dynamic cfg, S: static
ID Type Role Mac Address Pri State Comment
1 S ICX7750-48XGF alone cc4e.24d2.2c00 0 local Ready
23 D ICX7250-24 spx-pe cc4e.24dc.e9ce N/A remote Ready
24 D ICX7250-24 spx-pe cc4e.24dc.f166 N/A remote Ready

      +----+
2/1| 1 |2/4
      +----+
      +----+      +----+
1/1/3--2/3| 23 |2/5==2/5| 24 |2/4--1/1/16
      +----+      +----+

The example changes the ID for PE 18 to 23 and the ID for PE 17 to 24
ICX7750-48F Router# write memory
```

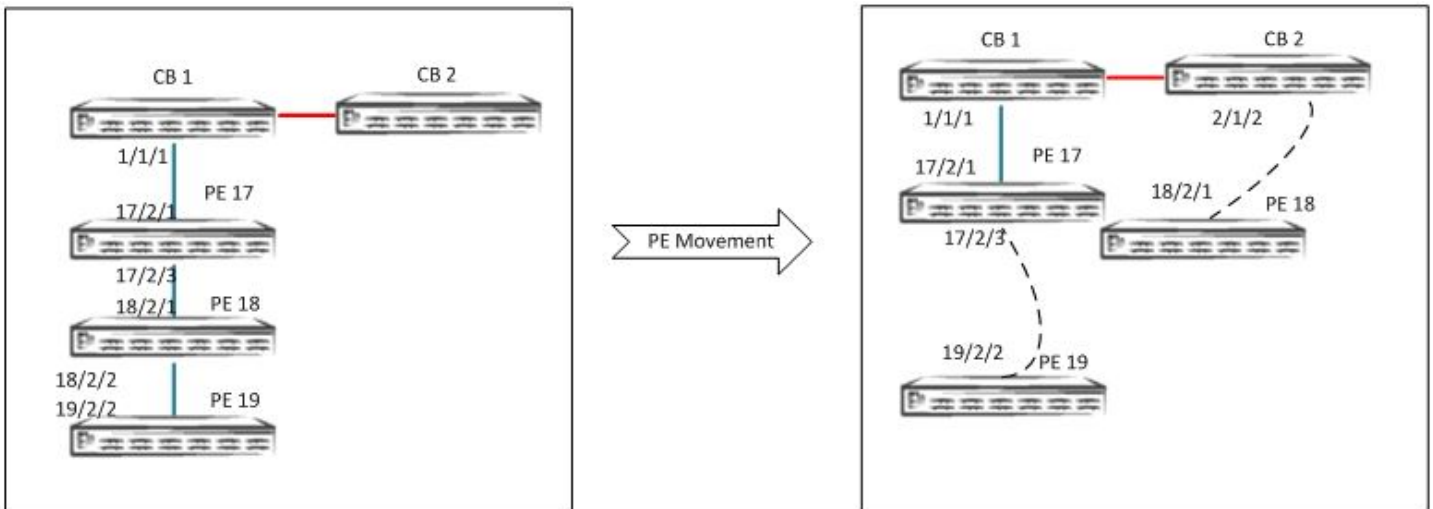
- Use the **show spx csp all** or **show debug all** command to verify the CSP operational status and any other items as needed. If the topology includes a PE ring, use the **show spx ring all** command to verify that the ring is in the active state.

NOTE

There are no specific **show** commands for ZTP. All commands that apply to SPX also apply to ZTP. Refer to [Debugging and Verification Commands](#) on page 67.

Deployment Scenario 7: SPX PE Movement: Moving PEs Without Changing IDs

FIGURE 44 Reference Topology: Moving PEs Without Changing IDs



In the following example, PE 18 is moved to a different CB port, and PE 19 is moved under PE 17.

- Enter the **spx allow-pe-movement** command in global configuration mode.

```
SPX(config)# spx allow-pe-movement
Please remove the spx allow-pe-movement configuration after the PEs are moved.
```

```
SPX# show spx
T=24m5.6: alone: standalone, D: dynamic cfg, S: static
ID  Type      Role      Mac Address  Pri State  Comment
1   S ICX7750-48XGF active    609c.9f1f.9900 128 local  Ready
2   S ICX7750-48XGF standby   cc4e.246d.9b00 128 remote Ready
17  S ICX7450-48G  spx-pe   cc4e.248e.2f90 N/A remote Ready
18  S ICX7450-48GF spx-pe   cc4e.246c.f850 N/A remote Ready
19  S ICX7450-48GF spx-pe   cc4e.246d.10b8 N/A remote Ready
    standby active
    +----+ +----+
    | 2 |2/4--2/1| 1 |2/4
    +----+ +----+
          +----+ +----+
1/1/1--2/1| 17 |2/3--2/1| 18 |2/2--2/2| 19 |
          +----+ +----+ +----+
```

- Identify the SPX port or SPX LAG on the CB where you want the PEs to be moved.

In the example, PE 18 is moved to the new SPX port 2/1/2, and PE 19 is moved under PE 17 using existing SPX ports.

- Configure the required SPX port or SPX LAG on the CB where the PEs are intended to be moved.

```
SPX# configure terminal
SPX(config)# spx cb-configure
SPX(config-spx-cb)# spx-port 2/1/2
SPX(config-spx-cb)# end
```

For a linear topology, configure the new SPX port on the CB.

Physically disconnect the transit PE, and move it to the desired SPX port.

- Physically remove PE 18 18/2/2 from 17/2/3, and move it to 2/1/2. Physically remove PE 19 19/2/2 from 18/2/2, and move it to 17/2/3.
- The topology stabilizes and reconverges with the new set of SPX ports.
- The old PE IDs are retained. The PE ID configuration changes to reflect the topology changes. Use the **show running-config** command to check the PE ID configuration.

```
pe-id 1/1/1 17 19
pe-id 2/1/1 18
```

- Use the **show spx** command to verify the operational status of the PEs.

```
SPX# show spx
T=24m5.6: alone: standalone, D: dynamic cfg, S: static
ID  Type          Role      Mac Address      Pri State  Comment
1   S ICX7750-48XGF active    609c.9f1f.9900  128 local  Ready
2   S ICX7750-48XGF standby  cc4e.246d.9b00  128 remote Ready
17  S ICX7450-48G  spx-pe   cc4e.248e.2f90  N/A remote Ready
18  S ICX7450-48GF spx-pe   cc4e.246c.f850  N/A remote Ready
19  S ICX7450-48GF spx-pe   cc4e.246d.10b8  N/A remote Ready
standby          active
+----+          +----+
| 2 |2/4--2/1| 1 |2/4
+----+          +----+
          +-----+ +-----+
1/1/1--2/1| 17 |2/3--2/2| 19 |
          +-----+ +-----+
          +-----+
2/1/2--2/1| 18 |2/2
          +-----+
```

- Verify that CSP is operational, that PEs are in the ready state, and that traffic has resumed. Use the **show spx csp all** command to verify the CSP operational status and any other items as needed. If the topology includes a PE ring, use the **show spx ring all** command to verify that the ring is in the active state.
- Save the configuration.

NOTE

There are no specific **show** commands for PE movement. All commands that apply to SPX also apply to ZTP. Refer to [Debugging and Verification Commands](#) on page 67.

Deployment Scenario 8: Adding a New Link Between CB-PE or PE-PE to Change Existing Linear Topology to Ring Topology

You can discover new physical links between a CB and an edge PE or between two edge PEs and form a PE ring from PE chains. This is applicable to FastIron 08.0.70 and later.

Make all necessary physical connections between two edge PEs or between an edge PE and the CB. At least one end of the link must be one of these port types:

- CB SPX port or SPX LAG member with no live PE link.
- CB port with zero-touch port configuration.
- Edge PE port on a non-base-module (2, 3, and 4 are non-base modules), excluding upstream SPX port or SPX LAG members and ports with configuration. In this case, the edge PE is the last unit of a PE chain.

FIGURE 45 Adding New Links Between CB and PE

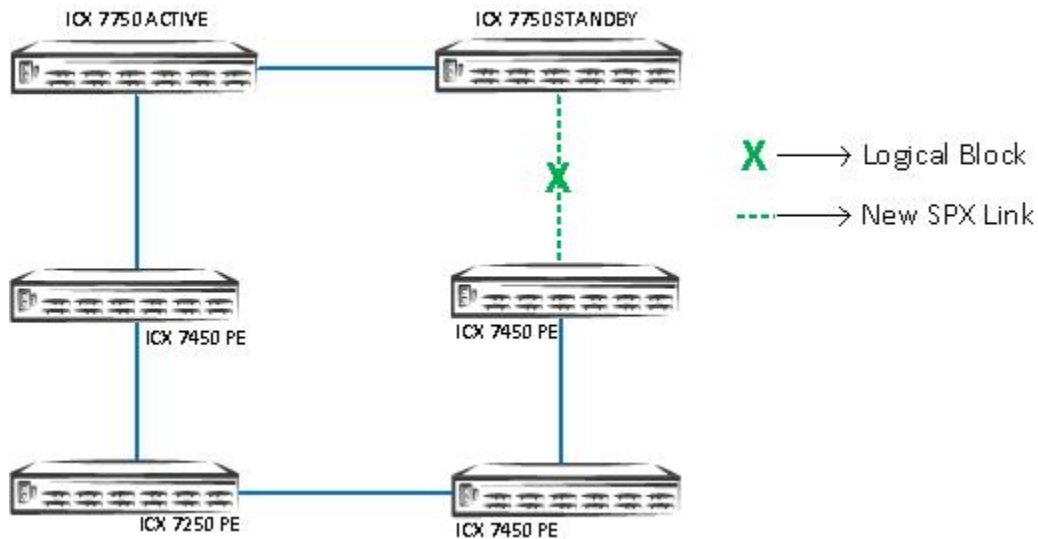
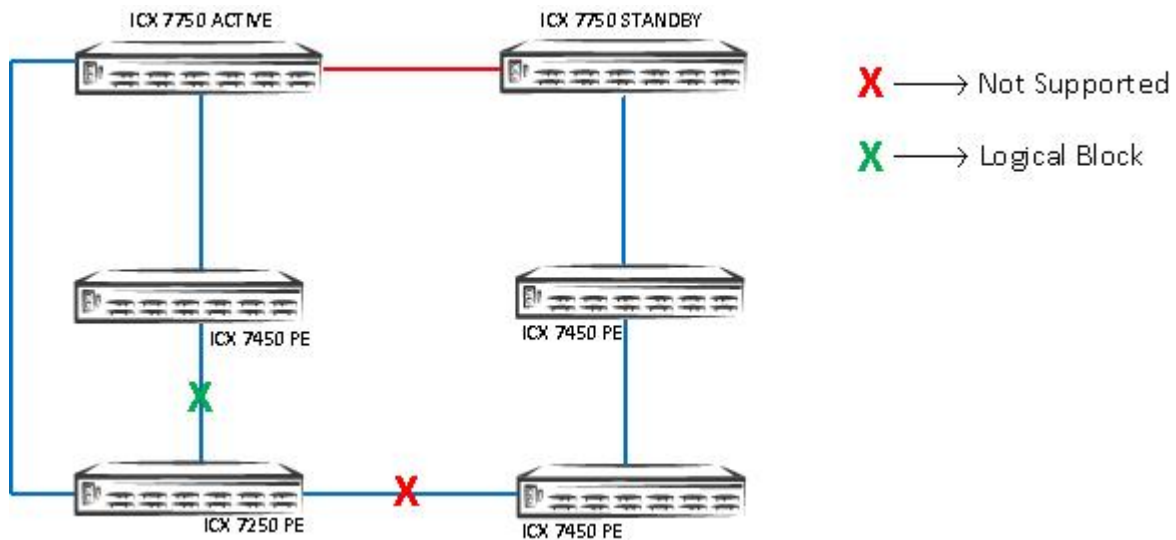


FIGURE 46 Adding New Links Between PE and PE



SPX interactive-setup provides an option to discover new links and convert chains to a ring.

1. In EXEC mode, enter the **spx interactive-setup** command, and select either option 2 or 3 when prompted.

```
ICX7750-20Q Router# spx interactive-setup
You can abort spx interactive-setup at any stage by <ctrl-c>
CBPE17PE18PE20PE21PE24data portPE21PE241G10Ga) T-connectionb) CB data portsd) different
speedsPE21PE24c) PE data ports have configurationconfig
0: quit
1: change PE IDs
2: discover and convert new units (no startup-config flash) to PEs
3: discover and convert existing/new standalone units to PEs
2&3 can also find new links and convert chain(s) to ring.
Please type your selection: 2
Probing topology to find new units...
```

SPX interactive-setup discovers the new link.

2. After the process completes, enter the **write memory** command to save the newly generated SPX port and SPX LAG configuration.

```
Probing topology to find new units...
Detect 2 new links (classified to 1 logical link) between existing units.
New logical link 0: =====
+-----+ +-----+ +-----+ +-----+
2/1/9--4/1| 23 |2/1==2/1| 24 |2/5==2/1| 25 |2/5==2/5| 26 |
+-----+ +-----+ +-----+ +-----+
+-----+ +-----+
1/1/5==3/1| 17 |2/1==2/1| 27 |
+-----+ +-----+
The new logical link (PE26--PE27: 2 link(s): 26/2/1-27/2/3 26/2/2-27/2/4) will make the above two
chains to
form a ring.
Do you want to select this link? (enter 'y' or 'n'): y
spx interactive-setup discovers 1 link (valid#= 1, selected#= 1) and 0 chain
ICX7750-20Q Router#T=53m40.8: Add spx-lag 26/2/1 to 26/2/2 for PE 26 to form a ring. Please do "write
memory".
T=53m40.8: Add spx-lag 27/2/3 to 27/2/4 for for PE 27 to form a ring. Please do "write memory".
ICX7750-20Q Router# write memory
ICX7750-20Q Router# show spx
... snipped
active standby
+----+ +----+ +----+
=2/1| 2 |2/4--2/4| 3 |2/1==2/1| 1 |2/4=
| +----+ +----+ +----+ |
| |
|-----|
+-----+ +-----+ +-----+ +-----+ +-----+
1/1/5==3/1| 17 |2/1==2/1| 27 |2/3==2/1| 26 |2/5==2/5| 25 |2/1==2/5| 24 |2/1=
+-----+ +-----+ +-----+ +-----+ +-----+ |
|
+-----+ |
2/1/9--4/1| 23 |2/1=
+-----
```

Any invalid connection is reported in a system message, and you are asked to remove it. Valid connections and ring formation are reported in system output.

The following example shows a warning message received after an invalid connection was detected.

```
Warning! The following 1 logical link(s) are invalid. Please remove them because they may cause
loops.
CB--PE17: error: CB 1/1/5 isn't spx-port/lag or ZTP-ports, 2 link(s): 1/1/5-17/3/1 1/1/7-17/4/1
Spx interactive-setup does not find any new unit
spx interactive-setup detects invalid topology, aborts
```

The following example shows a system message received when a valid connection is detected that cannot be handled by the system. In this case, you are requested to use the **multi-spx-port** or **multi-spx-lag** command to add the link, or to remove the link to avoid loops.

```
The following 1 logical link(s) would expand existing spx-port/lag. They are not handled.
Please manually use "multi-spx-port/lag" to add the link to existing spx-port/lag, or remove them
because they may cause loops.
PE17--PE27: 1 link(s): 17/2/1-27/2/1
```

Deployment Recommendations for ZTP

Keep these points in mind when configuring the Campus Fabric domain with the zero-touch or SPX interactive-setup utility:

- Before LAGs are formed, individual links may cause loops, especially if the CB or PE is connected to clients that are running any control protocols.

- Multiple links between any two units cause loops until they are converted to an SPX LAG. Ruckus recommends using **spx-port** or **spx-lag** to avoid loops.
- Loops cause high traffic in the looped ports and may cause high CPU if the looped packets are trapped to the CPU.
- The zero-touch utility does not run if the CPU level is greater than 96 percent. Instead, the utility issues a warning that suggests using the SPX interactive-setup utility.
- The SPX interactive-setup utility can run even under high CPU conditions.
- Loops should be resolved once the zero-touch or SPX interactive-setup utility has converted multiple links between any two units to SPX LAGs.
- As a best practice, you should remove the **zero-touch-ports** configuration once PE discovery is complete. And also disable **zero-touch-enable**.
- Once the **zero-touch-enable** configuration is removed after discovery, if the user wants to make changes to the existing system, such as changing PE IDs or moving PEs, the user can run SPX interactive-setup.
- Do not connect hosts or access points to PE candidates until zero-touch provisioning is complete.
- In a live production setup with connected hosts and access points, Ruckus recommends the SPX interactive-setup utility.
- Zero-touch configuration works for PE candidates that have no configuration.
- After new units are plugged in the Campus Fabric domain, check for loops by entering the **clear statistics** and then the **show statistics brief** commands on the CB. The packet counts displayed should be low. If packet counts are high, then that indicates there are loops in the system. The SPX interactive-setup utility can resolve all loops.

You can use manual configuration instead of ZTP or SPX interactive-setup to have greater control over the discovery process and avoid loops and high CPU. Manual configuration requires the following steps.

1. Configure the correct SPX ports or SPX LAGs on the CB and on new PE candidates.
2. Configure and reload new units to convert them to PEs.
3. Physically connect the links.

Best Practices

Consider the following best practices for bringing up the SPX topology.

The zero-touch utility is not enabled by default on a device. Use the **zero-touch-enable** command under **spx cb-configure** on the CB. Be sure to remove the **zero-touch-enable** configuration once PE units have been discovered.

- A new unit has no startup configuration flash during bootup. (The user has never issued the **write memory** command.)

You can enter the **erase startup-config** and **reload** commands to make it a new unit.

```
ICX7450-48 Router# erase startup-config
Erase startup-config Done.dhcp server lease database is also removed
stacking/spx pe flash file is also removed
ICX7450-48 Router# reloadAre you sure? (enter 'y' or 'n'): y
```

- Remove the **spx allow-pe-movement** configuration after the PEs are moved.

Remove the **spx allow-pe-movement** configuration using the **no spx allow-pe-movement** command in global configuration mode once the PEs have been moved and the Campus Fabric topology is stable.

```
SPX(config)# spx allow-pe-movement
Please remove the spx allow-pe-movement configuration after the PEs are moved
```

- Before changing PE IDs, make sure that you know what reconfiguration will be required related to the changed IDs.

- Do not attempt to change PE IDs when **spx allow-pe-movement** is configured.
Ruckus recommends changing PE IDs, if necessary, during the initial bring-up of Campus Fabric, before connecting hosts or configuring any protocols.
- If ports are planned for dedicated use in a Campus Fabric domain, configure the ports as SPX LAGs or SPX ports rather than as zero-touch ports. The zero-touch utility splits them into separate SPX LAGs as needed during the discovery process, using its Auto-LAG capability. This approach helps avoid looping of packets, which can cause high CPU utilization. Refer to [Zero-Touch Deployment Considerations](#) on page 95 for more information.
- With zero-touch, PE ID assignments are automatically based on the pool of available IDs. If you want to use specific IDs, use the SPX interactive-setup utility.
- When adding new PE units to existing PE units, use the SPX interactive-setup utility instead of zero-touch. When adding new units to an existing PE linear chain to form an SPX ring, use manual setup instead of zero-touch in releases prior to FastIron 08.0.70.
- From FastIron 08.0.70 and later, SPX interactive-setup can discover new links between PE and PE or CB and PE when a user tries to make an SPX PE ring topology on an existing linear topology by adding new links. Refer to [Deployment Scenario 8: Adding a New Link Between CB-PE or PE-PE to Change Existing Linear Topology to Ring Topology](#) on page 128.
- Wait at least 30 seconds before running the SPX interactive-setup utility again.

```
SPX# spx interactive-setupInteractive-setup ends 15 seconds ago, please retry in 15 sec
```

Debugging Notes

- If zero-touch is taking longer than expected, enter the following command and save the output for analysis: **debug stack zero-touch 2** (where 2 is the level of debug).
- During SPX system deployment, make sure that ports intended for zero-touch discovery remain up. If for any reason any of these ports go down, the zero-touch utility automatically creates LAGs based on ports detected during zero-touch discovery.
- Do not run the zero-touch utility if any of the PE candidates contain any stacking configuration. The recommended best practice is to create a clean unit before any zero-touch deployment.
- Beginning with FastIron 08.0.61, a user can collect the dumps of the following ZTP commands for debugging purposes:
 - **show spx zero-touch status**
 - **show spx zero-touch ipc**
 - **show spx zero-touch log**
- If a new unit is running a switch image, once the unit is added, the Auto-Copy utility copies the router image to the new unit. Refer to [Image Upgrade](#) on page 63 for more information. If the Auto-Copy utility is not completed, you must save the configuration and reload the CB.



© 2018 ARRIS Enterprises LLC. All rights reserved.
Ruckus Wireless, Inc., a wholly owned subsidiary of ARRIS International plc.
350 West Java Dr., Sunnyvale, CA 94089 USA
www.ruckuswireless.com