
TECHNICAL DECISION MAKER PRESENTATION

Cisco Catalyst 9300 Series

Prepared as a convenient PDF reference for network planning, platform evaluation, and procurement discussions.

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The bridge to possible

Cisco Catalyst 9300 Series Switches Architecture

Technical Decision Maker Presentation

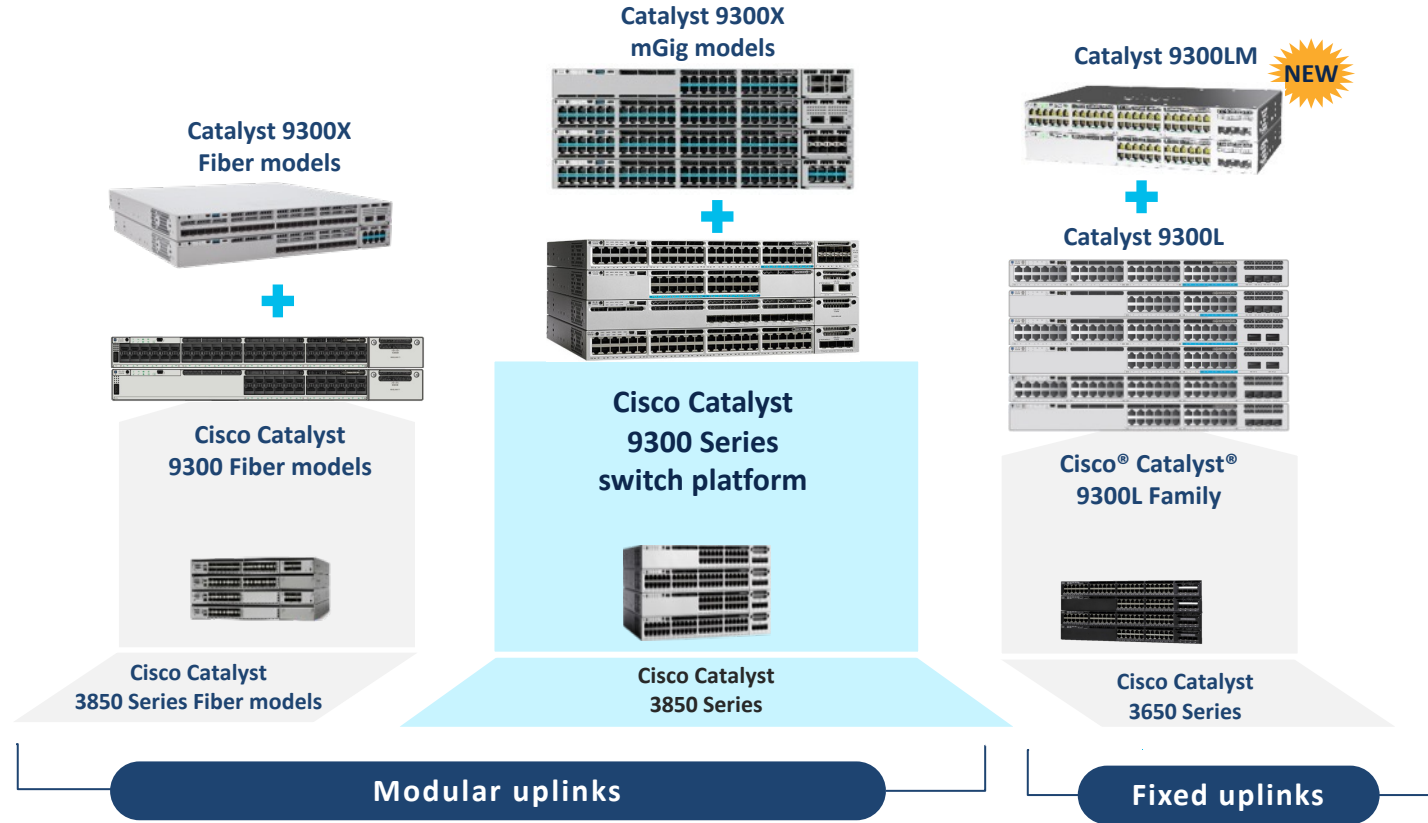
Agenda



- Cisco Catalyst™ 9300 and 9300X switching overview
- MultiGigabit Ethernet
- Smart Buildings
- High Availability
- Hardware Architecture
- Cisco IOS® XE
- Quality of Service
- Access Control Lists
- Application Hosting
- Security
- AVB & PTP
- Flexible Design and Overlay Architectures
- Programmability & Manageability

Cisco Catalyst 9300 Series

Platform transitions



Cisco Catalyst 9300 Series

Extended Catalyst 9300 Series with Catalyst 9300X models

Catalyst® 9300 models with **modular uplinks**

1G copper ports with PoE/Cisco UPOE®/UPOE+



48/24 ports data 1G



48/24 ports UPOE 1G



48/24 ports PoE+ 1G



48/24 ports UPOE+ 1G



48/24 ports UPOE 1G

Multigigabit models with UPOE



48/24 ports Multigigabit

1G fiber



48/24 ports SFP 1G

Catalyst® 9300X models with **modular uplinks**

Shipping

1/10/25G Fiber



24/12 ports SFP+ 1G/10G/25G

mGig Copper models



24/48 mGig with UPOE+



48 mGig port Data only

StackWise® and StackPower cables



50CM-1M-3M



30CM-150CM

9300 Uplinks



4x Multigigabit



4x 1G SFP



8x 1/10G SFP/SFP+



2x 40G QSFP



2x 1/10/25G SFP/SFP+

9300X Uplinks



4x 100/40G+ QSFP



2x 100/40G QSFP



8x 10G-Mgig



8x 25/10/1G**

Catalyst 9300 models with **Fixed uplinks**

1G Copper Data & PoE



48/24 ports PoE+/data 1G

Multigigabit models with UPOE



48/24 ports PoE+ 1G

4x1G or 4x10G fixed Uplinks

4x1G or 4x10G fixed Uplinks

Catalyst® 9300LM models with **Fixed uplinks**

NEW

4x25G Fixed Uplinks



40x 1G + 8 x mgig/10G



24 x 1G UPOE



48 x 1G Data



48 x 1G UPOE

Optional StackKit



Stack Adapters



50CM-1M-3M

Platinum-rated power supplies

Common components



315W AC



715W AC/DC



1100W AC



1900W AC

Modular fans



External Storage



USB 3.0
120/240GB

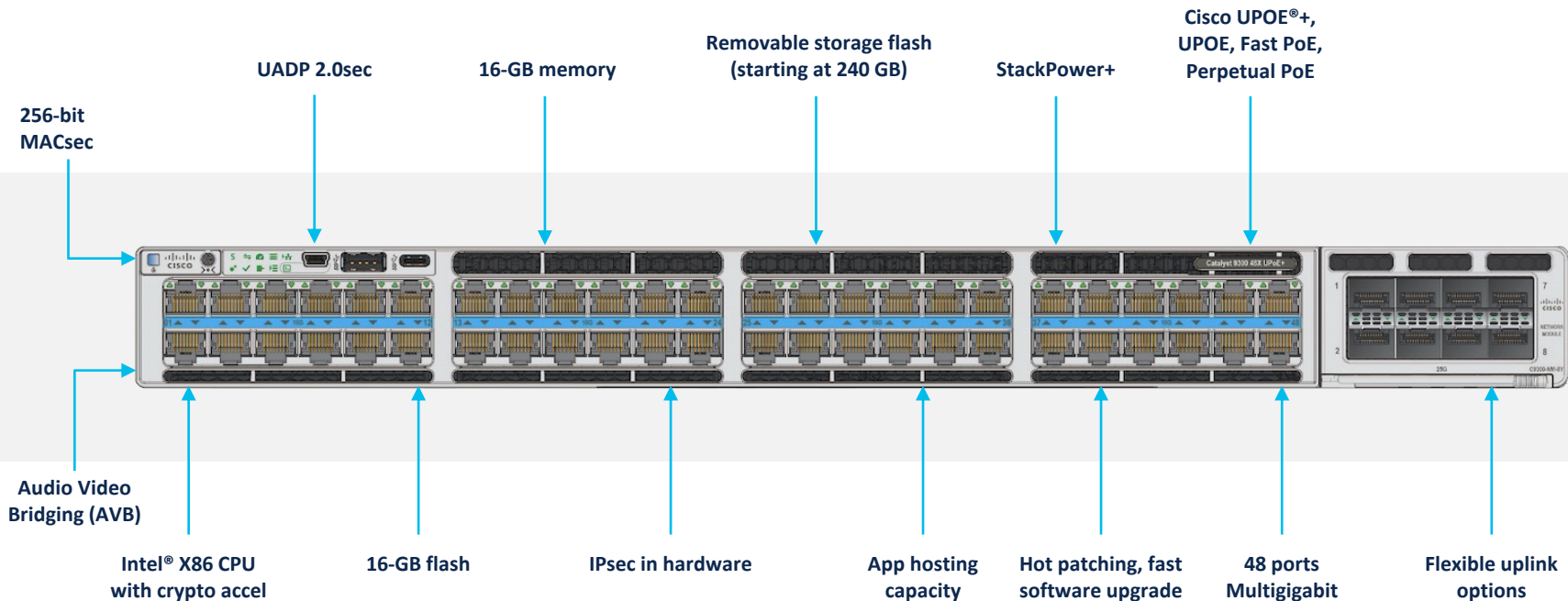
*Supported on 48HX and 24Y

Catalyst 9300X

High Performance Fixed Access Switch – Flexible Uplinks



Catalyst 9300X – High Performance Access Switch



Investment protection with Catalyst 9300X

External storage
(240-GB SSD)

Redundant fans

Redundant power



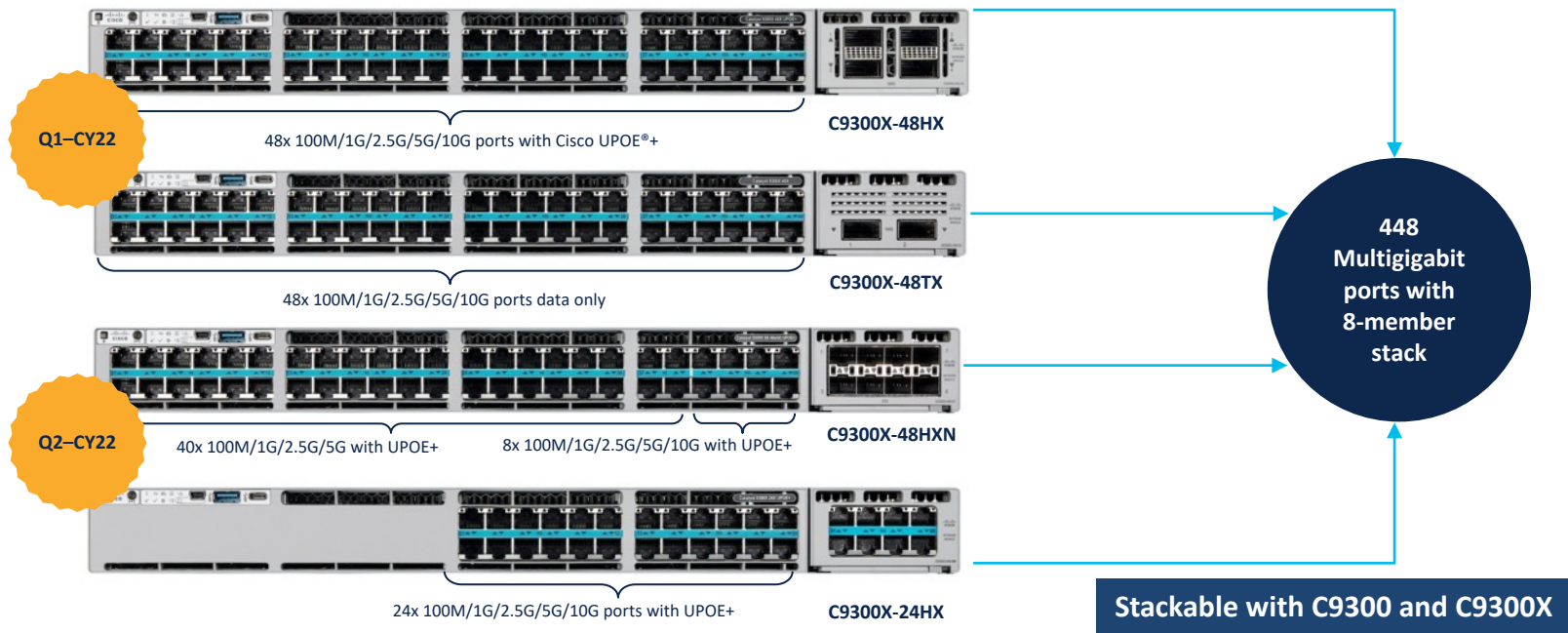
Data stack cables
1T Stacking BW

StackPower cables

Optional power supplies
(AC+DC)

Common components and stacking backward compatible with Catalyst® 9300 Series

Catalyst 9300X Multigigabit models



Highest Multigigabit ports in the industry with standalone and StackWise®-1T

Catalyst 9300X high-speed fiber models

Shipping



24x 25/10/1G

C9300X-24Y



12x 25/10/1G

C9300X-12Y

Stackable with
9300/9300X



3850 10G fiber
replacement



Collapsed access



Fiber To The
Desktop (FTTD)



Servers

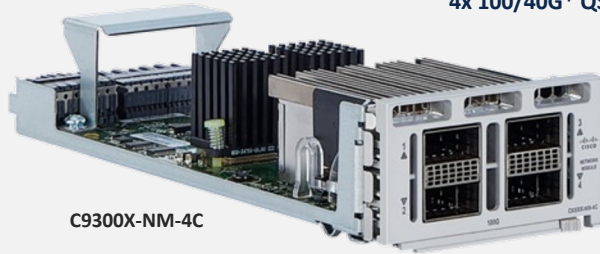
Bringing stackable high-speed fiber to access

Highest and most flexible speed uplink options in the industry

Catalyst 9300X-only modular uplinks

100/40G modular uplinks

Q1CY22



4x 100/40G* QSFP

C9300X-NM-4C

2x 100/40G QSFP



C9300X-NM-2C

Shipping

Multigigabit uplinks

Q1CY22

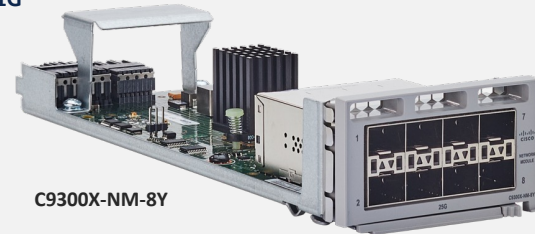


8x 10G-Multigigabit

C9300X-NM-8M

10/25G modular uplinks

8x 25/10/1G**



C9300X-NM-8Y

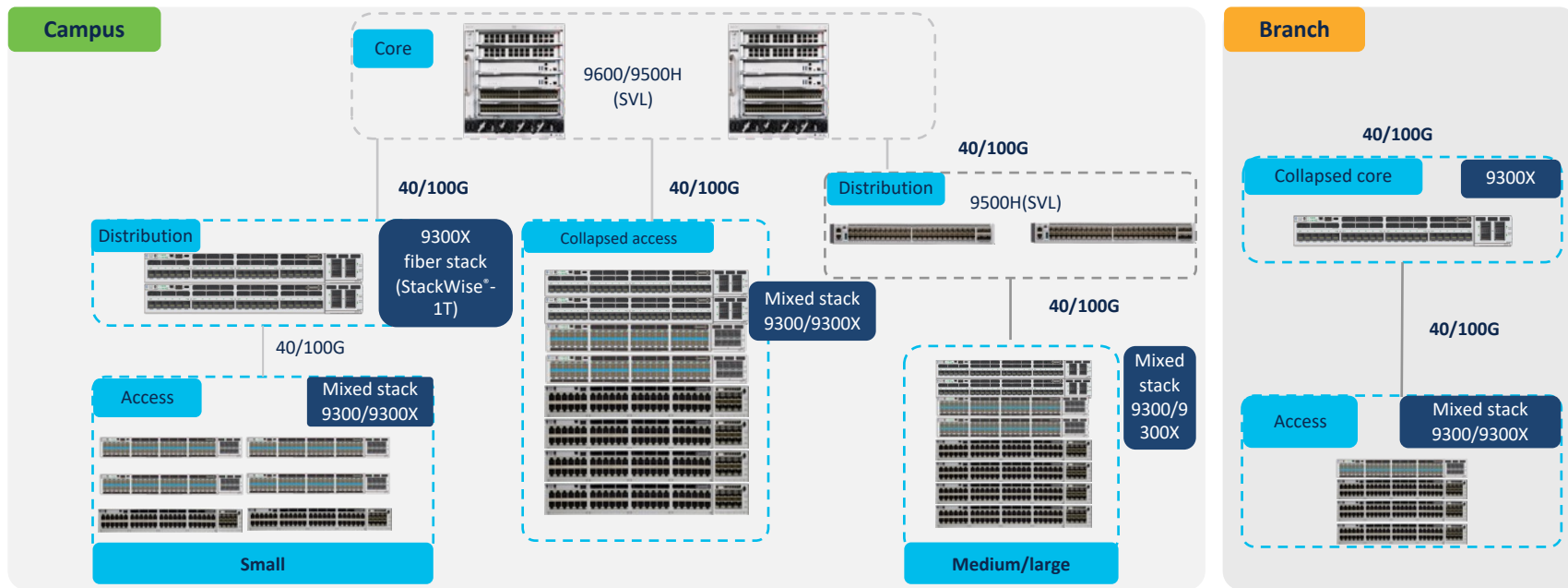
Shipping

* C9300X-NM-4C is supported only C9300X-24Y and C9300X-48HX/TX.

** Last 4 ports disabled on C9300X-48HXN.

PoE is not supported on Uplink modules

Flexible design options with the Catalyst 9300X in 2- or 3-tier architecture



Bringing 10/25/40/100G with StackWise-1 Terabit to access

Catalyst 9300

Leading Fixed Access Switch - Flexible Uplinks

Cisco Catalyst 9300 Series

Flexible Modular Uplink Models – Leading Fixed Access Switch

Catalyst® 9300 non-X models with **modular uplinks**

1G copper ports Data Only



48 ports data 1G



24 ports data 1G

1G copper ports with PoE/Cisco UPOE®/UPOE+



48/24 ports PoE+ 1G

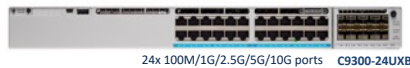


48/24 ports UPOE 1G

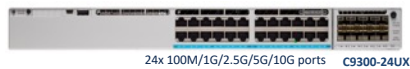


48/24 ports UPOE+ 1G

Multigigabit models with UPOE



24x 100M/1G/2.5G/5G/10G ports C9300-24UXB



24x 100M/1G/2.5G/5G/10G ports C9300-24UX



36x 2.5G ports 12x Multigigabit ports C9300-48UXM



48x 5G ports C9300-48UN

1G fiber models



48/24 ports SFP 1G

9300 Increased Scale models



C9300-48UB



C9300-24UXB



C9300-24UB

2x
Buffers

More
Packet Buffers

2-4x
Scale

Increased
Network Scale

Catalyst 9300 modular Uplinks

Common
components



4x Multigigabit



4x 1G SFP



8x 1/10G SFP/SFP+



2x 1/10/25G SFP/SFP+



2x 40G QSFP

StackWise® and StackPower cables



50CM-1M-3M



30CM-150CM

Platinum-rated power supplies



315W AC



715W AC/DC



1100W AC



1900W AC

Modular Fans



Catalyst 9300 – Leading Fixed Access Switch

Built-in RFID
(passive)

USB 2.0 flash drive

X86 CPU

UADP 2.0 ASIC

USB Console
Mini-USB type B

Multigigabit Capable

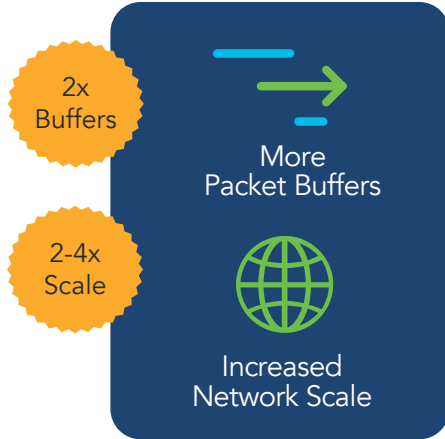
Unmatched POE
High power – 60/90W UPOE/UPOE+
Resiliency – Perpetual/Fast

Flexible Fixed or Modular Uplinks



Catalyst 9300 Increased Scale Platform

Fixed Access optimized for Media Distribution and IP Storage



C9300-48UB: 48 Port 1G switch with UPOE



C9300-24UXB: 24 Port Multigigabit switch with UPOE



C9300-24UB: 24 Port 1G switch with UPOE

Catalyst 9300 Leadership

UADP 2.0 XL

- Cisco IOS® XE Software
- x86 CPU and containers
- Cisco SD-Access
- Encrypted Traffic Analytics (ETA)
- AES-256/MACsec-256
- Trustworthy systems
- Cisco StackWise-480
- IEEE1588 and AVB*
- NBAR2
- Perpetual/Fast PoE
- Model-driven programmability
- Patching/GIR
- Streaming telemetry

Modular fans



8x 10G



2x 40G



4x Multigigabit



4x 1G



2x 25G

Modular uplinks

Higher-efficiency AC and DC power supplies

New Platinum rated



315W AC



715W AC/DC



1100W AC

Cisco Catalyst 9300 Series

Modular Uplink options

Modular Uplinks (C9300 SKUs)



**4x Multigigabit
copper**

C9300-NM-4M



4x 1G SFP

C9300-NM-4G



**8x 10G SFP,
SFP+**

C9300-NM-8X



**2x 1G,10G, 25G
SFP, SFP+**

C9300-NM-2Y



2x 40G QSFP

C9300-NM-2Q

* Above Uplink modules not supported on C9300X
PoE is not supported on Uplink modules

Catalyst 9300L

Leading Fixed Access Switch – Fixed Uplinks

Cisco Catalyst 9300 Series

Fixed Uplink Models

Fixed Uplinks (C9300L Models)

1G & PoE+



48/24 ports Data

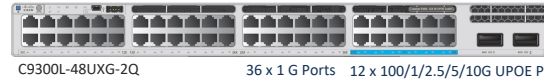
Fixed 1G or 10G
uplinks



48/24 ports PoE+

Fixed 1G or 10G
uplinks

UPOE & mGIG models



C9300L-48UXG-2Q

36 x 1 G Ports 12 x 100/1/2.5/5/10G UPOE Ports

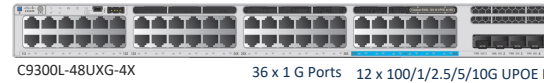
Fixed 40G
uplinks



C9300L-24UXG-2Q

16 x 1 G Ports 8 x 100/1/2.5/5/10G UPOE Ports

Fixed 10G
uplinks



C9300L-48UXG-4X

36 x 1 G Ports 12 x 100/1/2.5/5/10G UPOE Ports



C9300L-24UXG-4X

16 x 1 G Ports 8 x 100/1/2.5/5/10G UPOE Ports

Optional StackWise-320 Kit

Common components



Stack Adapters



50CM-1M-3M

Platinum-rated power supplies



315W AC



715W AC/DC



1100W AC



1900W AC

Modular Fans



* DC PS is Gold-Rated

Catalyst 9300LM

Shallow Depth Access Switches – Fixed Uplinks

Introducing 9300LM(mini) Series Switches in C9300L Family

Fixed Uplink replacement for Catalyst 3650-mini



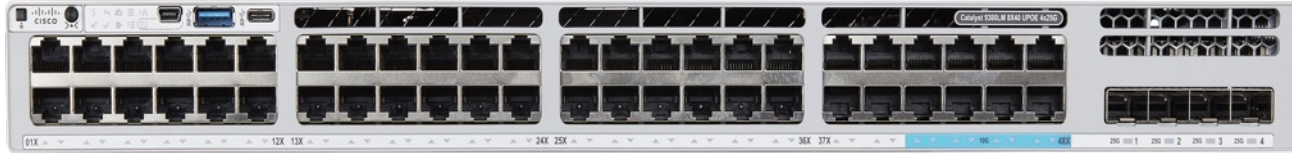
UADP 2.0



X86 CPU



Cisco Open IOS-XE



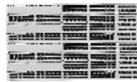
40 X 1G + 8 x mGig-10G

Fixed 25G Uplinks



UPOE

Next-gen IT/OT Workspaces



Cisco StackWise 320
Stackable with C9300L



mGig

Wifi 6E deployments



USB type-A front Panel SSD*
Application hosting

IBN Innovations



HA, Hot Patching,
UPOE



MACsec 256,
ETA



On-box
App hosting



SD-Access, BGP EVPN
AVC, FNF

*FCS+ Release

Cisco Catalyst 9300LM Series

Fixed Uplinks (C9300LM Models)

Multigigabit/UPOE model



C9300LM-48UX-4Y

40 x 1 G + 8 x 100/1/2.5/5/10G UPOE Ports

4 x10/25G
Uplinks

1G Data model



C9300LM-48T-4Y

48 x 1G Ports

4 x10/25G
Uplinks

UPOE models



C9300LM-24U-4Y

24 x 1G UPOE Ports

4 x10/25G
Uplinks



C9300LM-48U-4Y

48 x 1G UPOE Ports

4 x10/25G
Uplinks

NEW

Modular Stacking



Stack Adapters



Stack Cables

NEW

Newer Higher-Efficiency C9300LM only Power supplies



600W AC



715W DC



1000W AC

Modular Fans*



FAN Module

* Data SKU utilize Fixed Fan

Catalyst 9300LM- Shallow Depth



19.2 inches

Catalyst C9300L



11.8-13.2 inches

Catalyst C9300LM



11.6 inches

Catalyst C3650-mini

Dimension(W X H x D)

SKU	AC PSU	DC PSU
Data Models	17.50" x 1.73" x 12.39"	17.50" x 1.73" x 11.86"
UPOE/mGig Models	17.50" x 1.73" x 13.17"	17.50" x 1.73" x 13.03"

Migration Platform for C3650-mini

Modular components

Power supplies and fans

Cisco Catalyst 9300 Series

Common Components

Modular Uplink Models

(C9300/C9300X SKUs)

StackWise® and StackPower cables

- STACK-T1-50CM
- STACK-T1-1M
- STACK-T1-3M
- CAB-SPWR-30CM
- CAB-SPWR-150CM



StackWise 1T/480 & StackPower

Fixed Uplink Models

(C9300L SKUs)

Optional Stack Kit

- STACK-T1-50CM
- STACK-T1-1M
- STACK-T1-3M



- Stack Adaptors



StackWise 320

Platinum rated (90% efficiency)



350W AC-P



715W AC-P



1100W AC-P



1900W AC-P



715W WDC*

Modular Fans



N+1 redundancy on all Catalyst® 9300 Series models

Cisco Catalyst 9300 Series Switches

1900W AC PS

1900W AC-P



- Supported across all Catalyst 9300 and 9300X models and can be mixed with all other power supplies
- Currently shipping with C9300-H Models only and later for other models
- Output power of **1500W** with 115V AC input and **1900W** with 230V AC input
- Special power cable needed for 1900W AC PS

Cisco Catalyst 9300LM Series Exclusive Components

Fixed Uplink Models

(C9300LM SKUs)

NEW

New Stack Kit

Stack Cables



Stack Adaptors



StackWise 320

NEW

Higher Efficiency 9300LM only Power Supplies



600W AC-P



1000W AC-P



715W DC

Modular Fans

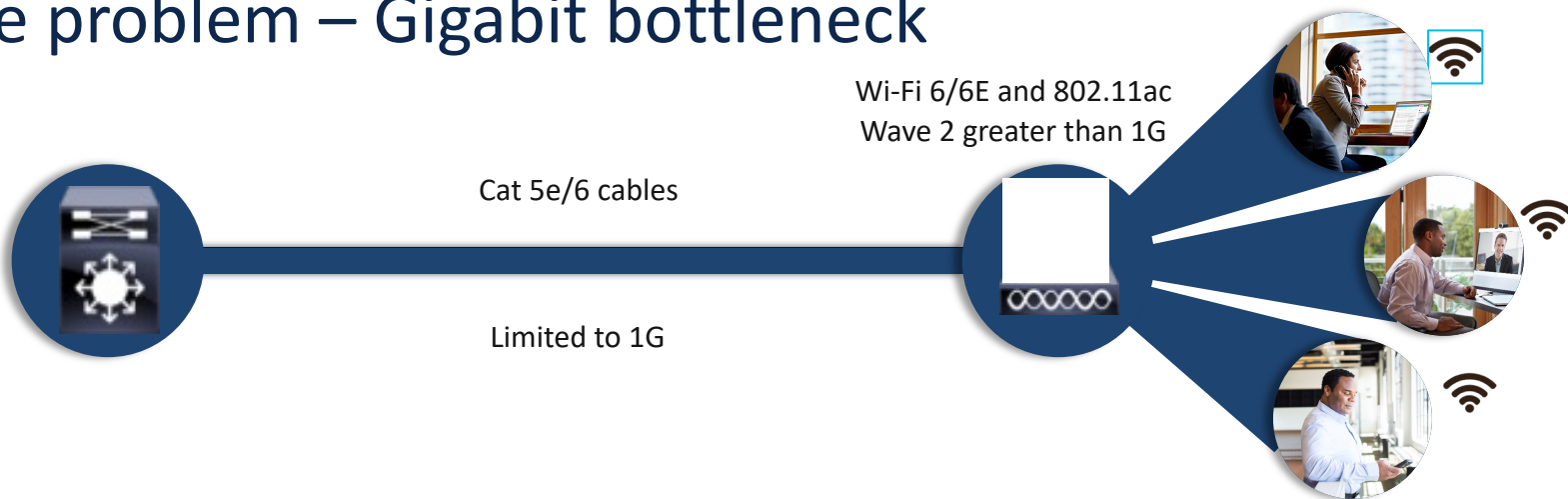


* Data SKU utilize Fixed Fan

Mixed AC/DC Power Supplies supported on 9300LM Series Models

Catalyst 9300 Multigigabit Models for Wi-Fi-6/6E Deployments

The problem – Gigabit bottleneck

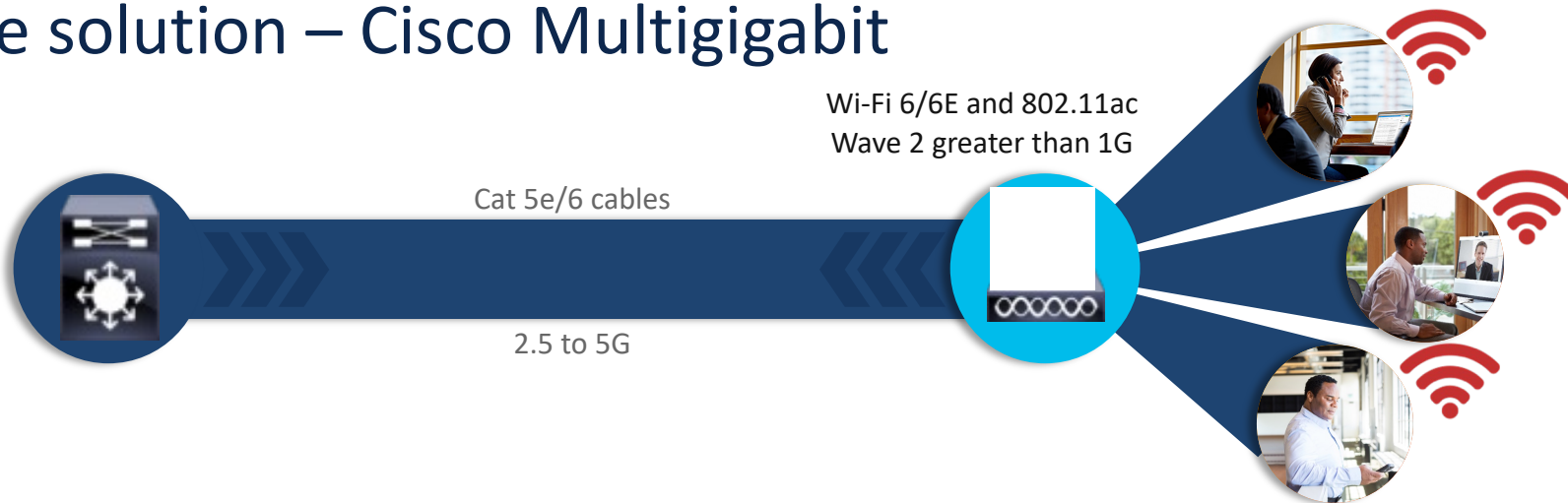


Existing Gigabit infrastructure is insufficient to handle Wi-Fi 6/6E and 802.11ac Wave 2 growth beyond 1 Gbps

Gigabit Ethernet has been around since 1999 and has now become the bottleneck

Market needs an innovative technology to support greater than 1 Gbps over existing cables

The solution – Cisco Multigigabit



Cisco Multigigabit

Is a game-changing innovation allowing enterprise networks to evolve beyond 1G

Enables 2.5 and 5 Gbps up to 100m on legacy cables

Supports all PoE standards up to 90W

Delivers up to 5x faster speeds in enterprise without replacing cabling infrastructure

Multigigabit – IEEE standard



802.3bz

Multigigabit speeds are now IEEE standard



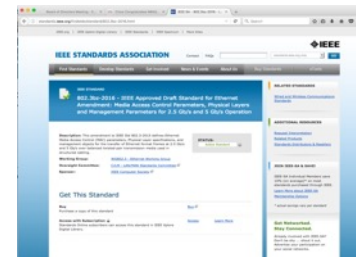
Cisco blog:

<http://blogs.cisco.com/enterprise/nbase-t-alliance-achieving-a-new-industry-standard>



Network World:

<http://www.networkworld.com/article/3124948/lan-wan/ieee-sets-new-ethernet-standard-that-brings-5x-the-speed-without-disruptive-cable-changes.html>



IEEE Post:

<http://standards.ieee.org/findstds/standard/802.3bz-2016.html>



Ethernet Alliance

http://www.ethernetalliance.org/wp-content/uploads/2016/09/EA_IEEE802bz_FINA_L_26Sep16.pdf

What speeds are supported on Multigigabit ports?

Multigigabit PHYs are different from 1-Gbps PHYs

Multigigabit ports are capable of the following speeds:

- 100 Mbps, 1 Gbps, 2.5 Gbps, 5 Gbps, 10 Gbps
- No 10 Mbps on Multigigabit ports

2.5 Gbps and 5 Gbps are now standard

The non-Multigigabit ports are the same as previous line cards and products; they **support 10-Mbps, 100-Mbps, and 1-Gbps speeds**

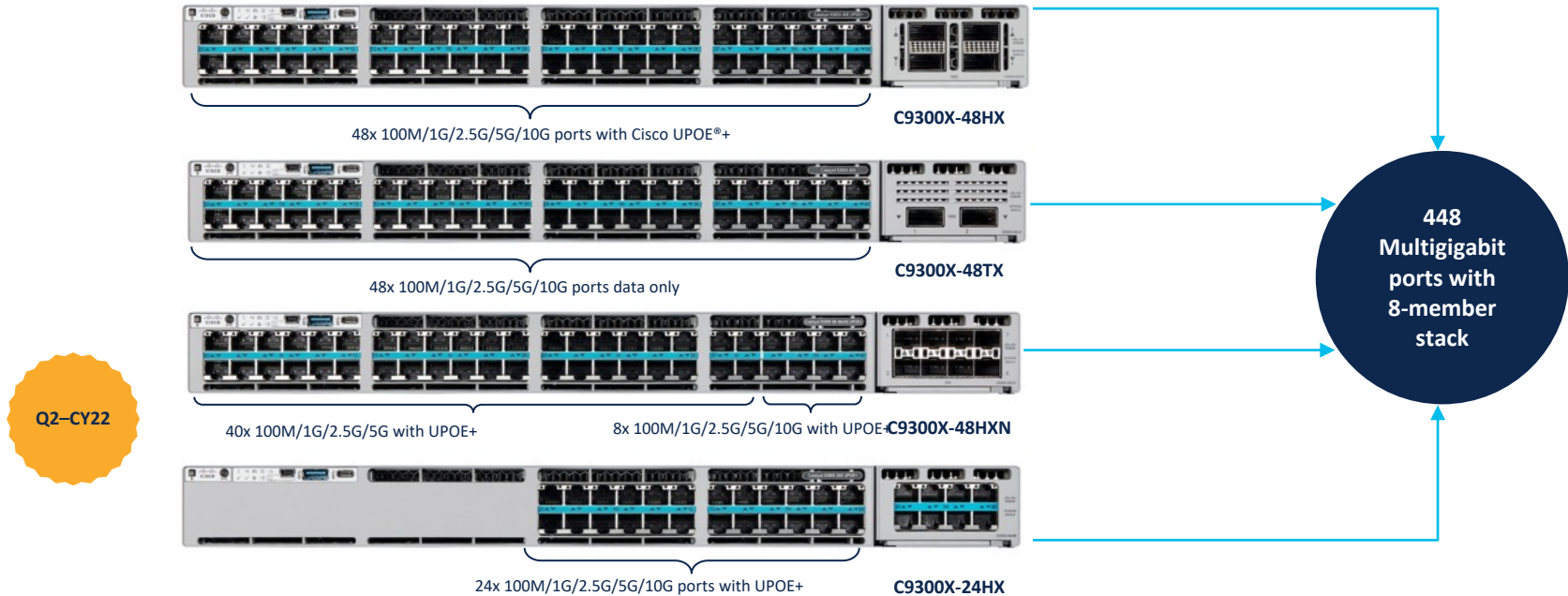
Multigigabit PHYs are same across our Cisco® Catalyst® Multigigabit switch models

Half duplex on Multigigabit ports is **not supported**

		10 Mbps	
		100 Mbps	
		1 Gbps	
		2.5 Gbps	
		5 Gbps	
		10 Gbps	

Cisco Catalyst 9300 Series

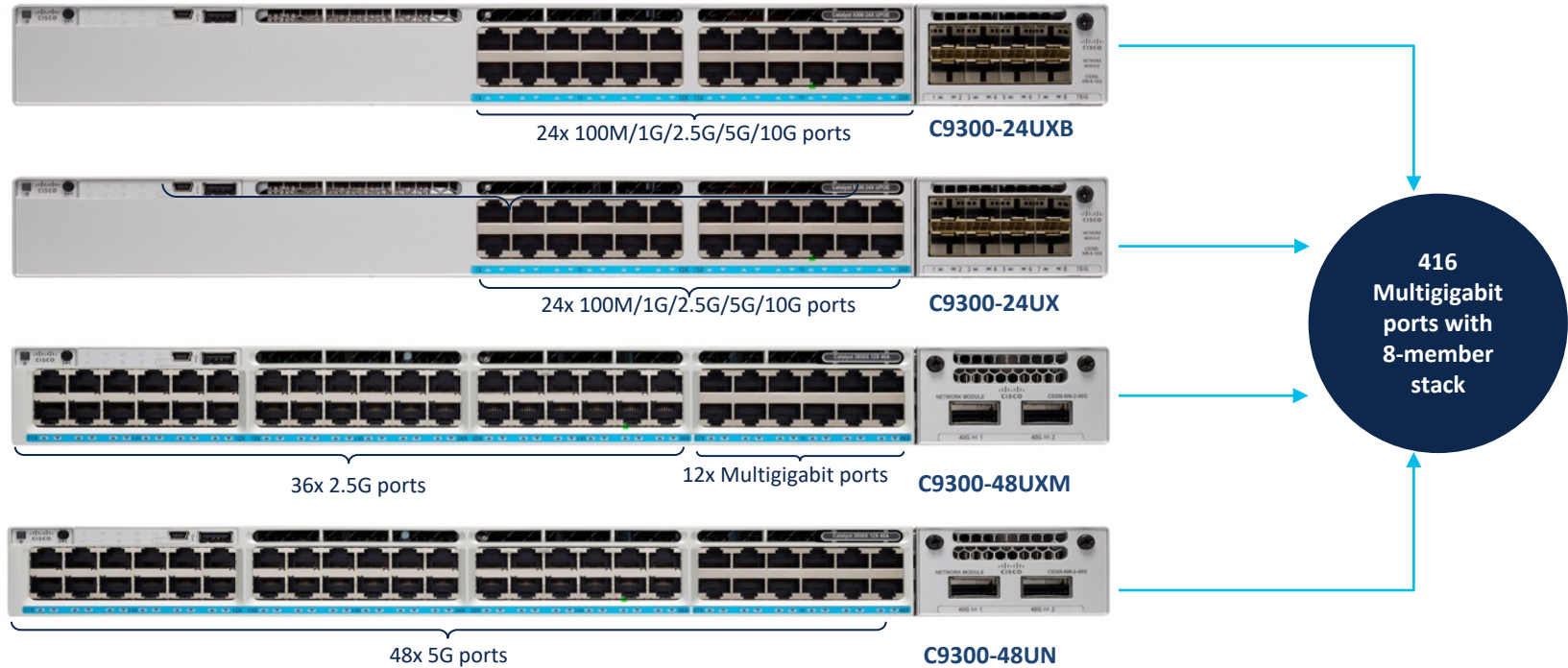
C9300X Multigigabit Models with UPOE+



Highest Multigigabit ports in the industry with standalone and StackWise®-1T

Cisco Catalyst 9300 Series

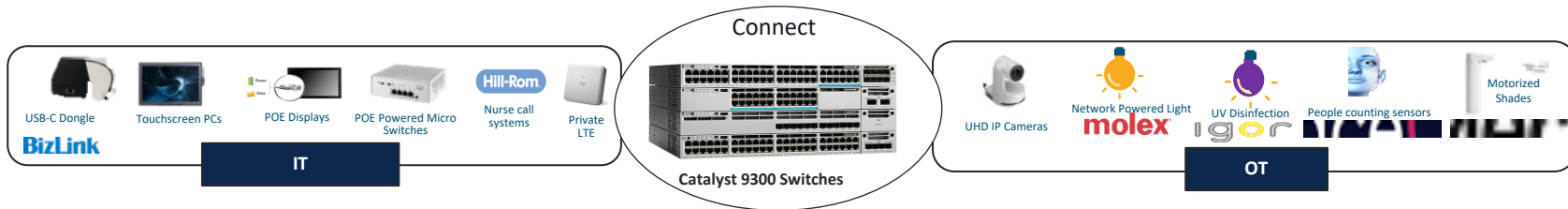
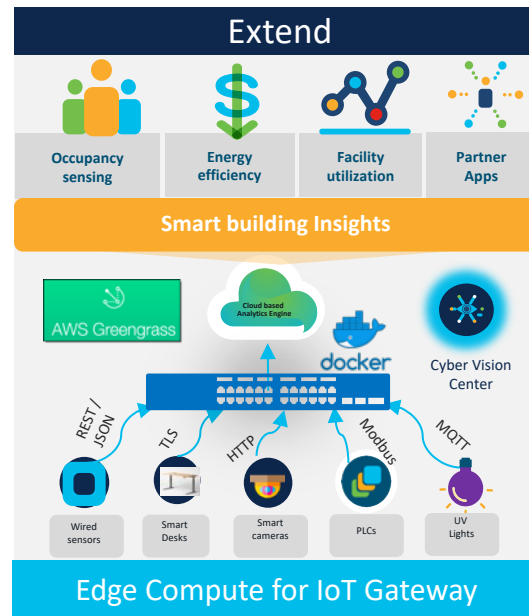
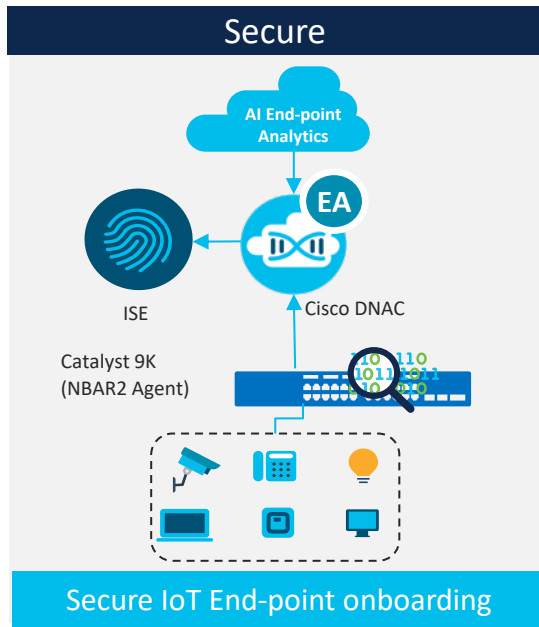
C9300 Multigigabit Models with UPOE



Highest 2.5G and Multigigabit density in the industry

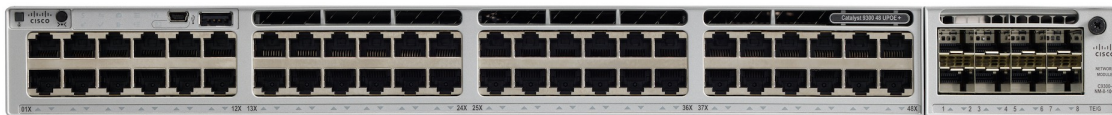
Catalyst 9300 90W UPOE+ Models for Smart Building Deployments

Connect, Secure, Assure and Extend with Catalyst 9300



Catalyst 9300 – Purpose Built for Smart Buildings

C9300-48H: 48-port 90W 1G switch



C9300-24H: 24-port 90W 1G switch



C9300-24HX: 24-port 90W 1G switch



C9300-48HX: 48-port 90W mGig switch



C9300-48HXN: 48-port 90W mGig switch



Enabler for Smart Building

IEEE 802.3 BT Compliant

Backward Compatible with all
PoE Standards

350W AC-P



715W AC-P



1100W AC-P



1900W AC-P

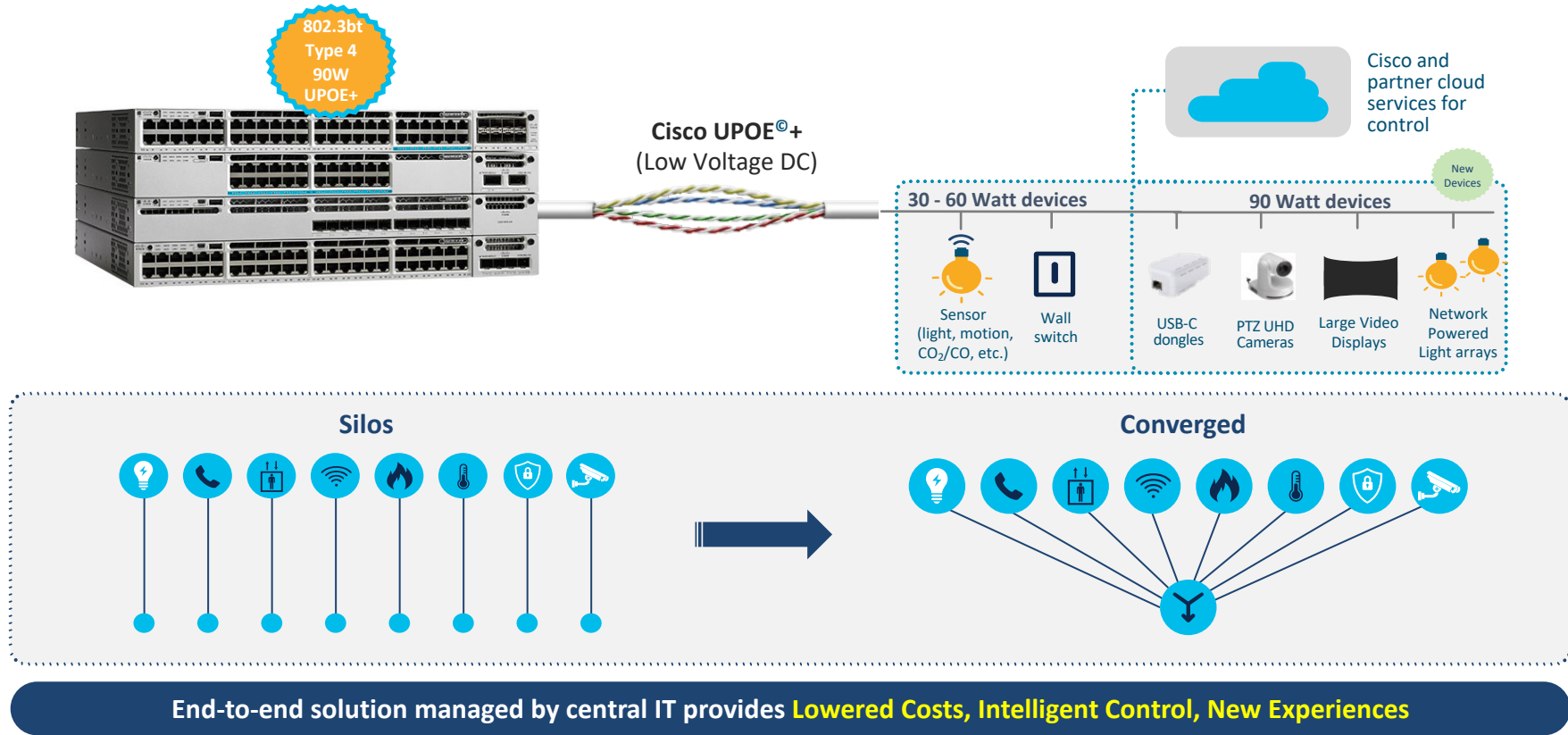


715W WDC



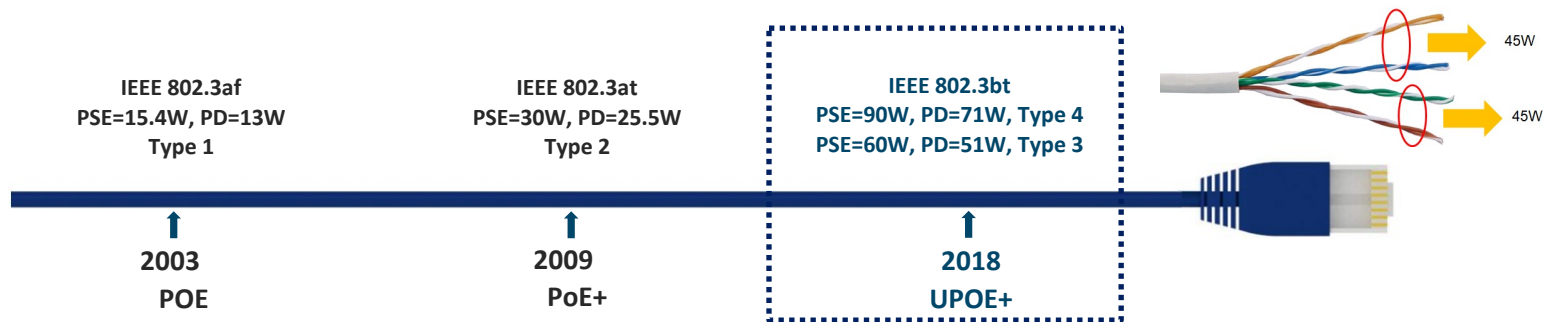
- ✓ 24 and 48 port 90W SKUs
- ✓ Wire-speed, non-blocking performance
- ✓ Seamlessly integrates with Cisco Catalyst 9300 Series copper
- ✓ Supports same optics
- ✓ Common stacking – StackWise-480/1T
- ✓ Common power stacking – StackPower
- ✓ Common power supplies, fans, cables

90W UPOE+ enables IT/OT Convergence in Smart Buildings



IEEE 802.3bt - Introduction

Ratified Sept 2018



- Enables **Delivery of up to 90W** to a powered device, over four pairs of Category 5e and above cables
- Introduces **4 new Classes** for PDs - class 5 to class 8; PSE output 45W - 90W, PD input 40W - 73W
- Introduces **2 new Types** for PSEs & PDs - Type 3(60W) and Type 4 (90W)
- Enables support for **Dual Signature** PDs & **Single Signature** PDs
- Supports **Power Demotion** to handle scenarios where Type 4 PD is connected to a Type 3 PSE.

IEEE 802.3bt Compliance on Catalyst Switches

802.3 BT Complaint



9300-24U/24UB



9300-48U/48UB



9300-24UX/UXB



9300-48UXM



9300-48UN

Catalyst 9300 UPOE Models with **IOS XE 16.12.1**

- Support for **Type 3 PSE (up to 60W per port or Class 6)**
- New POE “upoe-plus” mode configuration to get UPOE+/802.3bt support
- 802.3bt Type 4 PSE not supported. Type 4 PD is supported through power demotion to 60W.

PSE: Power Sourcing Equipment
PD: Powered Device

Catalyst 9300: Configuring IEEE 802.3bt Mode

```
switch(config)# [no] hw-module switch <switch-num> upoe-plus
```

```
Device(config)# hw-module switch 2 upoe-plus
```

```
!!!WARNING!!!This configuration will power cycle the switch to make it effective. Would you like to continue y/n?
```

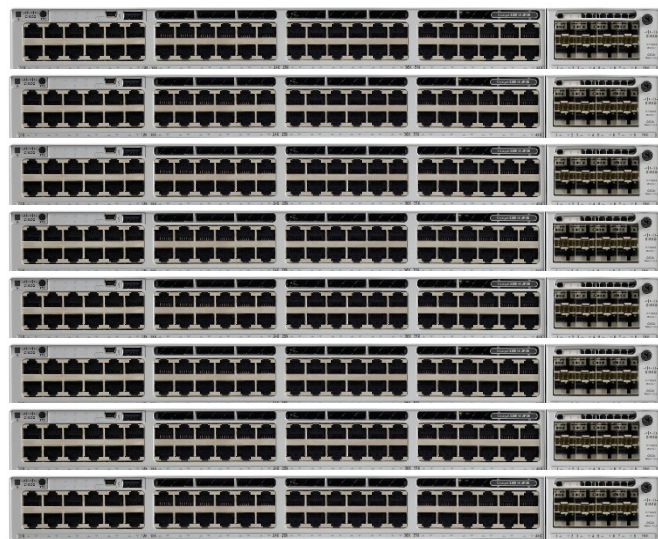
- Default mode (before config) is 802.3at
- Upon config, switch power-cycles to load new firmware for enabling 802.3bt compliance – POE devices are expected to go down and come back up again once reload is finished
- Mode change should be done after system boots up completely and reaches SSO HOT state
- Use 'no hw-module switch <switch-num> upoe-plus' to move back to AT mode
- BT mode is remembered across switchovers

**AF & AT are compatible with BT in “upoe-plus” mode. UPOE is BT compliant.
PDs are provided power ranging from 4W – 60W.**

Applicable to UPOE only models

Catalyst 9300 90W UPOE+ Models

Highest UPOE+ scale in industry to power latest intelligent devices



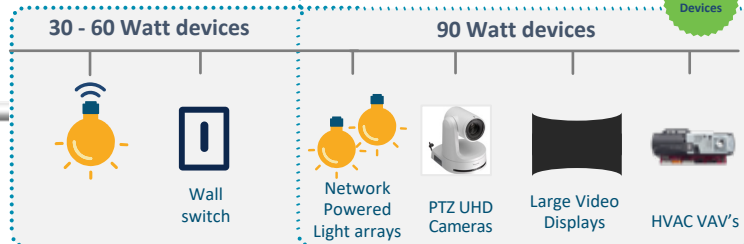
StackWise-1T/480

Cisco UPOE+[®]
(low voltage)

Cat5e/6



Cisco and
partner
cloud
services for
control



- Up to 288 ports* x 90W concurrent power
- IEEE 802.3bt standards compliant
- Backward Compatible with previous POE Standards

21x8=168 Ports with 2x 1100 AC PS in each switch
(combined mode) or 32 x8 = 256 Ports with 2x 1900 AC PS
(9300-48H) or 36 x8 = 288 ports with 2x1900 AC PS (9300X)

~ 21 Ports with 2x1100 AC PS in combined mode or
~ 32 Ports with 2x1900 AC PS in combined mode (9300-48H)
~ 36 Ports with 2x1900 AC PS in combined mode (9300X)

Cisco innovations in Power over Ethernet (PoE)

Deliver a robust low-voltage infrastructure

2-event classification

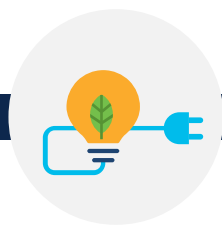
- Fast power negotiation without Link Layer Discovery Protocol (LLDP)
- Physical layer negotiation < 1 second

Perpetual PoE*

- Uninterrupted PoE power during control plane reboot

Fast PoE*

- Bypasses Cisco IOS® control plane boot
- Restores power to Powered Device (PD) within 30 seconds of power resumption



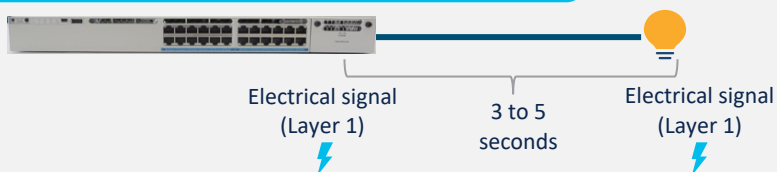
* Support for Perpetual and Fast PoE with StackPower is on roadmap (Catalyst® 9300 SKUs only).

2-event classification

Without 2-event classification



With 2-event classification (hardware based)

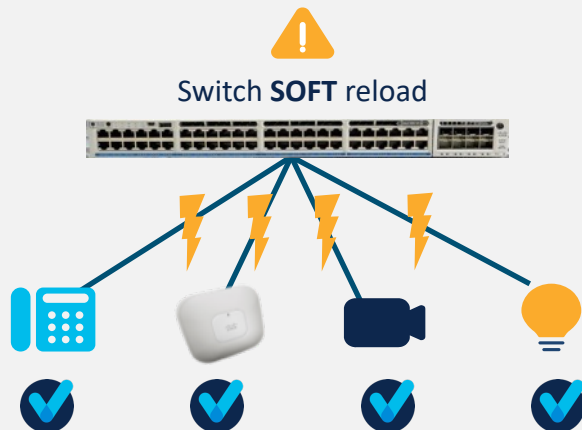


```
Switch> enable
Switch# configure terminal
Switch(config)# interface gigabitethernet2/0/1
Switch(config-if)# power inline port 2-event
Switch(config-if)# end
```

- Class 4 PD gets 30W even before the link comes up, otherwise 15.4W
- Type 2 Power Sourcing Equipment (PSE) sends classification voltage (second handshake) pulse to Class 4 PD (PoE+, 12.96W to 25.5W) confirming it is a high-power-capable PSE
- 30W of power is allocated for PD (PD draws up to 25.5W)
- Both PSE and PD need to support 2-event classification
- No waiting for Cisco® Discovery Protocol or LLDP exchange for PoE+ power levels

Perpetual PoE

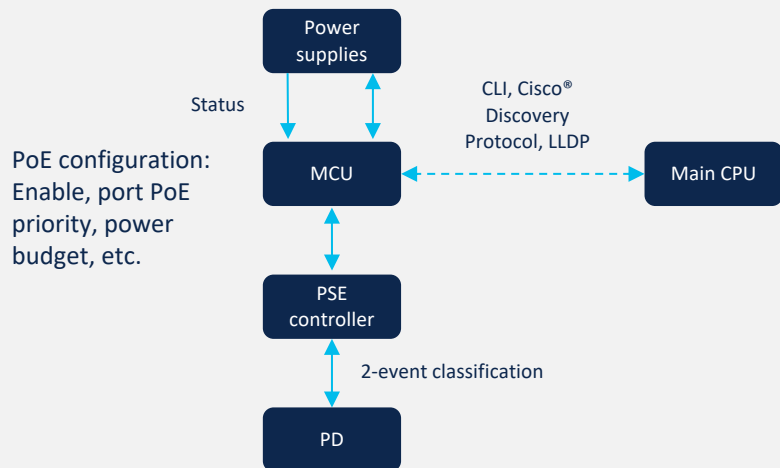
PoE devices connected to switch stay powered even on switch reload



```
Switch> enable
Switch# configure terminal
Switch(config)# interface gigabitethernet2/0/1
Switch(config-if)#
power inline port perpetual-poe-ha
Switch(config-if)# end
```

- PoE devices continue to get last negotiated power
- Applicable to “soft” reload – Image upgrade, software crash, manual reboot
- Supported with stacking deployments
- Not applicable during power outage to switch or when front end processor is removed
- Not applicable when switch is in hibernation mode

Fast PoE

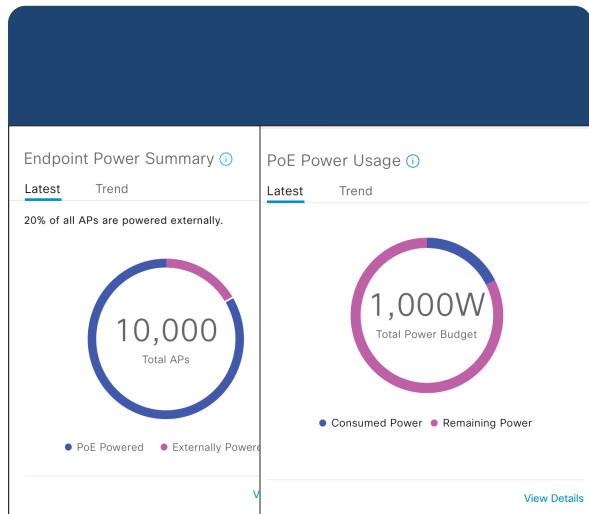


```
Switch> enable
Switch# configure terminal
Switch(config)# interface
gigabitethernet2/0/1
Switch(config-if)#power inline port
perpetual-poe-ha
Switch(config-if)#power inline port poe-ha
Switch(config-if)# end
```

- Restores power to PD less than 30 seconds after restoration of power
- Works even before Cisco IOS® comes up
- Allocates last power (stored in NVRAM) drawn from PDs
- Works in stacking deployments

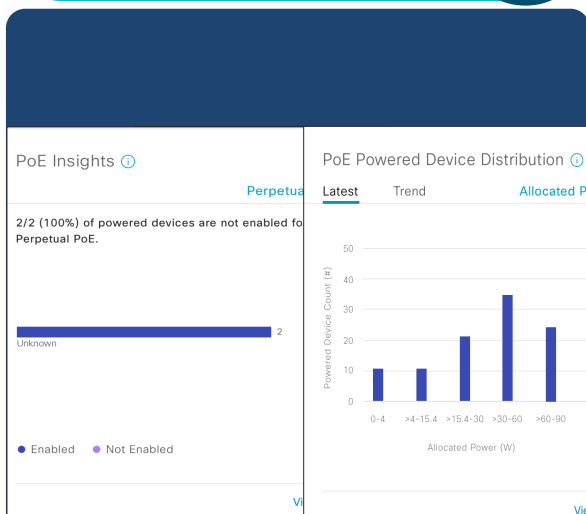
PoE Analytics for End-to-End PoE Management

Plan



Ensure your Infra is
Smart Building Ready*

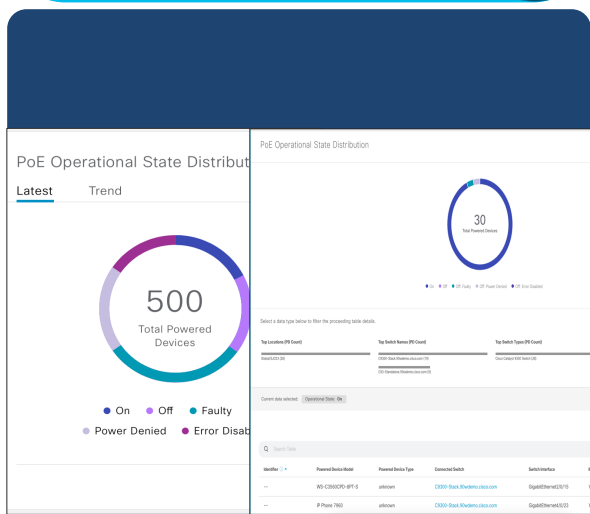
Monitor



Gather Deep Insights into

- Connected Devices
- Power Consumption
- Power Load

Troubleshoot



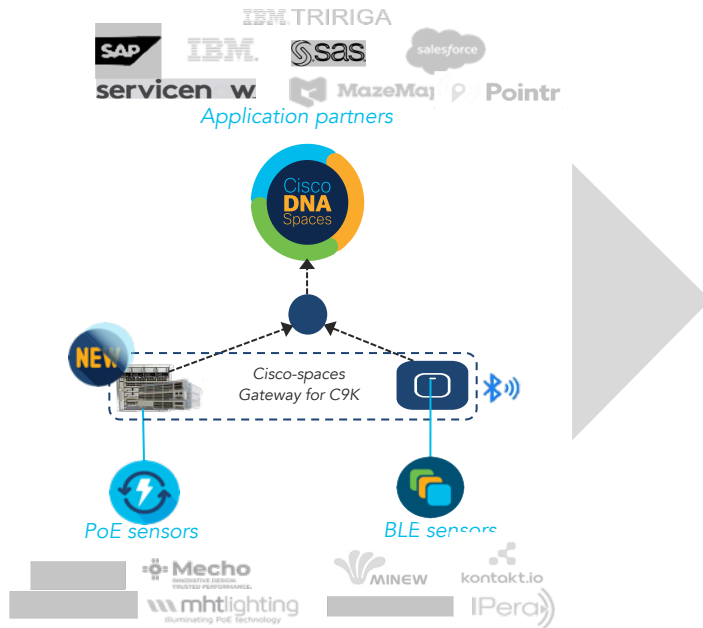
Troubleshoot PoE endpoints
with Cisco DNAC Assurance
Issues and Dashlets

*: Fury roadmap

Catalyst 9K expands value for Smart buildings

NEW

Cisco-spaces gateway for Catalyst 9K will expand outcomes



New Use Cases

Sustainable buildings
Employee health & Safety
Productivity Improvement
Building Analytics

Unified Marketplace

Largest choice of IoT devices
Unmatched solution scale
Cisco validated

Lower TCO

Automated workflows
No vendor lock-ins
Cloud based as-a-service

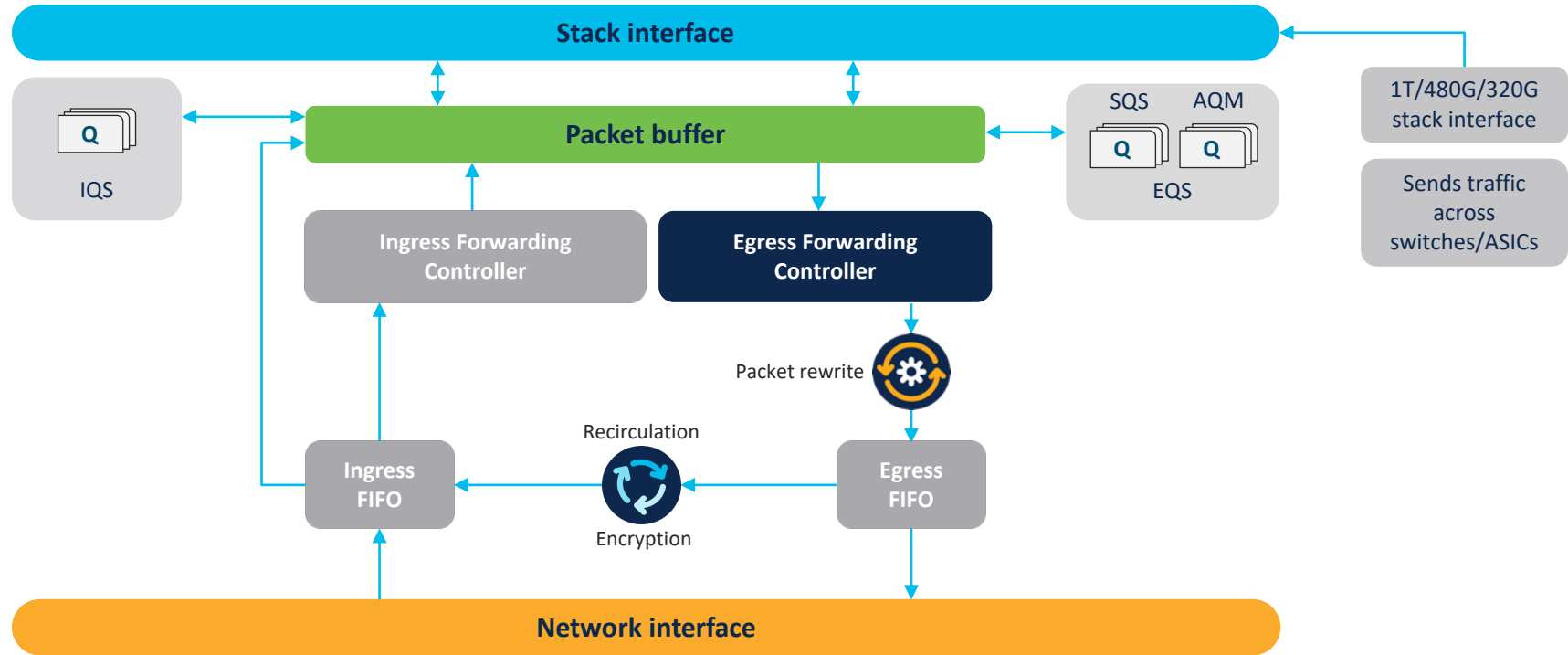
High Availability

StackWise- 1T/480/320



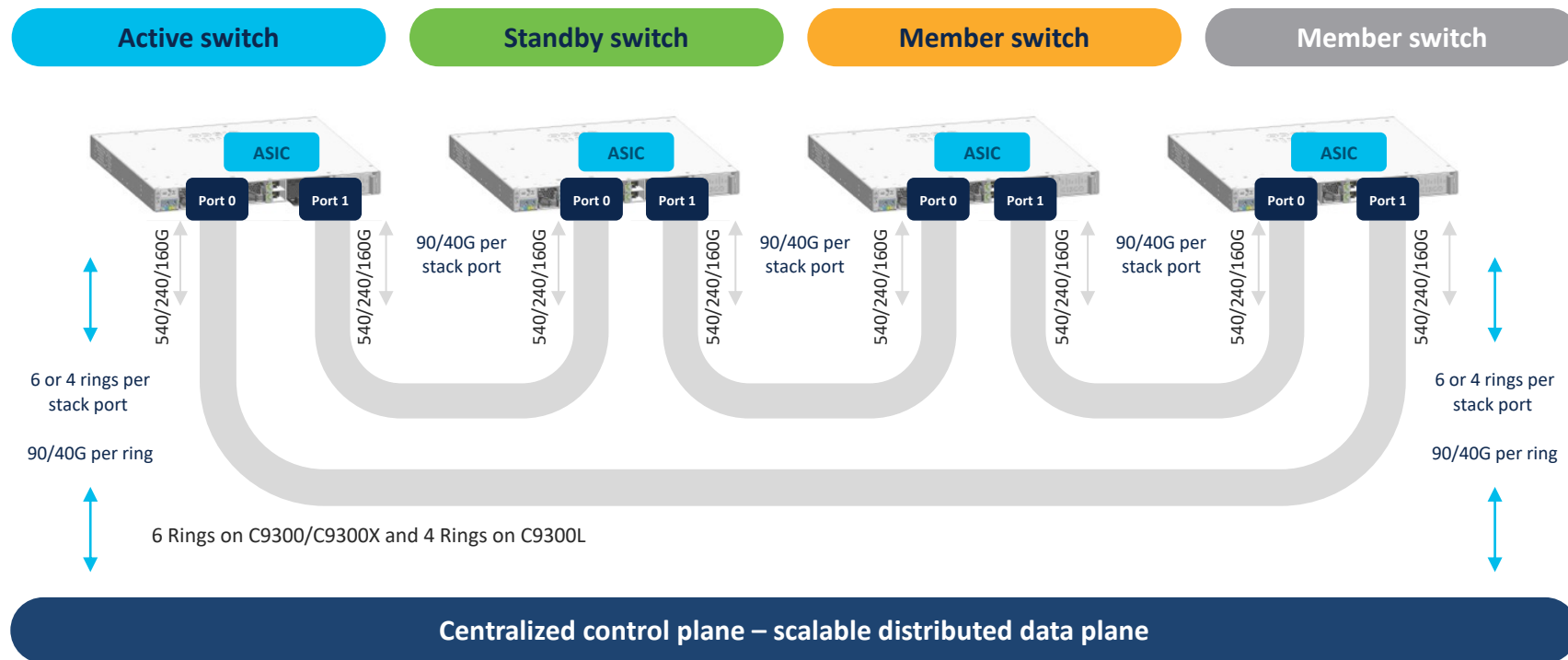
Cisco Catalyst 9300 Series Switches

Stacking architecture



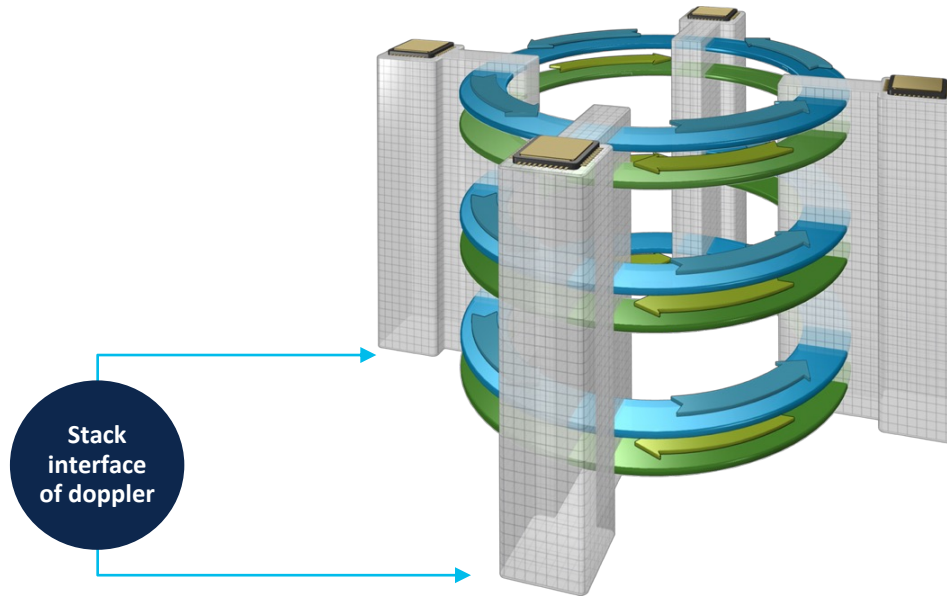
Cisco Catalyst 9300 Series Switches

StackWise-1T/480/320



Cisco Catalyst 9300X models

The stack ring – StackWise-1T on all Catalyst 9300X models

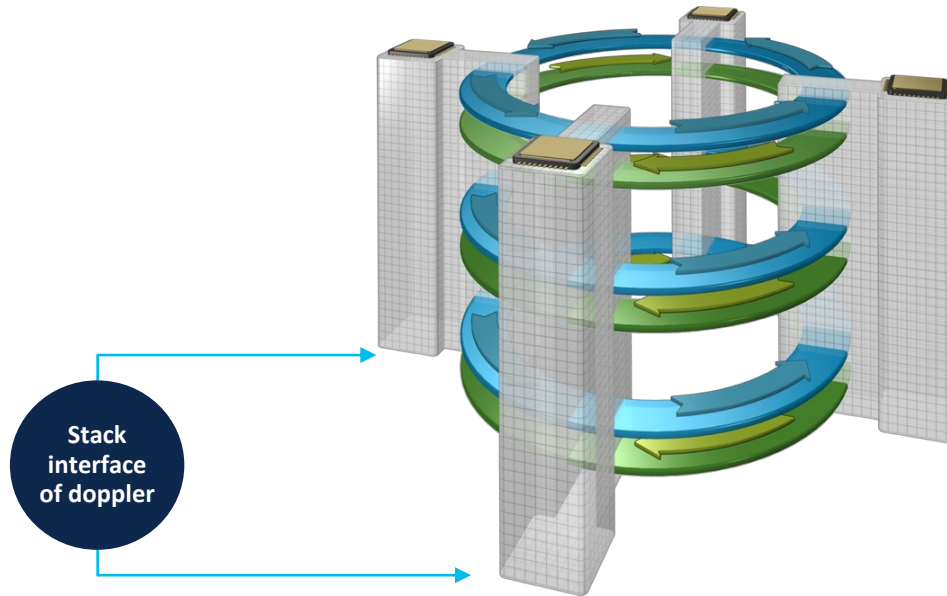


- 6 rings in total
- **3 rings go east**
- **3 rings go west**
- Each ring is 90 Gbps
- 540 Gbps unidirectional
- Spatial reuse = 1000 Gbps

Assuming 4x 24-port Cisco Catalyst 9300X modular uplink models

Cisco Catalyst 9300 models

The stack ring – StackWise-480 on Catalyst 9300 models

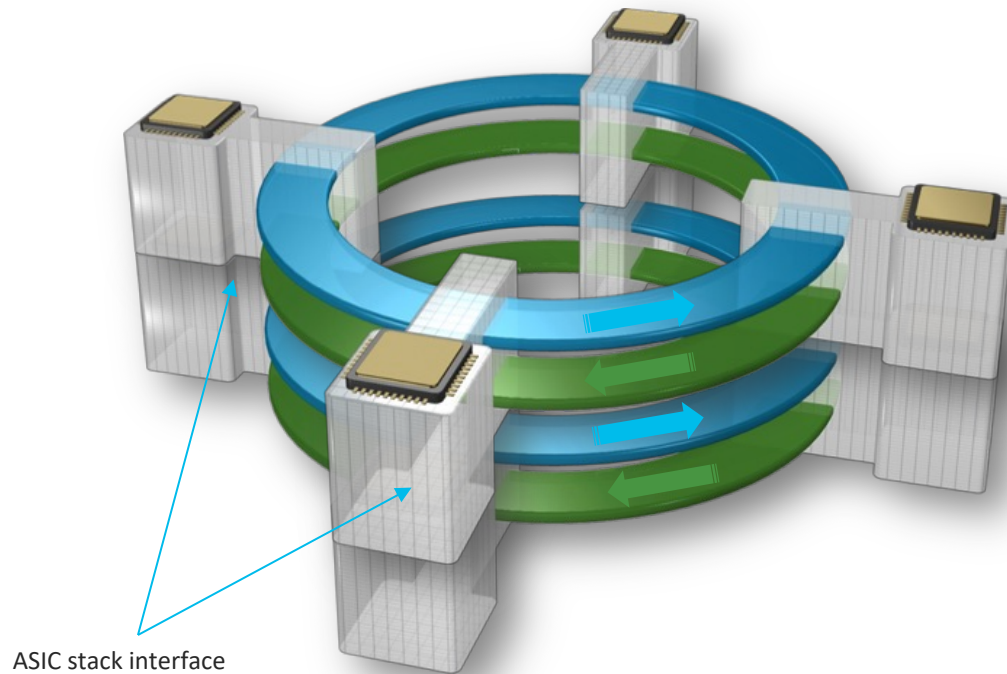


- 6 rings in total
- **3 rings go east**
- **3 rings go west**
- Each ring is 40 Gbps
- 240 Gbps unidirectional
- Spatial reuse = 480 Gbps

Assuming 4x 24-port Cisco Catalyst 9300 modular uplink models

Cisco Catalyst 9300L/9300LM models

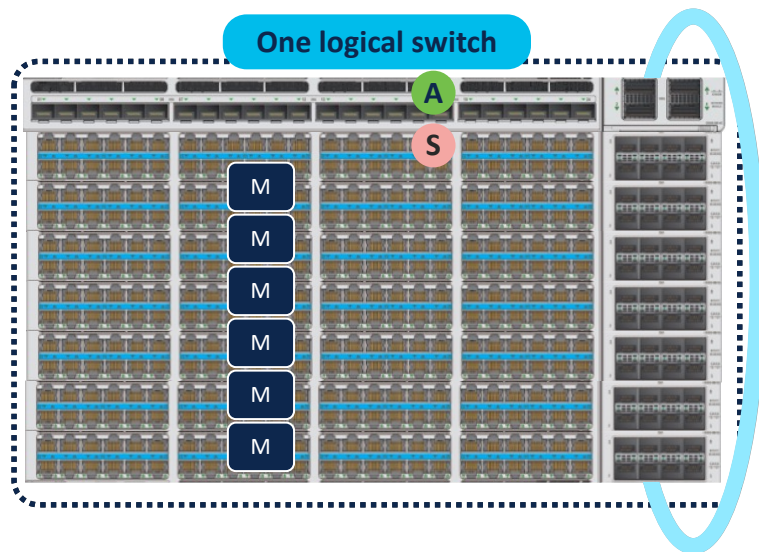
The stack ring – StackWise-320 on Catalyst 9300L/9300LM models



- 4 rings in total
- 2 rings go east
- 2 rings go west
- Each ring is 40 Gbps
- 160 Gbps bidirectional
- Spatial reuse = 320 Gbps

Assuming 4x 24-port Cisco® Catalyst® 9300L/9300LM fixed uplink models

Day 0 stacking bandwidth: 1 Terabit and 480G



1. 480G stack bandwidth for 15 minutes, while checking for following conditions:

- Full ring stack
- Only Catalyst 9300X models in stack

1Terabit Stack is reloaded after 15 minutes

480G

2. If any of the below conditions are not met:

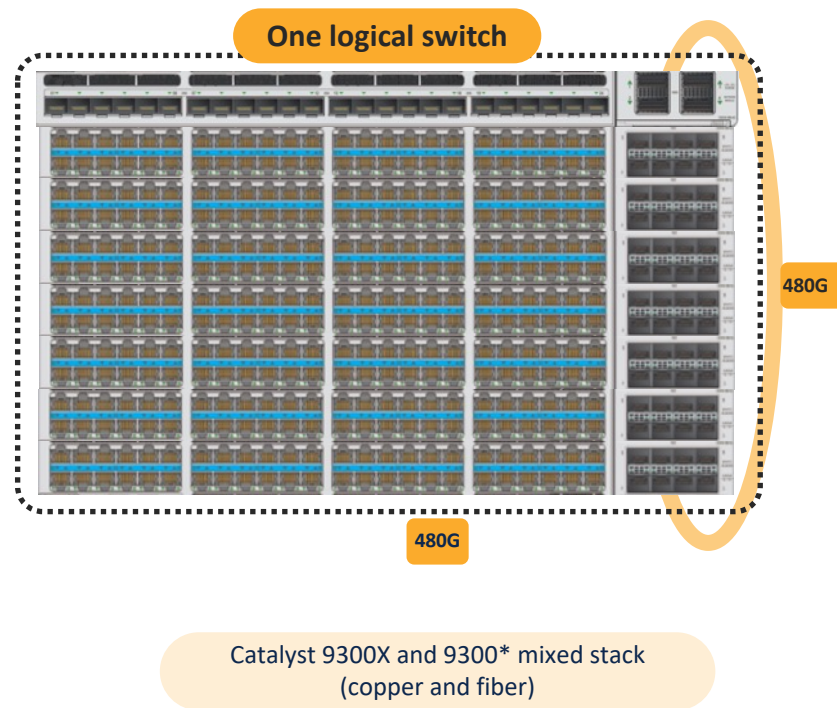
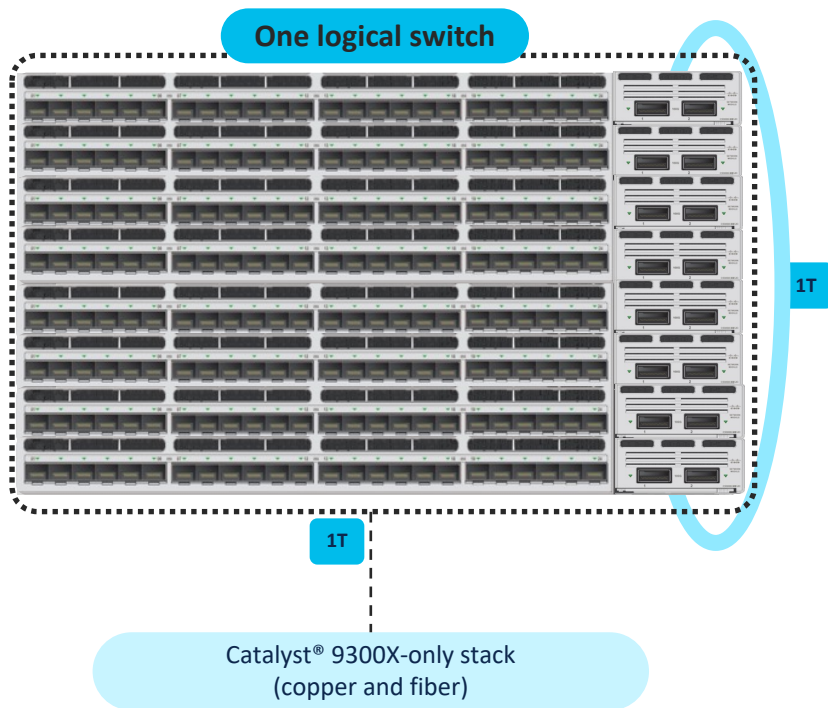
- Full ring stack – Half ring
- Only Catalyst 9300X models in stack - Mixed stack with non-X models
- Stack bandwidth will remain at 480G until the above conditions are met and then the below command has to be added for speed change and a stack reload

Stack speed can be changed manually using CLI if the above conditions are changed explicitly at a later time

```
Switch(config)#switch stack-speed high(1T)
Switch(config)#switch stack-speed Low(480G)
```

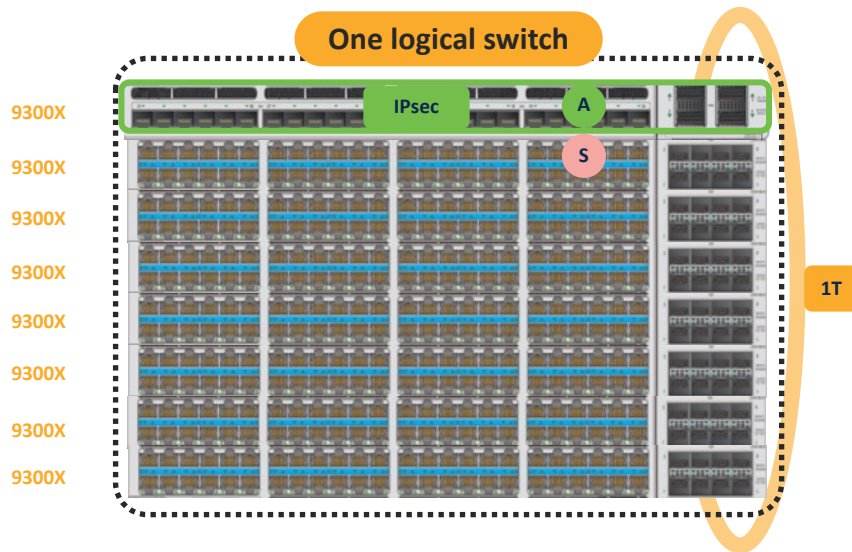
Stack bandwidth:

Catalyst 9300X and 9300 mixed stack



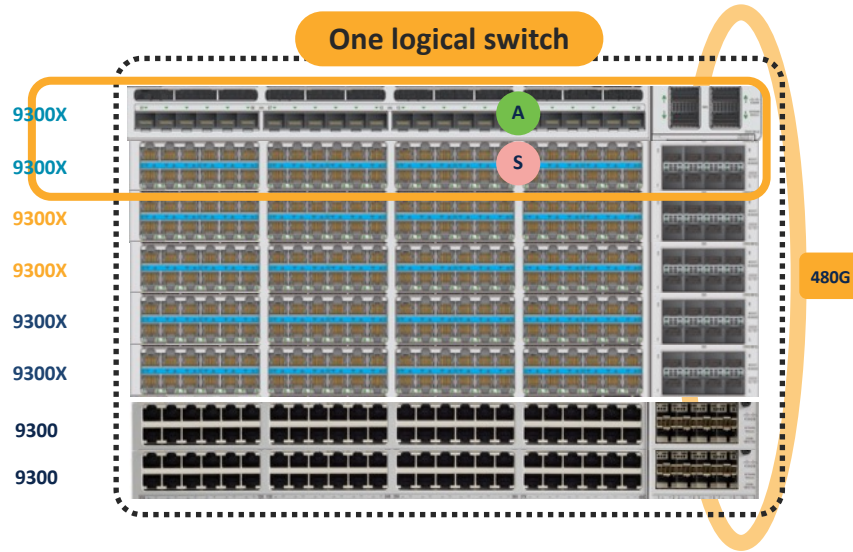
* Catalyst 9300B and 9300L models are not supported in mixed stack.

Mixed stacking considerations: Catalyst 9300X and 9300



IPsec support with Catalyst® 9300X-only stack

- IPsec is not supported in mixed stack

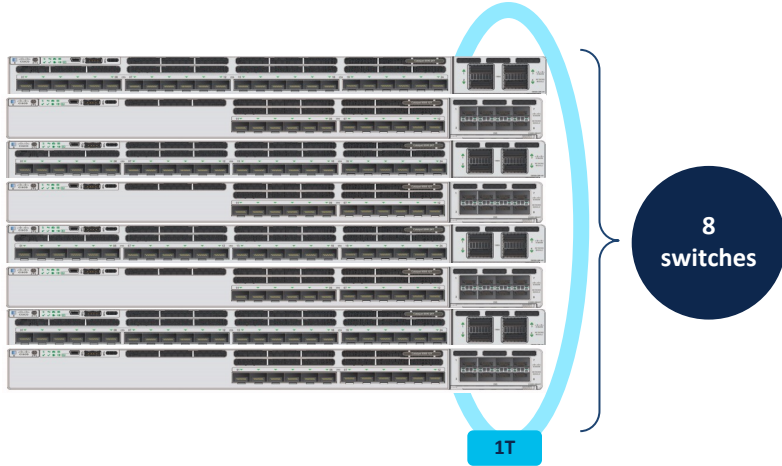


App hosting with 1+1 mode

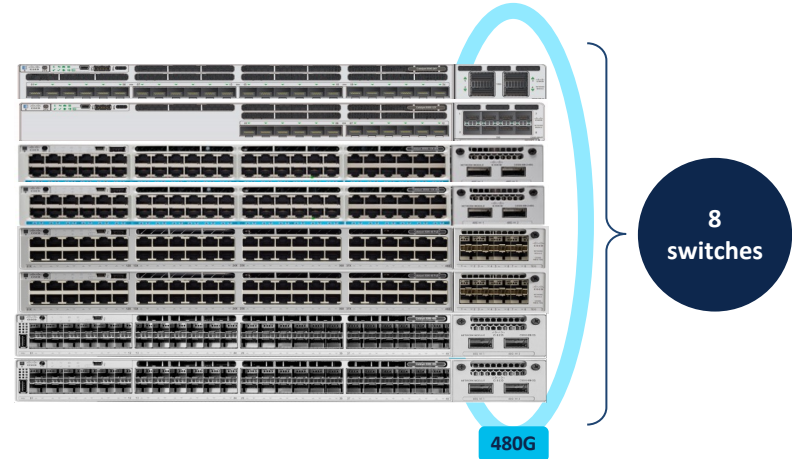
- Both Active and Standby roles should be assigned to either Catalyst 9300X or Catalyst 9300

Catalyst 9300 stacking support

Modular uplink
Catalyst 9300X models (10/25G fiber)



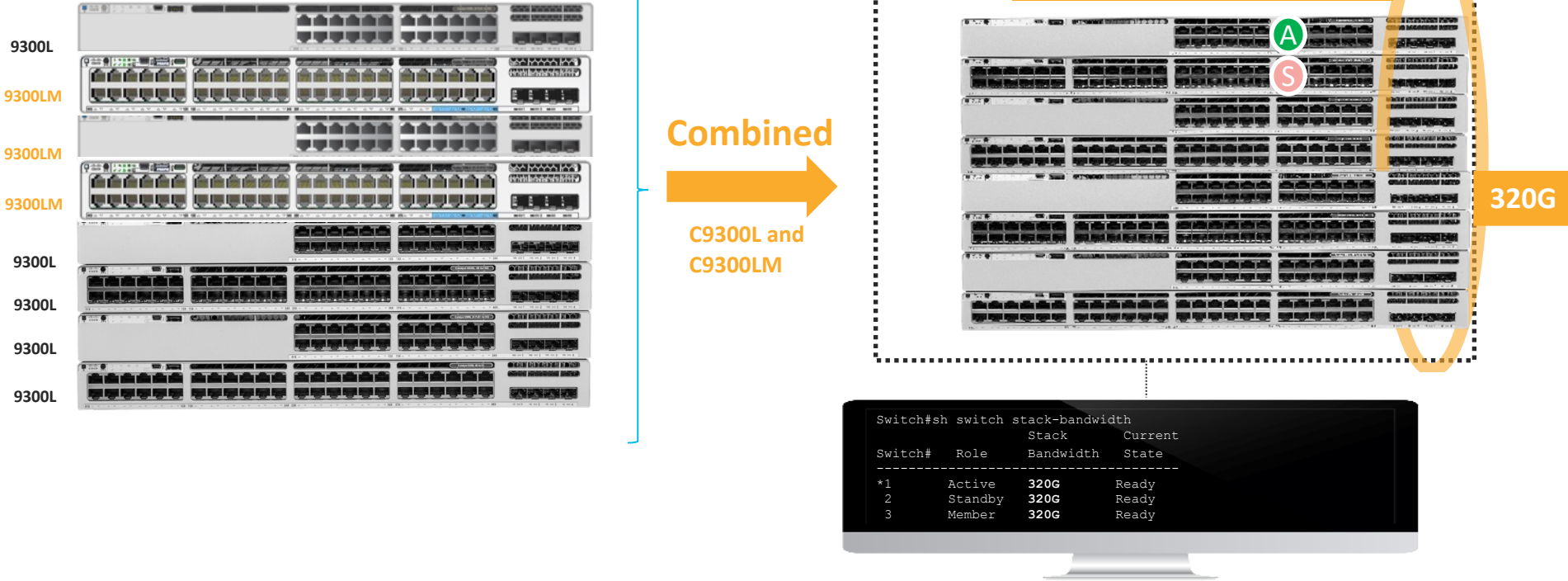
Modular uplink
Catalyst 9300 (non -B) and 9300X models



Stacking supported among **Catalyst 9300X** models and mixed stacking between **Catalyst 9300** and **Catalyst 9300X** models

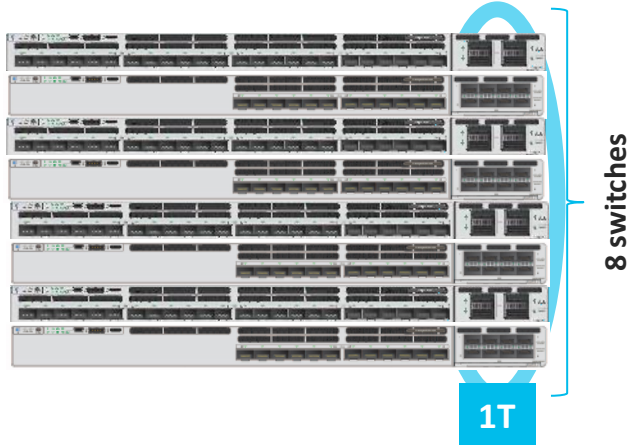
Mixed stacking is not supported between **Catalyst 9300**, **9300X**, and **9300L** models

Mixed Stacking between C9300L and C9300LM

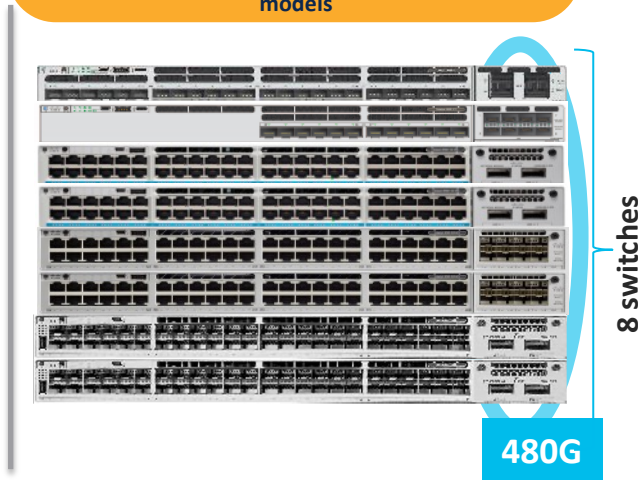


Catalyst 9300 Stacking Support

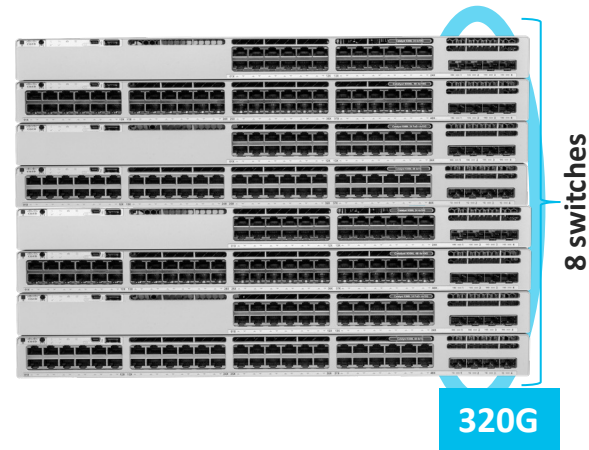
Modular Uplink
Catalyst 9300X models (10/25G Fiber)



Modular Uplink
Catalyst 9300 (non-B) and Catalyst 9300X
models



Fixed Uplink
Catalyst 9300L and Catalyst 9300LM models



Stacking supported among Catalyst 9300X models and mixed stacking between Catalyst 9300 and Catalyst 9300X models

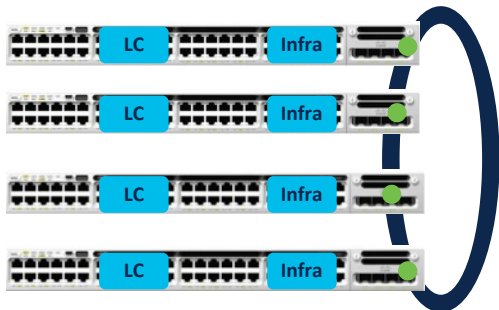
Stacking supported among
Catalyst 9300L and Catalyst 9300LM
models only

Mixed stacking is not supported between **Catalyst 9300**, **9300X**, and **9300L** models

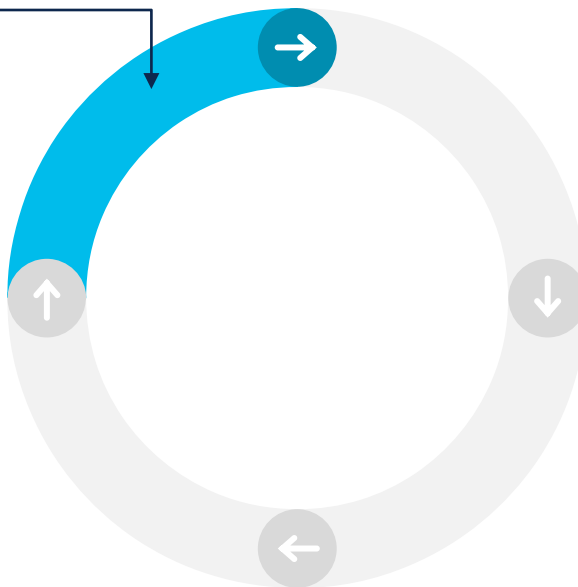
Stacking process – Stack discovery

Stack discovery

- Broadcast, followed by neighborcast



Stack **port 1** cable is connected and the **link is up**
Stack **port 2** cable is connected and the **link is up**
Waiting for 120 seconds for other switches to boot
%IOSXE-1-PLATFORM: process stack-mgr: %STACKMGR-1-DISC_START: **Switch 3 is starting stack discovery.**
##All switches in the stack have been discovered



Stack interfaces brought online

Stack Discovery Protocol runs

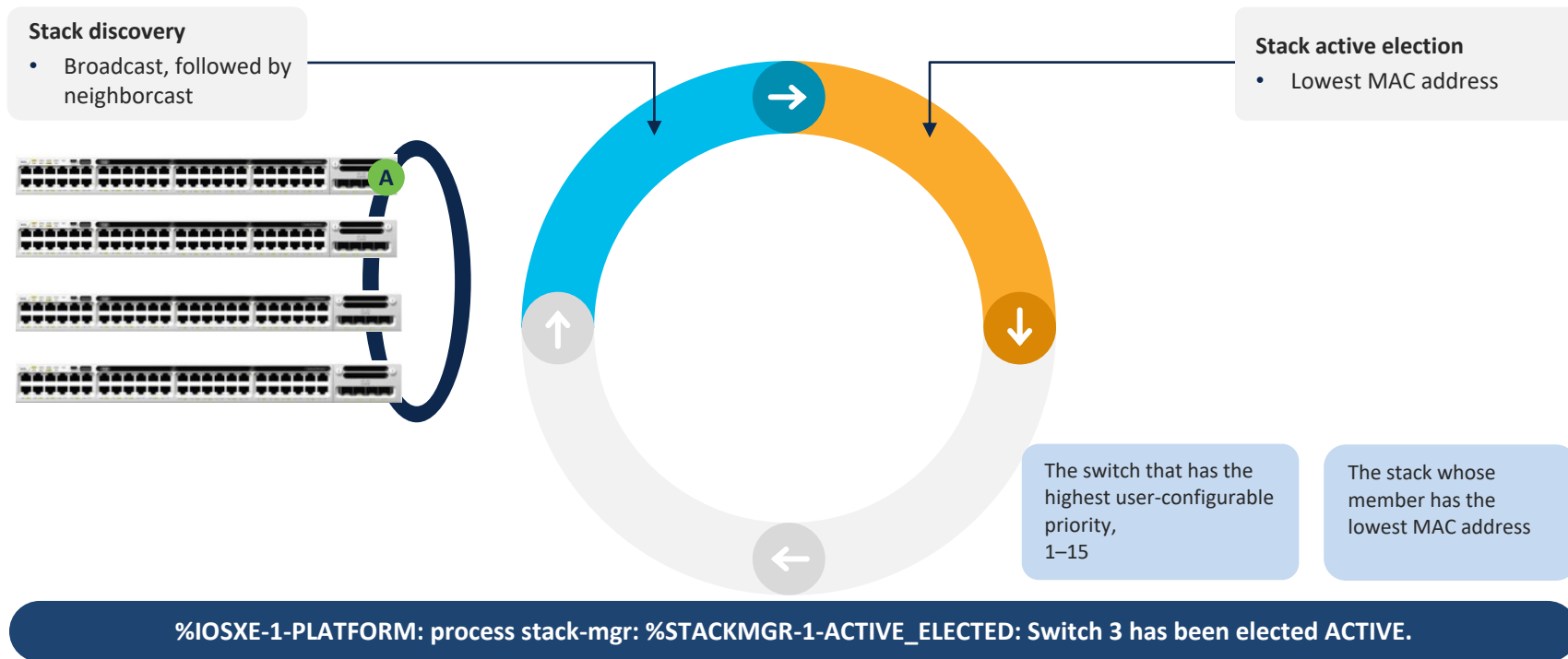
Full ring: Discovery exits after all members are found

Half ring: System waits for 2 minutes

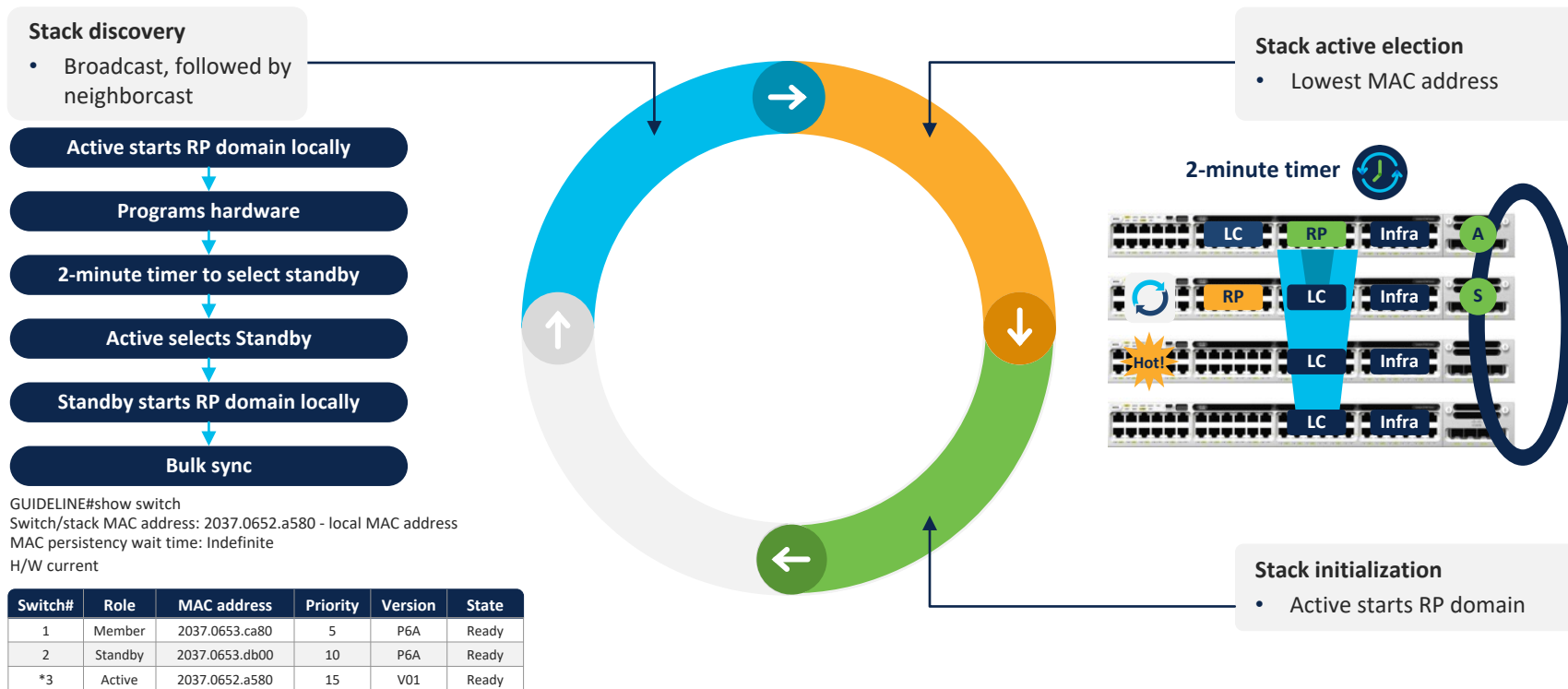
Switch number is 3

```
%IOSXE-1-PLATFORM: process stack-mgr:
%STACKMGR-1-DISC_DONE: Switch 3 has finished stack discovery.
%IOSXE-1-PLATFORM: process stack-mgr:
%STACKMGR-1-SWITCH_ADDED: Switch 3 has been added to the stack.
```

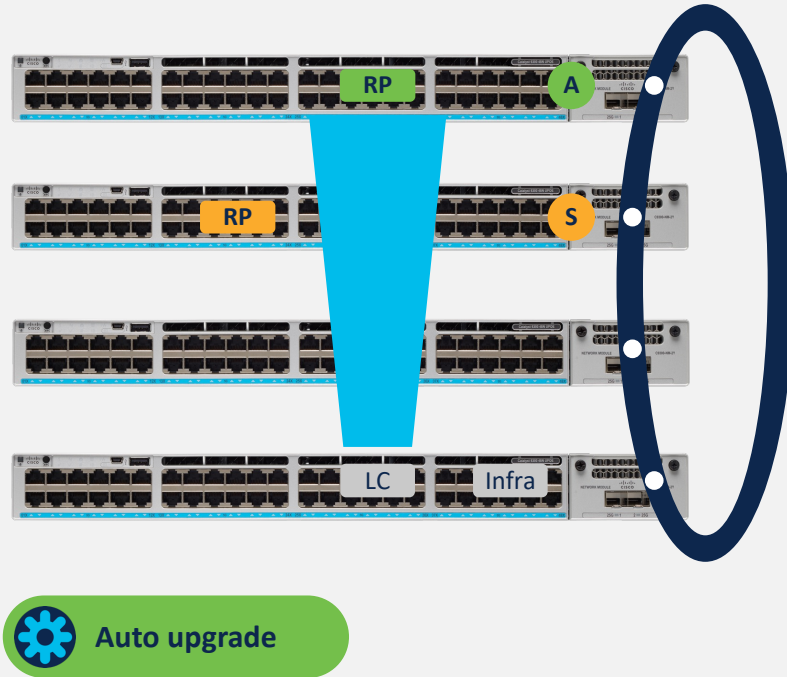
Stacking process – Stack active election



Stacking process – Stack initialization

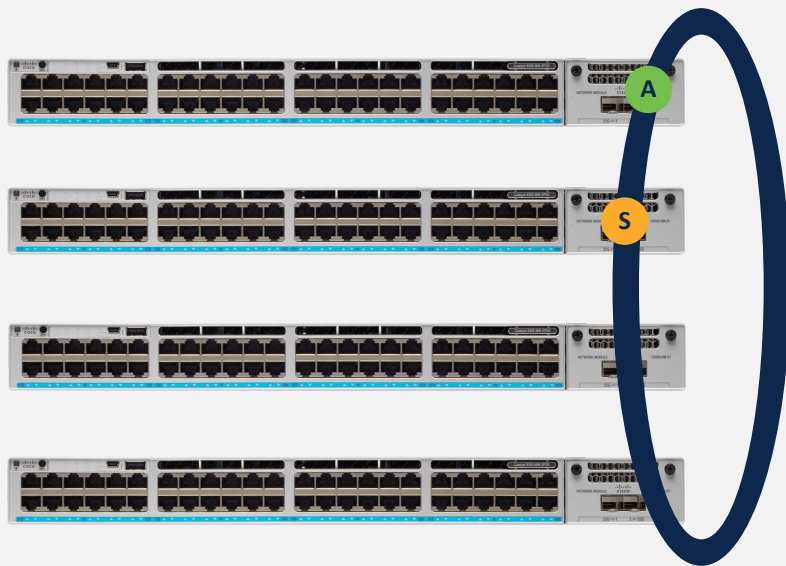


Stack member addition – Software upgrade



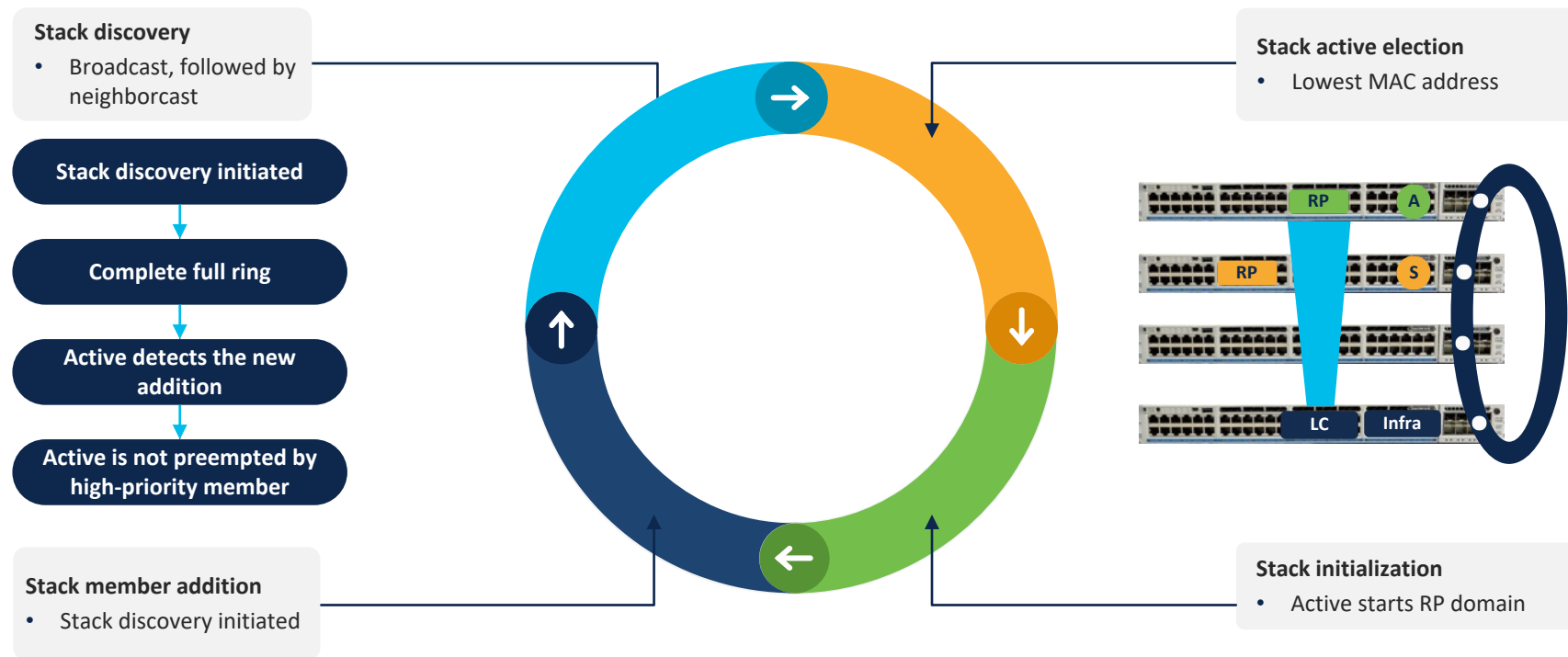
- Common Cisco IOS® XE on all stack members
- Stack member with version mismatch with Active switch will fail to RPR mode
- Enable “software auto-upgrade enable”
- System must boot in install mode (default and recommended)

Stack member deletion



- Stack discovery initiated and completed
- Active detects member removal, and cleanup process is initiated
- Cleanup involves removing TCAM entries referencing removed member, MAC addresses, Cisco Discovery Protocol tables – more like all ports on the member are shut down
- Configuration is moved to pre-provisioned state

Stacking process – Stack member addition



StackPower Modular uplink models only

(Catalyst 9300 and 9300X models)

StackPower – Overview

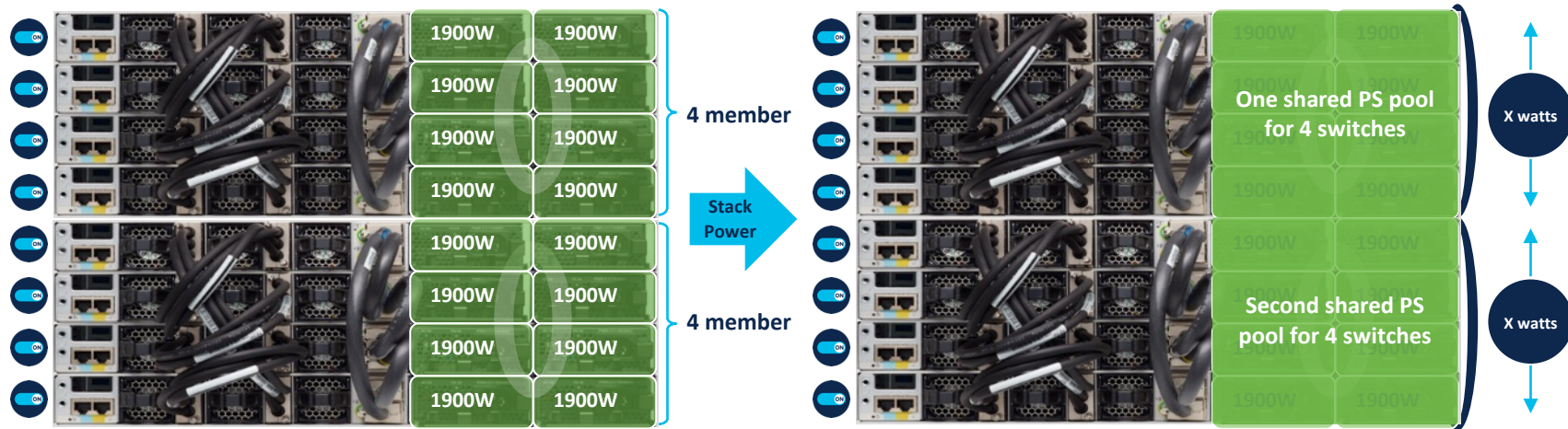
“Zero-footprint” Redundant Power System (RPS) deployment



- Provides RPS functionality with **zero RPS footprint**
- **Pay-as-you-grow** architecture – Similar to the data stack
- **1+N redundancy** with inline power
- Up to **four switches** in a StackPower ring
- **Multiple StackPower** possible within one data stack
- Up to **eight switches** in a star topology with an expandable power system (XPS)

StackPower is not supported on Catalyst 9300L SKUs

Highly available StackPower

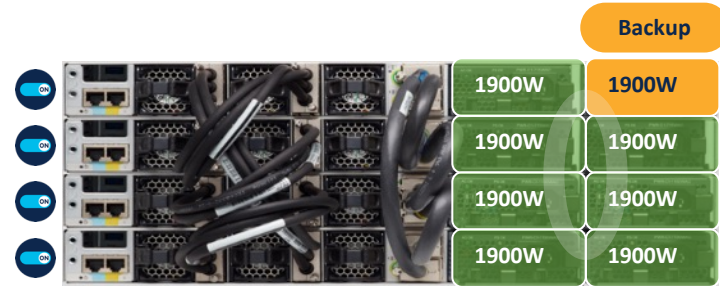
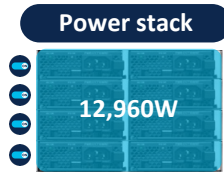


- Pools power from all Power Supplies (PS)
- All switches in StackPower share the available power in the pool
- Each switch is given its minimum power budget

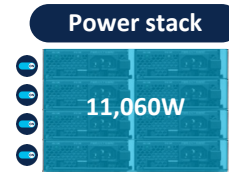
Power stack modes



Combined mode
(default mode)



Redundant mode
(user configurable)

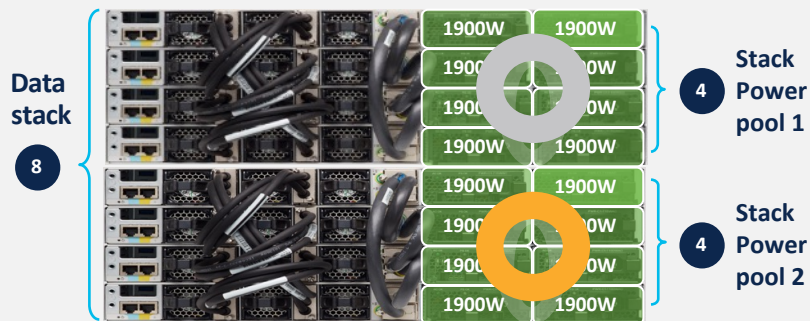


- All power supplies contribute to common output power budget

- One of the highest valued power supplies is not used in the power budget calculation

Power stack deployment models

Ring model (default)



Power sharing and redundancy are available only within individual pools

Star model (requires XPS 2200 device)



Power sharing and redundancy extend across all eight members in the stack

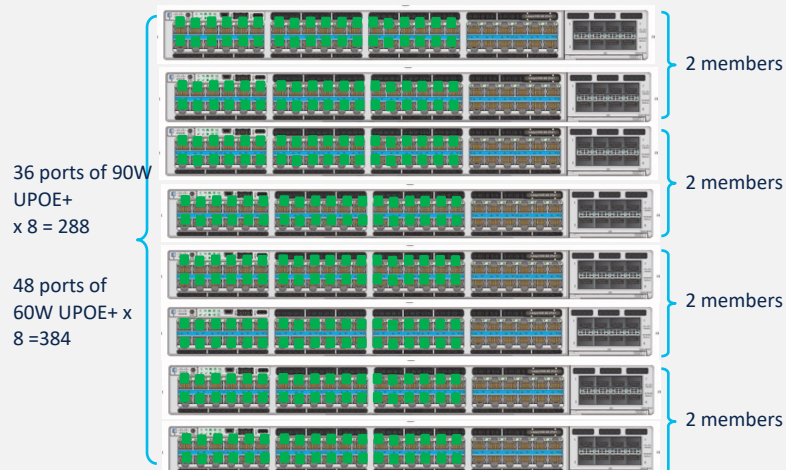
StackPower design considerations for higher 60/90W port density

60W deployments with Catalyst 9300X



Note: Configure 2-, 3-, or 4-member power stacks for proper power allocation

90W deployments with Catalyst 9300X

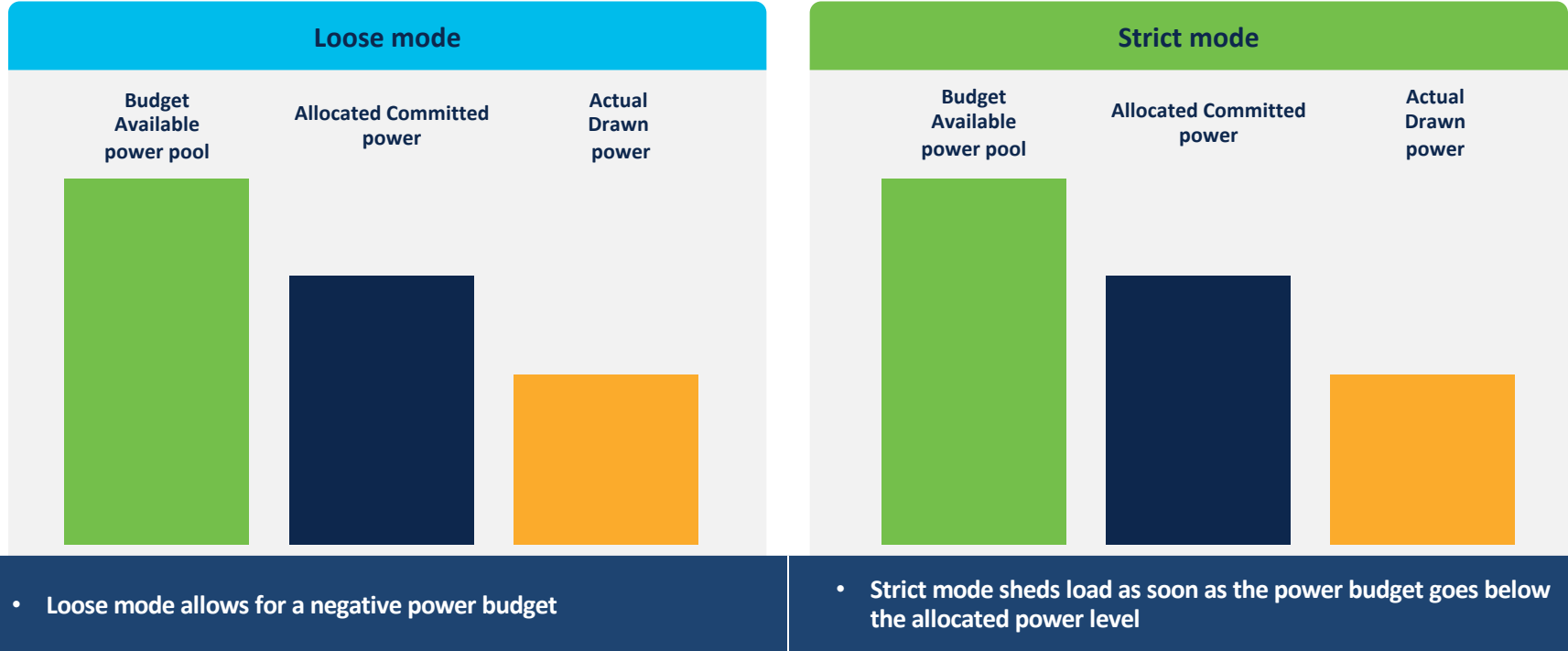


Note: Configure 2-member power stacks for proper power allocation

384 ports of 60W Cisco UPOE® with 2x 1900W PS per switch 288 ports of 90W UPOE+ with 2x 1900W PS per switch

Enforcement modes

Strict and loose modes control the behavior of load shed



Power commands



For your reference

```
Switch#show power inline
```

Module	Available (Watts)		Used (Watts)	Remaining (Watts)	
1	1290.0		0.0	1290.0	
2	720.0		0.0	720.0	
Interface	Admin	Oper	Power (Watts)	Device	Class Max
Gi1/0/1	auto	off	0.0	n/a	n/a 60.0
Gi1/0/2	auto	off	0.0	n/a	n/a 60.0
Gi1/0/3	auto	off	0.0	n/a	n/a 60.0
Gi1/0/4	auto	off	0.0	n/a	n/a 60.0
Gi1/0/5	auto	off	0.0	n/a	n/a 60.0

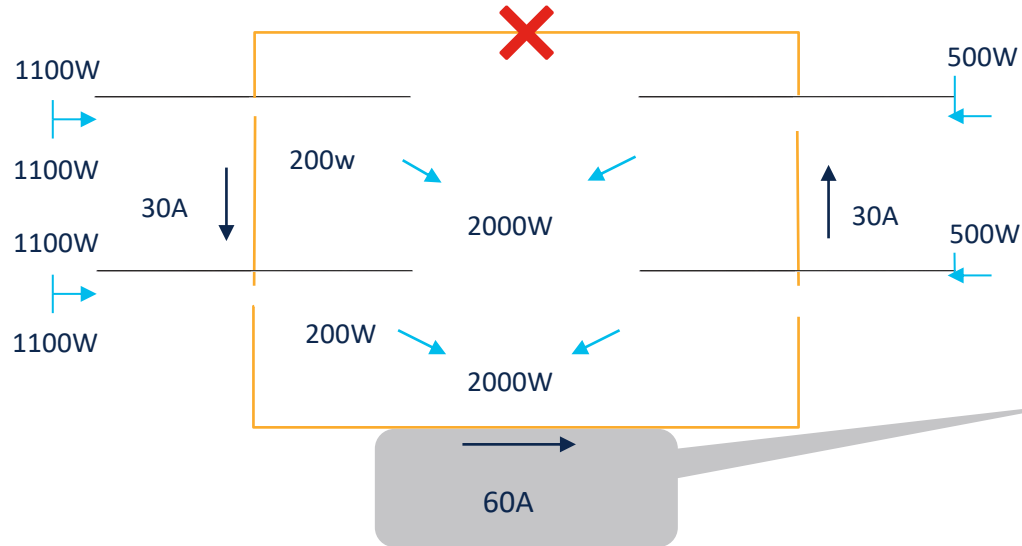
PoE usage

PoE budget

```
Switch#sh stack-power budgeting
```

Power Stack Name		Switches Mode	Stack Topolgy	Total Pwr(W)	Rsvd Pwr(W)	Alloc Pwr(W)	Unused Pwr(W)	Num SW	Alok PS
Powerstack-1		SP-PS	Stdaln	1815	30	470	1315	1	2
SW	Power Stack Name	PS-A (W)	PS-B (W)	Power Budgt(W)	Alloc Power(W)	Avail Pwr(W)	Consumd Pwr Sys/PoE(W)		
1	Powerstack-1	1100	715	1785	470	1315	143 /0		
Totals:					470	1315	143 /0		

Best practices



Total input power = 5400A

Total output power = 4400A

The right half generates only 20A but consumes 80A

StackPower rated for ~40A

In a failure scenario, StackPower could be oversubscribed; console messages will warn about the condition and intelligent load shed will occur

Recommendations

- Balance power supplies across all systems
- Fill up power supply slot A on every switch in the stack before using slot B on any switch

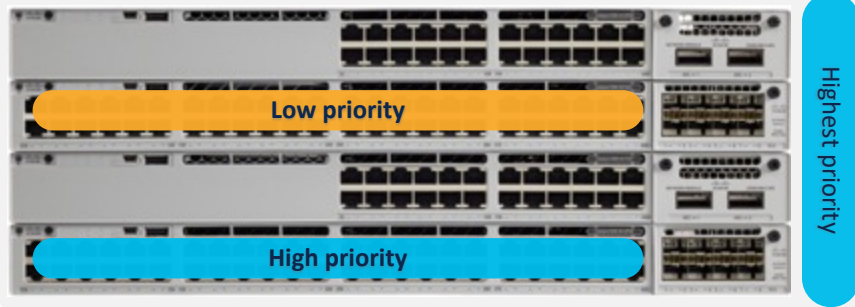
Power priority

Load shedding

Standalone mode



Stack mode



Load shedding based on configured priority

1. Low-priority ports
2. High-priority ports
3. Switch priority – **Highest priority**

```
9300-GIR-Access-144#show stack-power load-shedding switch 1
```

Power Stack Name	Stack Mode	Stack Topolgy	Total Pwr(W)	Rsvd Pwr(W)	Alloc Pwr(W)	Unused Pwr(W)	Num SW	Num PS
Powerstack-1	SP-PS	StdnlIn	1100	30	240	830	1	1

SW	Power Stack Name	Priority Sw-Hi-Lo	Consumd Sw(W)	Consumd Hi(W)	Consumd Lo(W)	Alloc Hi(W)	Alloc Lo(W)
1	Powerstack-1	4-13-22	153	0	0	0	0

Switch 1 High Priority Active (powered) Ports:

Switch 1 High Priority Inactive (unused) Ports:

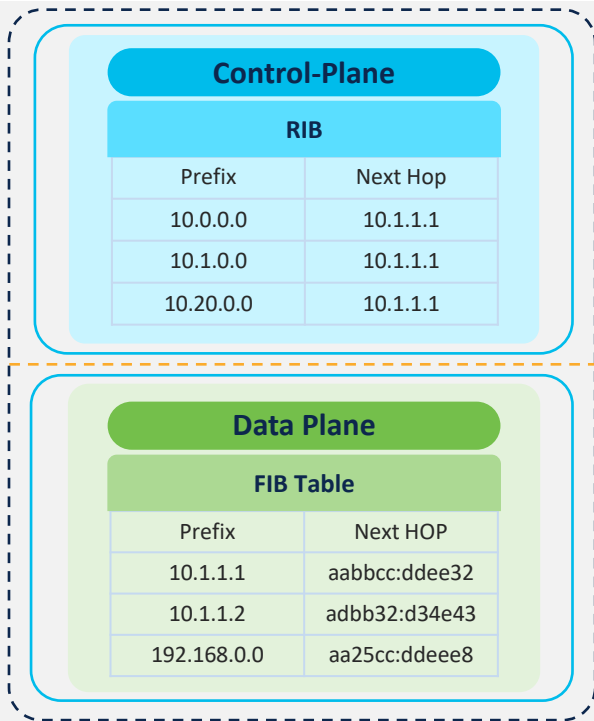
Switch 1 Low Priority Active (powered) Ports:

Switch 1 Low Priority Inactive (unused) Ports:

```
Gi1/0/1, Gi1/0/2, Gi1/0/3, Gi1/0/4, Gi1/0/5, Gi1/0/6,
Gi1/0/7, Gi1/0/8, Gi1/0/9, Gi1/0/10, Gi1/0/11, Gi1/0/12,
Gi1/0/13, Gi1/0/14, Gi1/0/15, Gi1/0/16, Gi1/0/17, Gi1/0/18,
Gi1/0/19, Gi1/0/20, Gi1/0/21, Gi1/0/22, Gi1/0/23, Gi1/0/24,
```

Extended Fast Software Upgrade (xFSU)

Extended Fast Software Upgrade (xFSU)



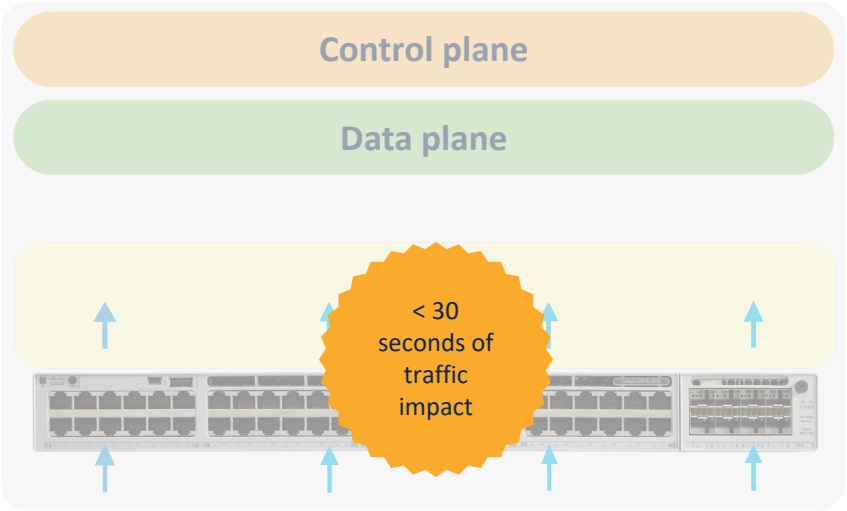
- xFSU provides a mechanism to upgrade the software image by segregating the control plane and data plane update on a single control plane device
- It updates the control plane by leveraging the NSF/graceful restart architecture and data plane by leveraging cache and flush software infrastructure to reduce the overall traffic impact during the software upgrade

Extended Fast Software Upgrade

Catalyst® 9300/9300/9300L/9300LM standalone



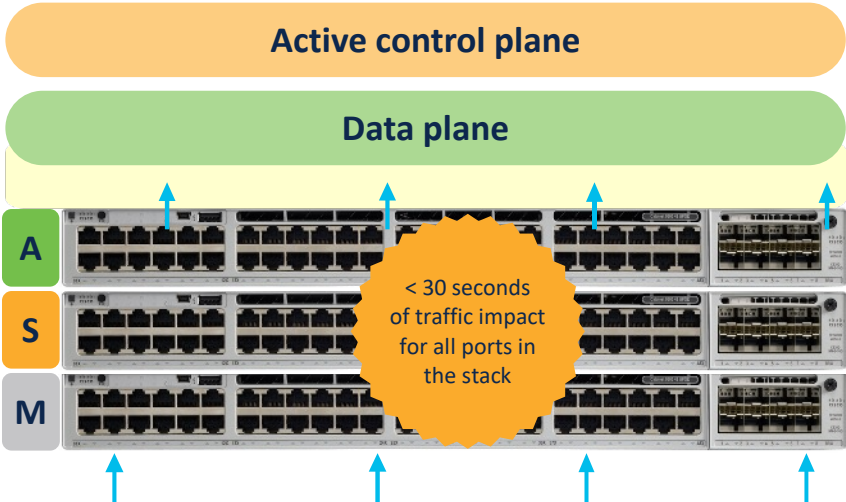
#Install add file image activate reloadfast commit



Catalyst 9300X/9300/9300L/9300LM stack

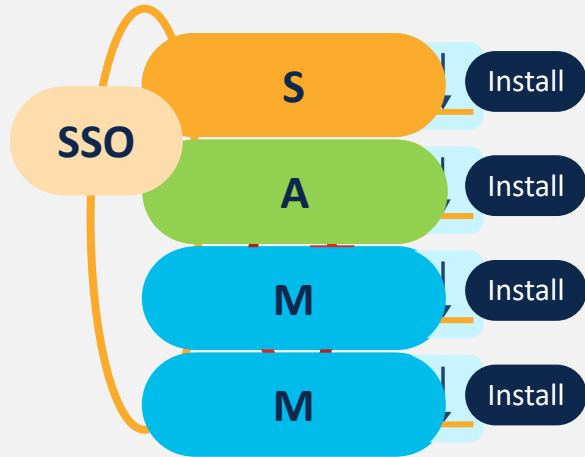


#Install add file image activate reloadfast commit



Extended Fast Software Upgrade on stack

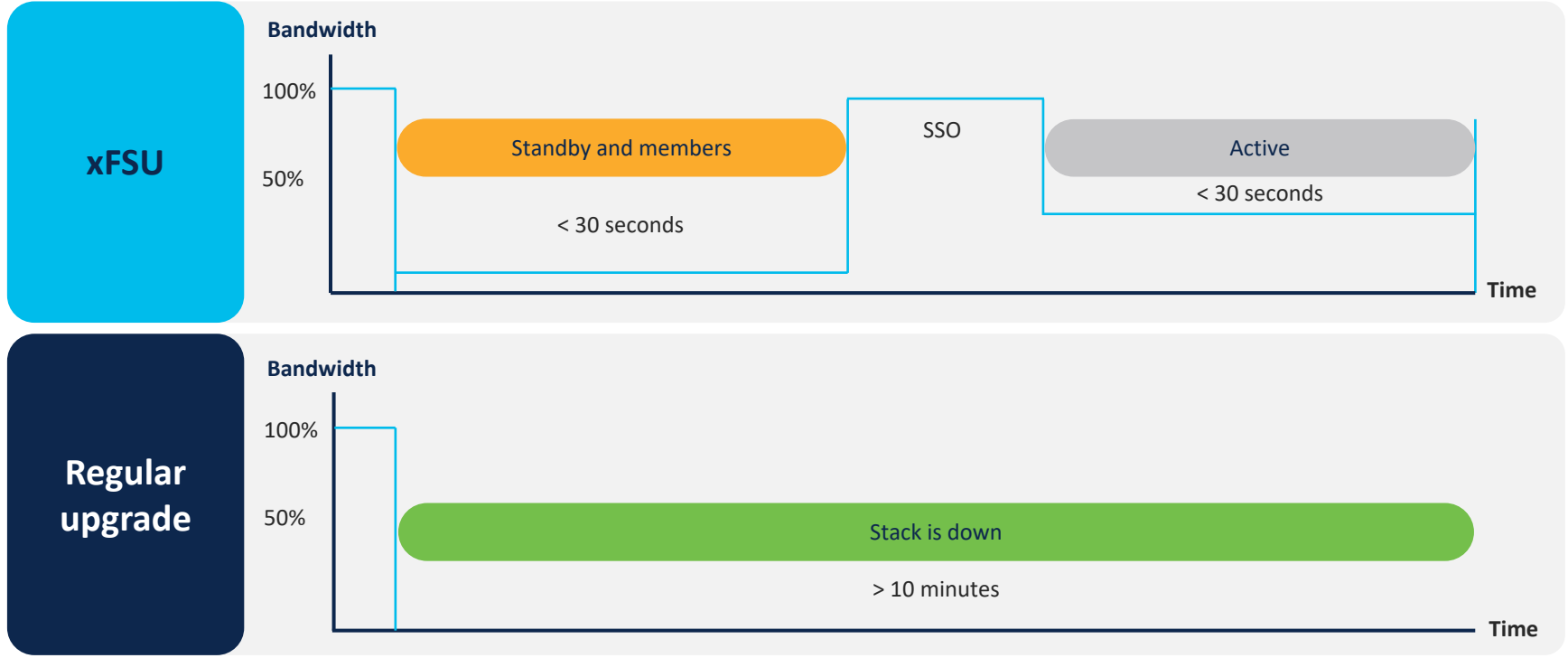
#Install add file image activate reloadfast commit



1. Install the images on all switches
2. Fast reload the standby and member switches
3. Fast reload the Active switch only
4. Standby becomes the new Active
5. Old Active switch becomes the new Standby

Traffic impact during the complete upgrade is less than 30 seconds

Convergence time



Extended Fast Software Upgrade

CLI commands

- xFSU is supported only in install mode
- One-step command that activates the Fast Software Upgrade and commits it:

```
9300# install add file flash:cat9k_iosxe.BLD_V17.X activate reloadfast commit
```

Fast reload without software upgrade:

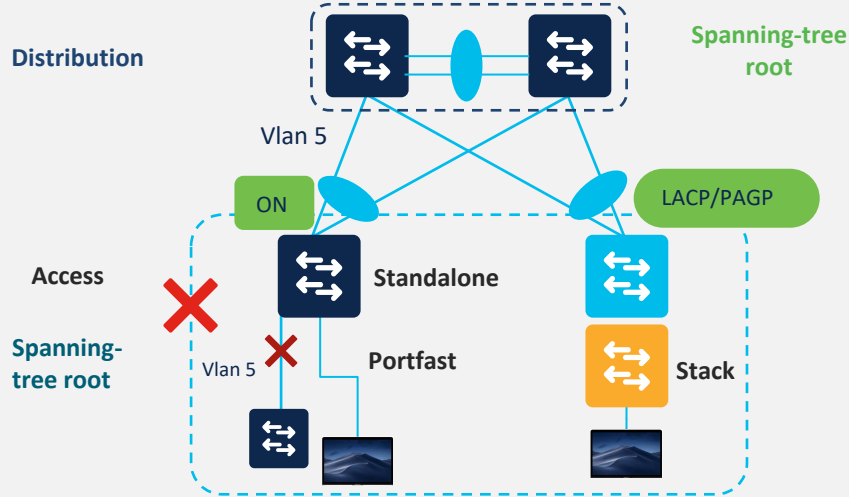
```
9300# reloadFast
```

Additional configurations needed for graceful restart

- IPv6 support needs a new command to be configured
 `ipv6 nd reachable-time 3600000`
- OSPFv3 needs a new command to be configured
 `9300(config)#snmp ifmib ifindex persist`
 `9300(config)#router ospfv3 1`
 `9300(config-router)#router-id 1.1.1.1`
 `9300(config-router)#interface-id snmp-if-index`
- BGP
 `bgp graceful-restart`

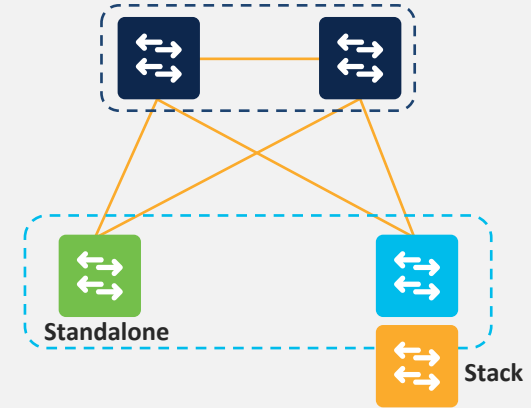
Design caveats

Layer 2 designs



- xFSU switch cannot be a root switch
- XFSU switch cannot have more than one forwarding port for the same VLAN

Layer 3 designs



Layer 3 protocols: OSPF, BGP, ISIS

- LISP/VXLAN is not supported

xFSU Platform & Software Support

Platform	Software	xFSU Matrix	Protocol/ Feature Support	Fast Reload Only	Fast Software Upgrade
- C9300 9300L– Standalone		EMR → EMR & Within EMR Same as ISSU Support	- Static Port-channel - BGP - OSPF - ISIS - STP, UDLD	Supported	From 17.3.2 Release
9300X	17.7.1		LACP, MAB, Dot1x, web authentication	Supported	From 17.9.X Release

Tip: Perpetual POE needs to be enabled explicitly for uninterrupted POE during xFSU

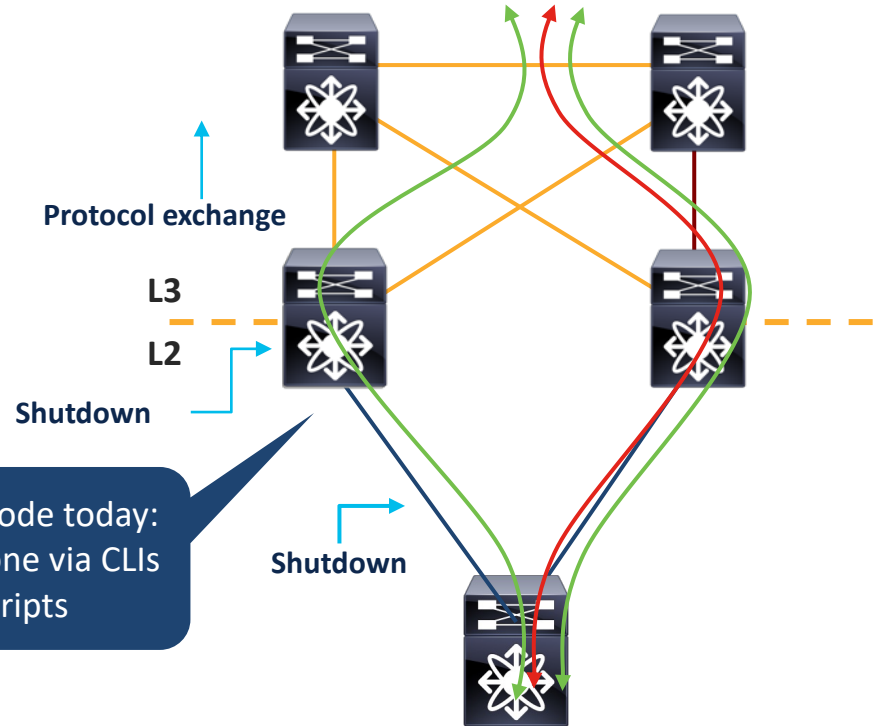
Graceful Insertion and Removal (GIR)

Isolate a node with no or minimal impact

Hardware replacement

Software upgrades

Configuration changes



TCAMs, buffers, and scale



Lookup tables

Forwarding resources

	Cisco Catalyst™ 9300X Series	Cisco Catalyst 9300 Series	Cisco Catalyst 9300B Series
MAC addresses	32,000	32,000	64,000
Host/direct routes	24,000	24,000	48,000
IGMP groups	8,000	8,000	16,000
LPM/indirect routes	15,000	8,000	64,000
Multicast routes	8,000	8,000	16,000
SGTs	8,000	8,000	8000

Feature resources

	Cisco Catalyst 9300X Series	Cisco Catalyst 9300 Series	Cisco Catalyst 9300B Series
Security ACL entries	8,000	5,000	18000
• Port ACL (PACL) • VLAN ACL (VACL) • Router ACL (RACL)			
QoS ACL entries	4,000	5,000	18000

NetFlow

NetFlow entries: 128,000/64,000/64,000 per UADP 2.0 XL/2.0/2.0sec ASIC

Scale and TCAM partition

Each IPv6 ACL (without port range) requires two TCAM entries

```
Cat9300X$$ hardware fed switch active fwd-asic resource tcam utilization 0
Codes: EM - Exact_Match, I - Input, O - Output, IO - Input & Output, NA - Not Applicable
```

```
CAM Utilization for ASIC [0]
```

Table	Subtype	Dir	Max	Used	%Used	V4	V6	MPLS	Other
Mac Address Table	EM	I	32768	46	0.14%	0	0	0	46
Mac Address Table	TCAM	I	1024	22	2.15%	0	0	0	22
L3 Multicast	EM	I	8192	0	0.00%	0	0	0	0
L3 Multicast	TCAM	I	512	9	1.76%	3	6	0	0
L2 Multicast	EM	I	8192	0	0.00%	0	0	0	0
L2 Multicast	TCAM	I	512	11	2.15%	3	8	0	0
IP Route Table	EM	I	24576	4	0.02%	3	0	1	0
IP Route Table	TCAM	I	15872	19	0.12%	6	10	2	1
QOS ACL	TCAM	IO	4096	85	2.08%	28	38	0	19
	TCAM	I		45	1.10%	15	20	0	10
	TCAM	O		40	0.98%	13	18	0	9
Security ACL	TCAM	IO	8192	149	1.82%	26	78	0	45
	TCAM	I		106	1.29%	12	54	0	40
	TCAM	O		43	0.52%	14	24	0	5
Netflow ACL	TCAM	I	512	6	1.17%	2	2	0	2
PBR ACL	TCAM	I	5120	22	0.43%	16	6	0	0
Netflow ACL	TCAM	O	1024	6	0.59%	2	2	0	2
Flow SPAN ACL	TCAM	IO	1024	13	1.27%	3	6	0	4
	TCAM	I		5	0.49%	1	2	0	2
	TCAM	O		8	0.78%	2	4	0	2
Control Plane	TCAM	I	512	289	56.45%	138	106	0	45
Tunnel Termination	TCAM	I	512	27	5.27%	10	16	0	1
Lisp Inst Mapping	TCAM	I	2048	1	0.05%	0	0	0	1
CTS Cell Matrix/VPN									
Label	EM	O	8192	0	0.00%	0	0	0	0
CTS Cell Matrix/VPN									
Label	TCAM	O	512	1	0.20%	0	0	0	1
Client Table	EM	I	4096	0	0.00%	0	0	0	0
Client Table	TCAM	I	256	0	0.00%	0	0	0	0
Input Group LE	TCAM	I	1024	0	0.00%	0	0	0	0
Output Group LE	TCAM	O	1024	0	0.00%	0	0	0	0
Macsec SPD	TCAM	I	1024	2	0.20%	0	0	0	2

Cisco Catalyst 9300 Series Switches

Switch Database Management (SDM) template

Access template

Maximizes system resources
for unicast and multicast
routing and security



Cisco® Catalyst®
9300 Series Switches

NAT template *

Maximizes the Network Address
Translation (NAT) configurations
on the switch

* NAT template is not applicable to Catalyst 9300B and 9300X models, NAT entries are included in default template for Catalyst 9300B and 9300X models

Cisco Catalyst 9300 Series Switches

SDM template – CLI

	Command	Purpose
Step 1	Show sdm prefer	Display the template in use
Step 2	Configure terminal	Enter Global Configuration mode
Step 3	Sdm prefer { access nat }	Specify the SDM template to be used on the switch
Step 4	End	Return to Privilege exec mode
Step 5	Reload	Reload the operating system
Step 6	Show sdm prefer	Display the template in use

```
9300_L#sh sdm prefer
Showing SDM Template Info
```

```
This is the Access template.
Number of VLANs: 4094
Unicast MAC addresses: 32768
Overflow Unicast MAC addresses: 1024
L2 Multicast entries: 8192
Overflow L2 Multicast entries: 512
L3 Multicast entries: 8192
Overflow L3 Multicast entries: 512
Directly connected routes: 24576
Indirect routes: 8192
STP Instances: 1024
Security Access Control Entries: 5120
QoS Access Control Entries: 5120
Policy Based Routing ACEs: 1024
Netflow Input ACEs: 256
Netflow Output ACEs: 768
Flow SPAN ACEs: 1024
Tunnels: 512
LISP Instance Mapping Entries: 512
Control Plane Entries: 512
Input Netflow flows: 32768
Output Netflow flows: 32768
SGT/DGT (or) MPLS VPN entries: 8192
SGT/DGT (or) MPLS VPN Overflow entries: 512
Wired clients: 2048
MACSec SPD Entries: 256
MPLS L3 VPN VRF: 255
MPLS Labels: 2048
MPLS L3 VPN Routes VRF Mode: 7168
MPLS L3 VPN Routes Prefix Mode: 8192
MVPN MDT Tunnels: 256
L2 VPN EOMPLS Attachment Circuit: 256
MAX VPLS Bridge Domains : 128
MAX VPLS Peers Per Bridge Domain: 32
MAX VPLS/VPWS Pseudowires : 1024
```

These numbers are typical for L2 and IPv4 features.
Some features such as IPv6, use up double the entry size;
so only half as many entries can be created.
* values can be modified by sdm cli.

Packet buffers

Ingress buffers

For Ingress Queuing and Scheduling (IQS) (dedicated and shared)

Egress stack buffers

For Egress Stack Queuing and Scheduling (SQS) (dedicated and shared)

Egress port buffers

For egress port queues (AQM)

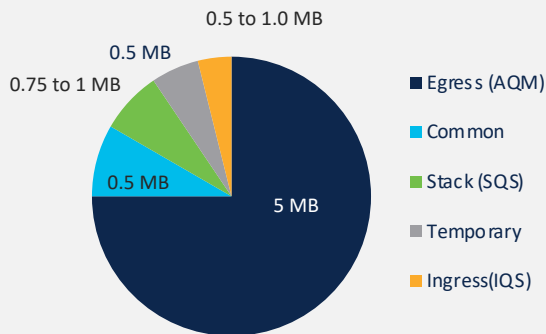
Temporary buffers

For packet from the stack or CPU

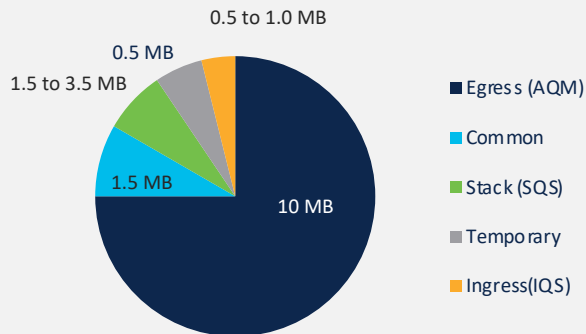
Allocation: Dedicated buffers are used first

Cisco Catalyst 9300 – buffer complex composition

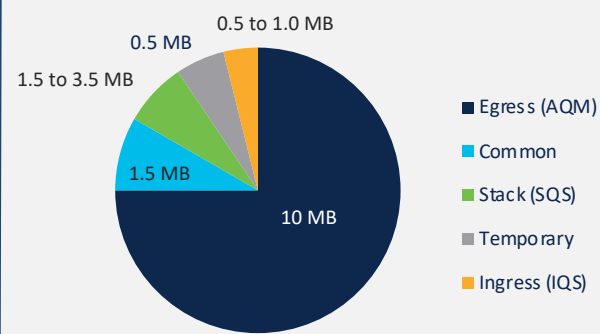
UADP 2.0



UADP 2.0 XL



UADP 2.0sec



Catalyst 9300/L models

- Total of 16 MB buffer on switch
- 8 MB packet buffer per core is shared by ingress and egress data paths

Catalyst 9300B models

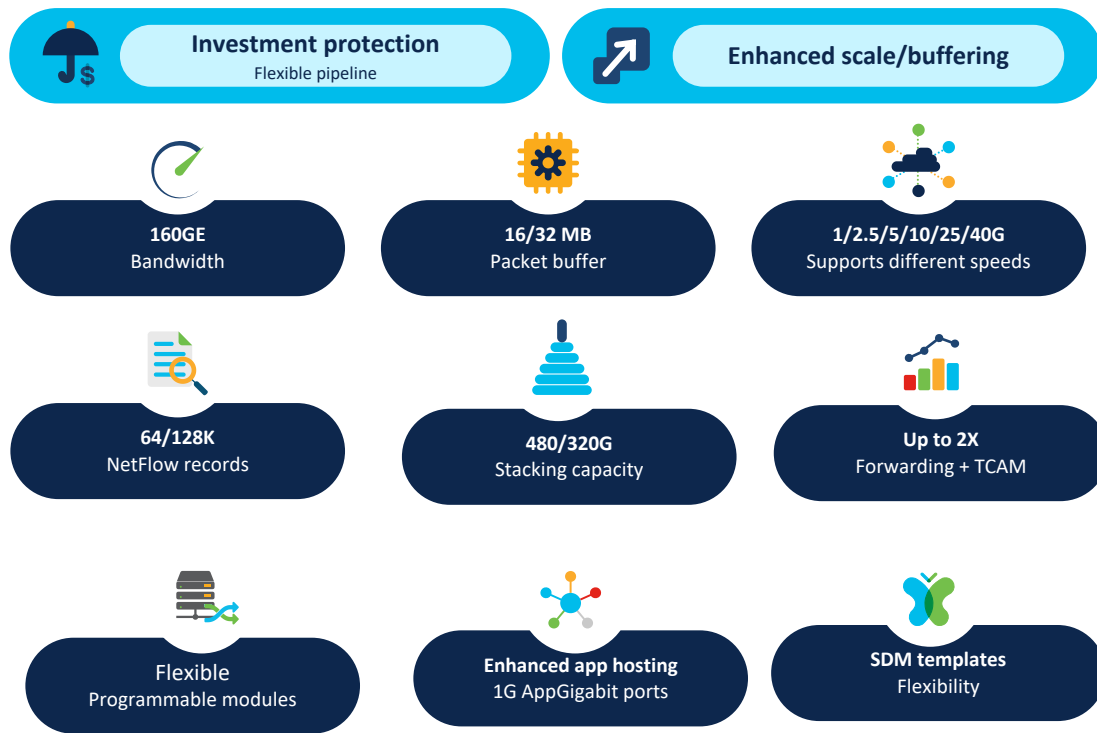
- Total of 32 MB buffer on switch
- 16 MB packet buffer per core is shared by ingress and egress data paths

Catalyst 9300X models

- Total of 16 or 32 MB buffer on switch depending on Single or Dual Asic switch
- 16 MB packet buffer is shared by ingress and egress data paths

Cisco Catalyst 9300 and 9300X Series switching architecture

UADP 2.0/ 2.0 XL – Next generation of ASIC innovation

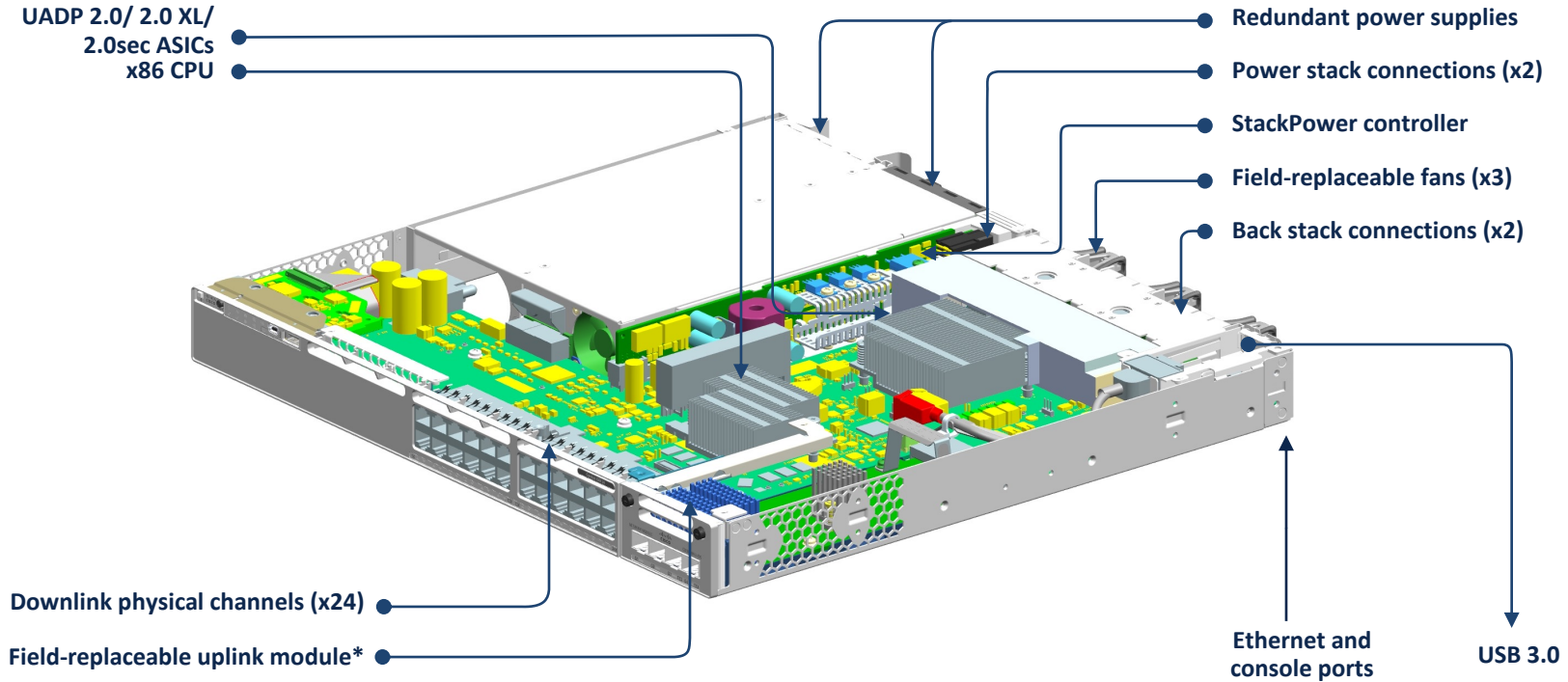


UADP 2.0sec – Next generation of ASIC innovation



Cisco Catalyst 9300X

Under the covers

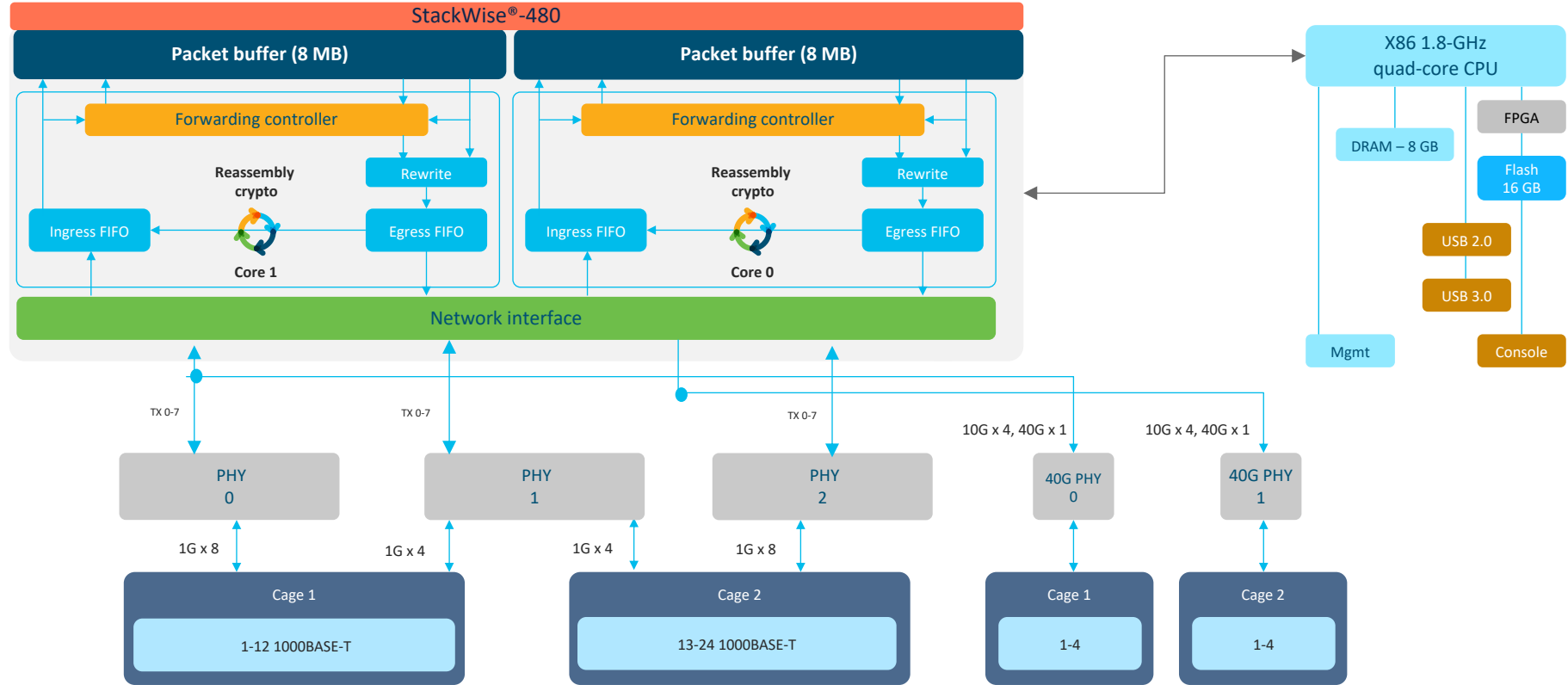


* Modular uplink models only.

Cisco Catalyst 9300 models

24-port 1-Gbps model block diagram

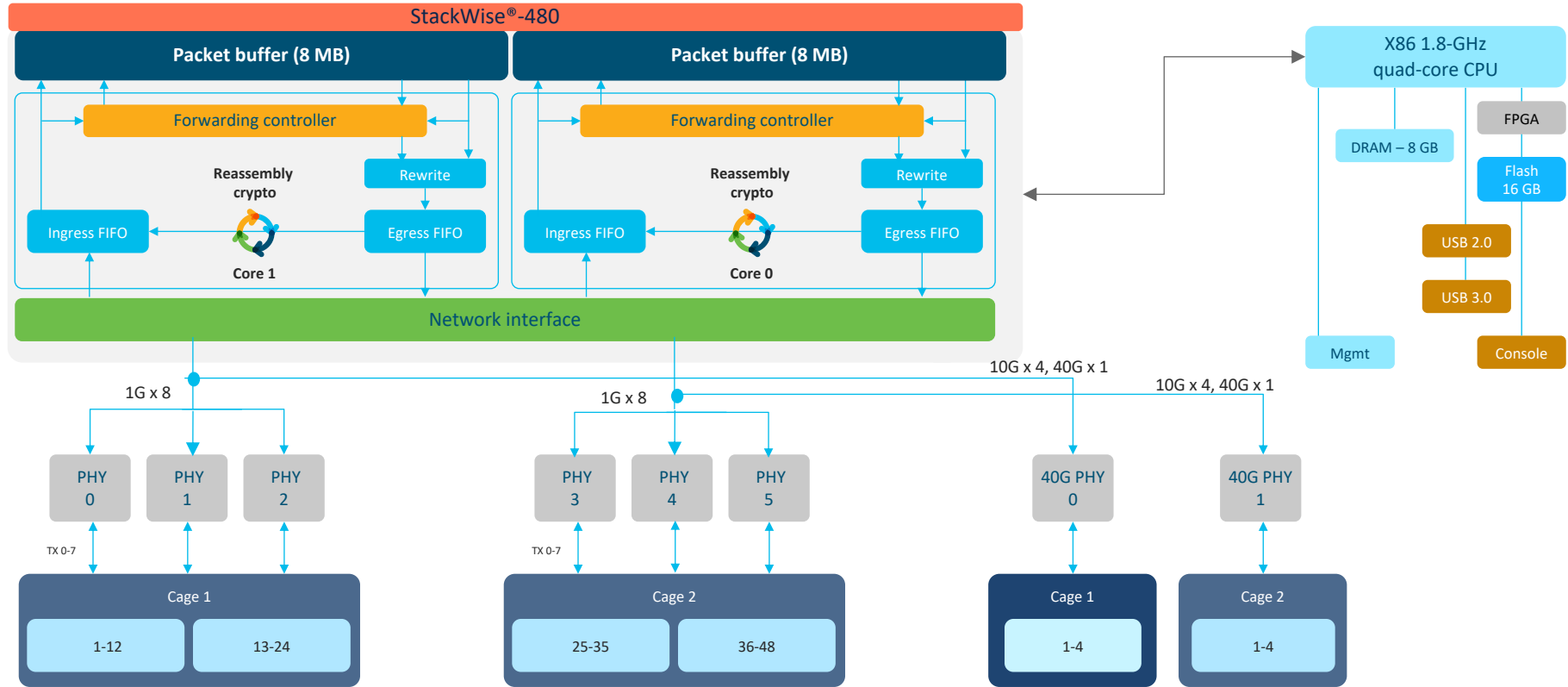
C9300-24T/P/U/H SKUs



Cisco Catalyst 9300 models

48-port 1-Gbps model block diagram

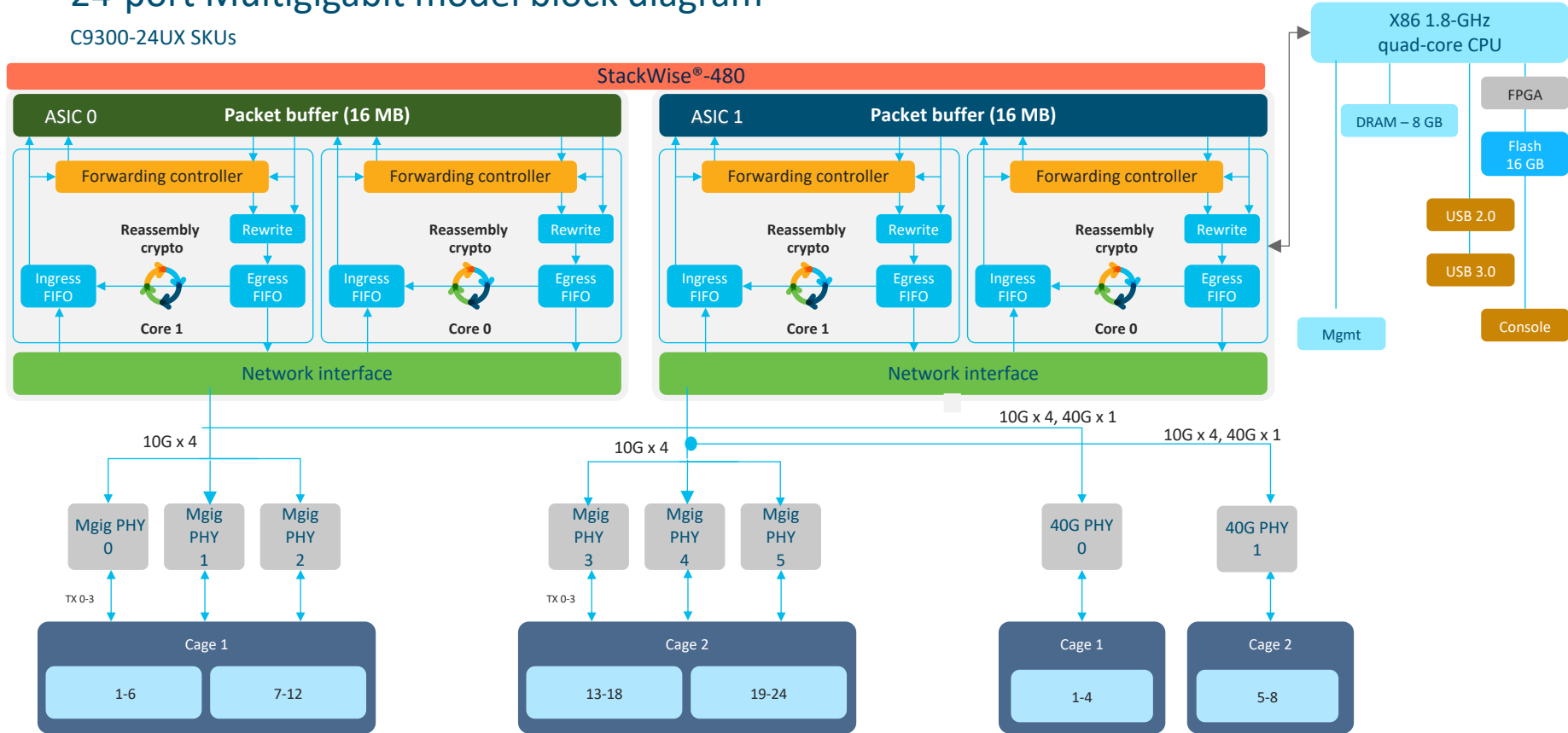
C9300-48T/P/U/H SKUs



Cisco Catalyst 9300 models

24-port Multigigabit model block diagram

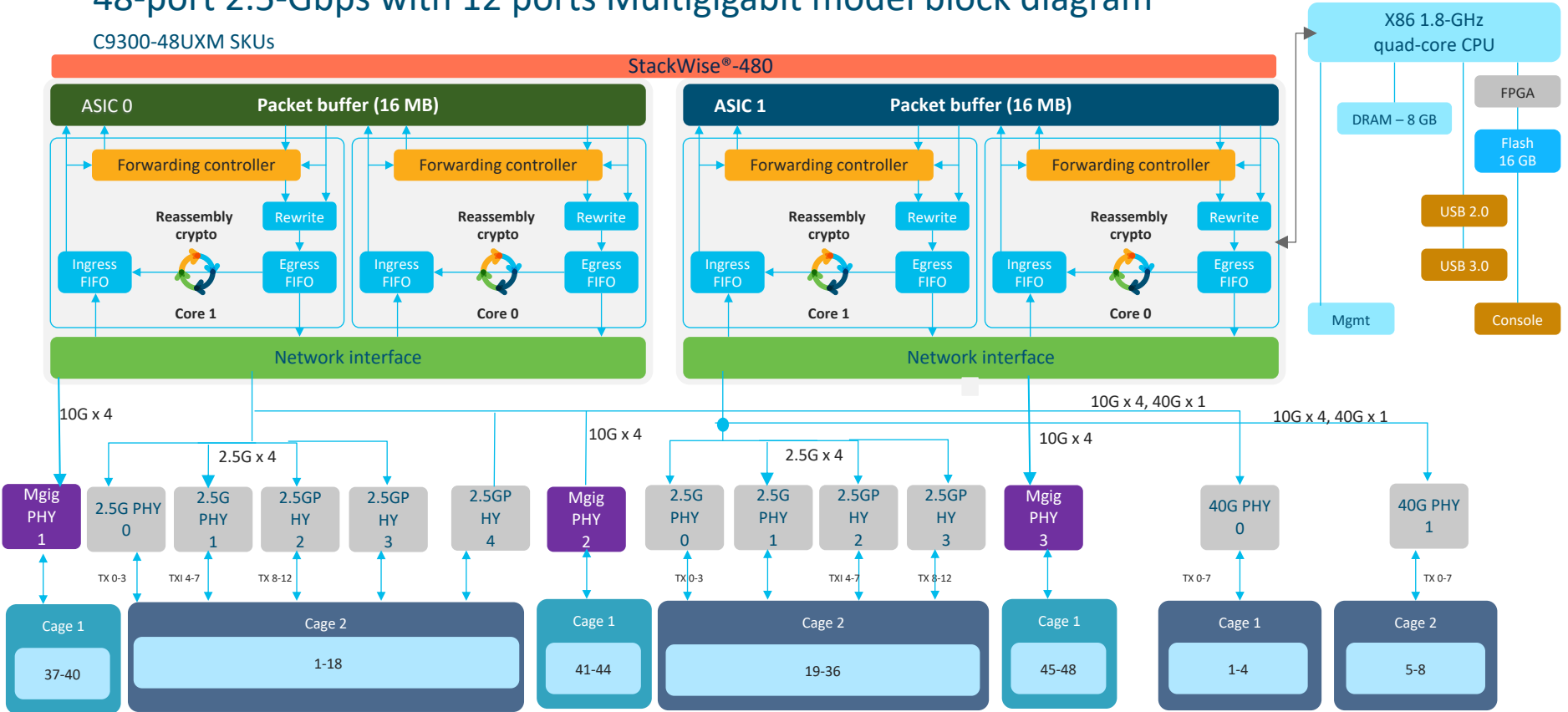
C9300-24UX SKUs



Cisco Catalyst 9300 models

48-port 2.5-Gbps with 12 ports Multigigabit model block diagram

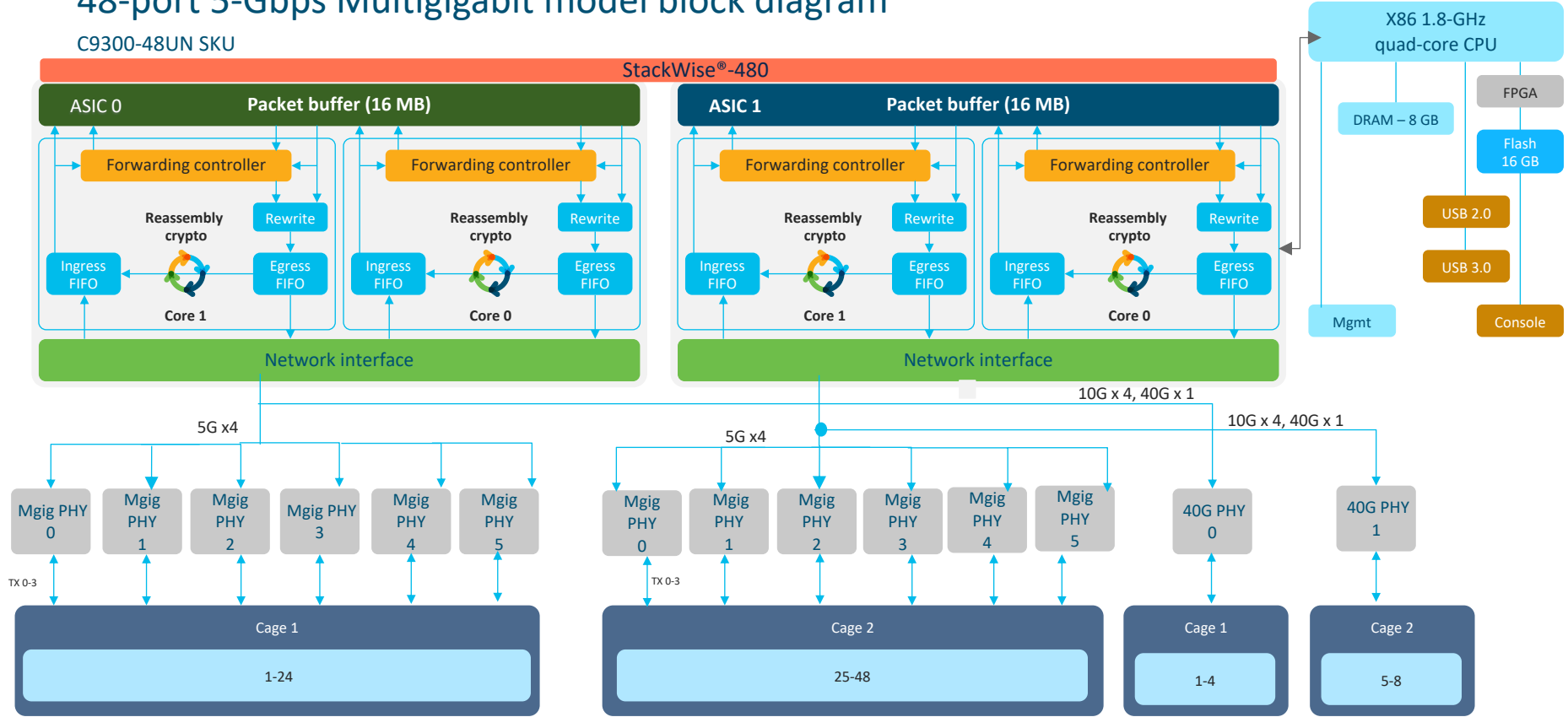
C9300-48UXM SKUs



Cisco Catalyst 9300 models

48-port 5-Gbps Multigigabit model block diagram

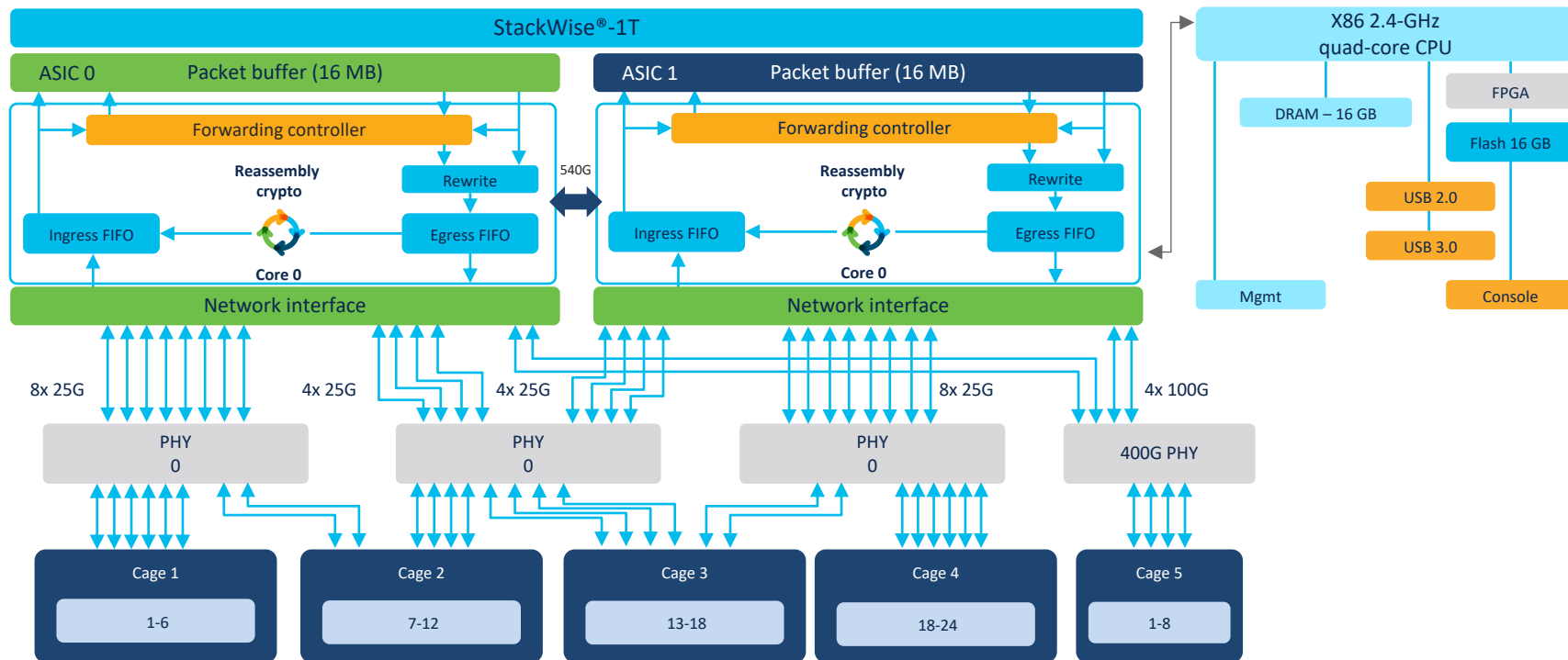
C9300-48UN SKU



Cisco Catalyst 9300X models

24 port 10/25G SFP+

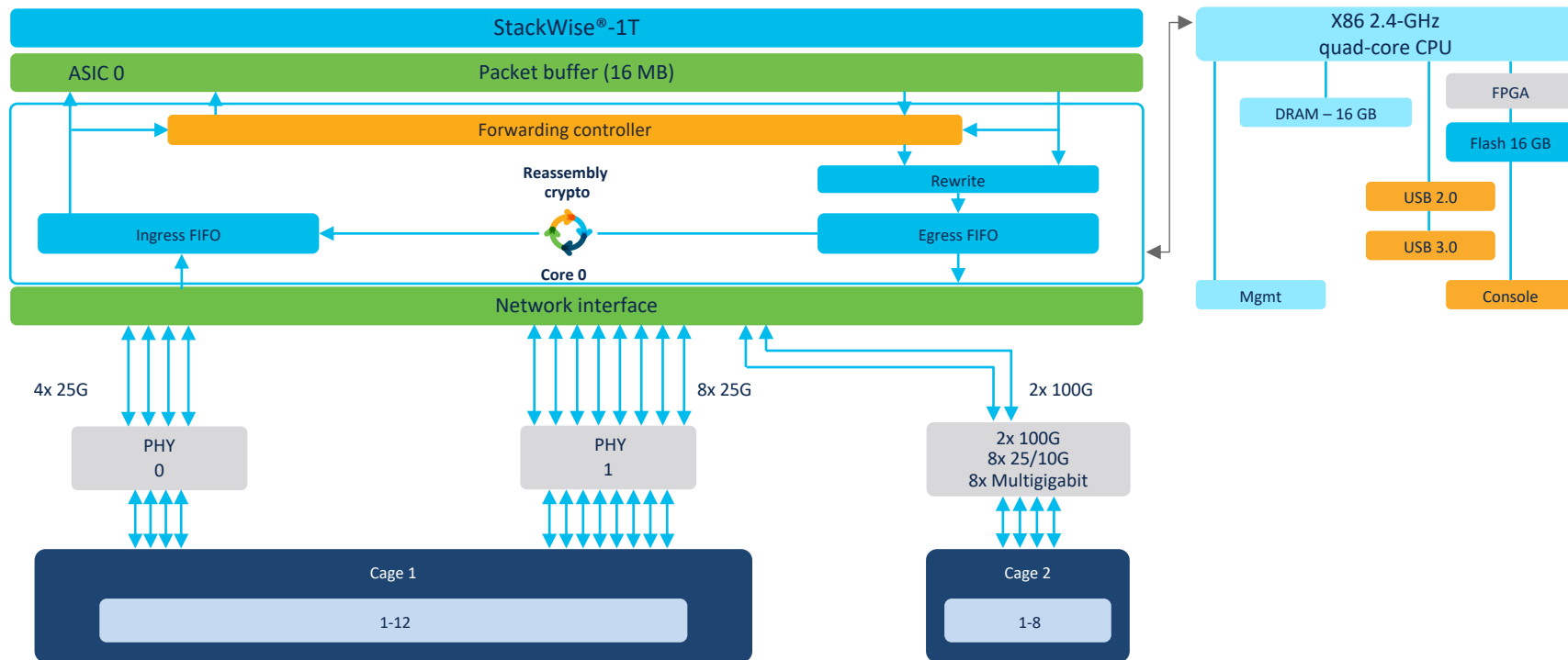
C9300X-24Y SKUs



Cisco Catalyst 9300X models

12 port 10/25G SFP+

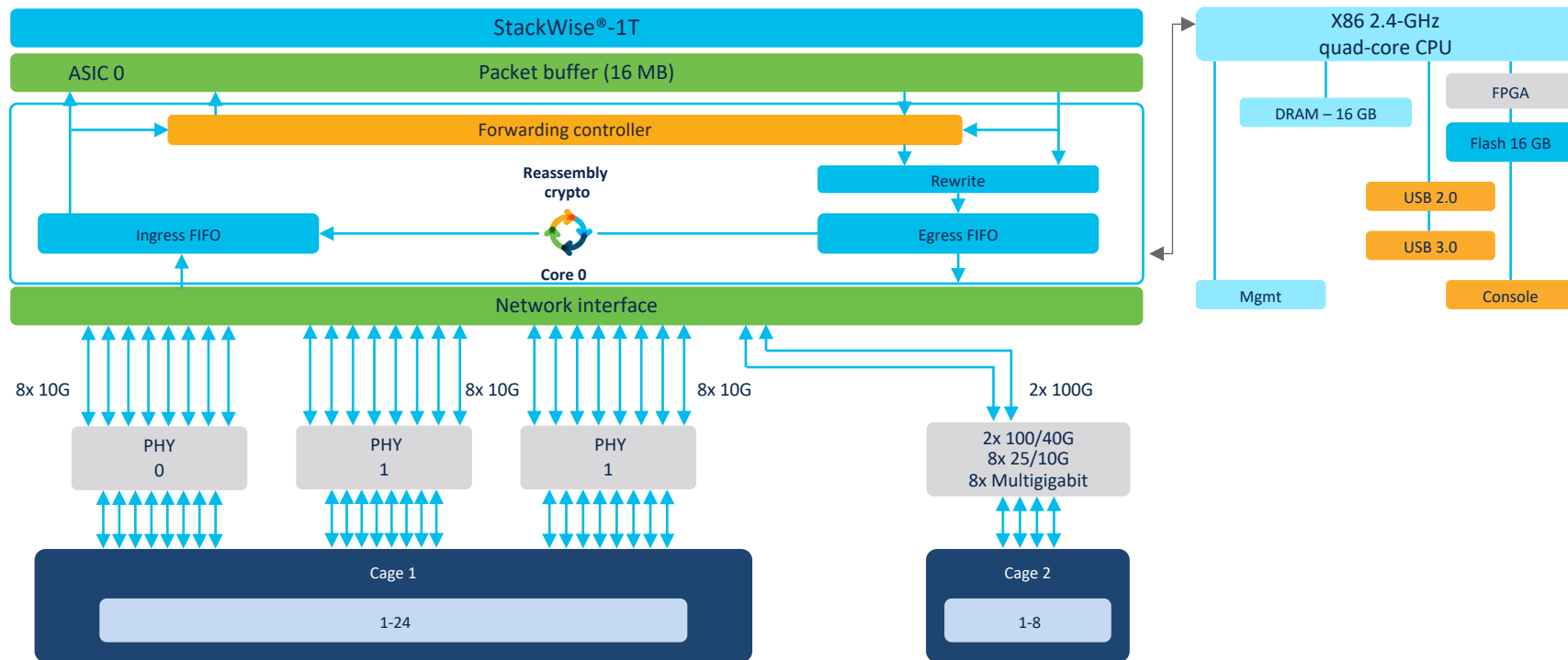
C9300X-12Y SKUs



Cisco Catalyst 9300X models

24 port 1/2.5/5/10G copper

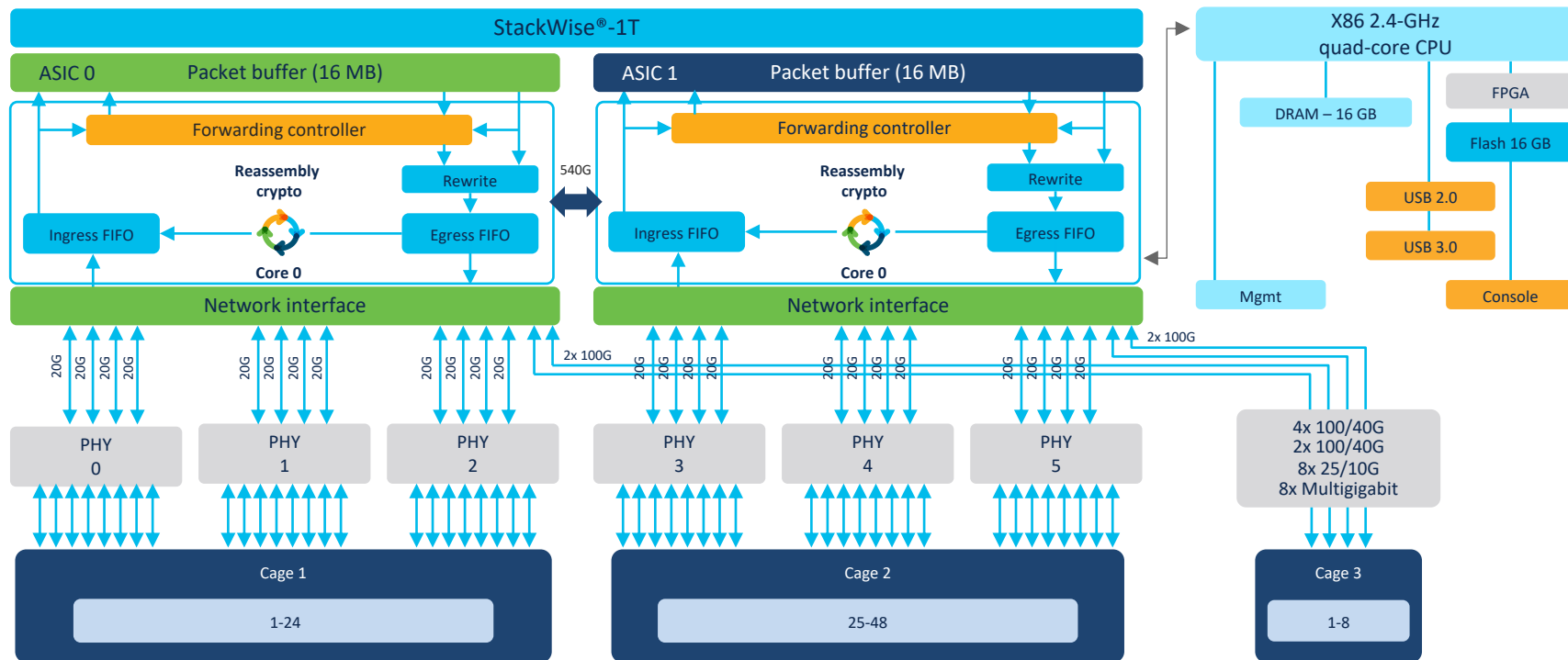
C9300X-24HX SKUs



Cisco Catalyst 9300X models

48 port 1/2.5/5/10G copper

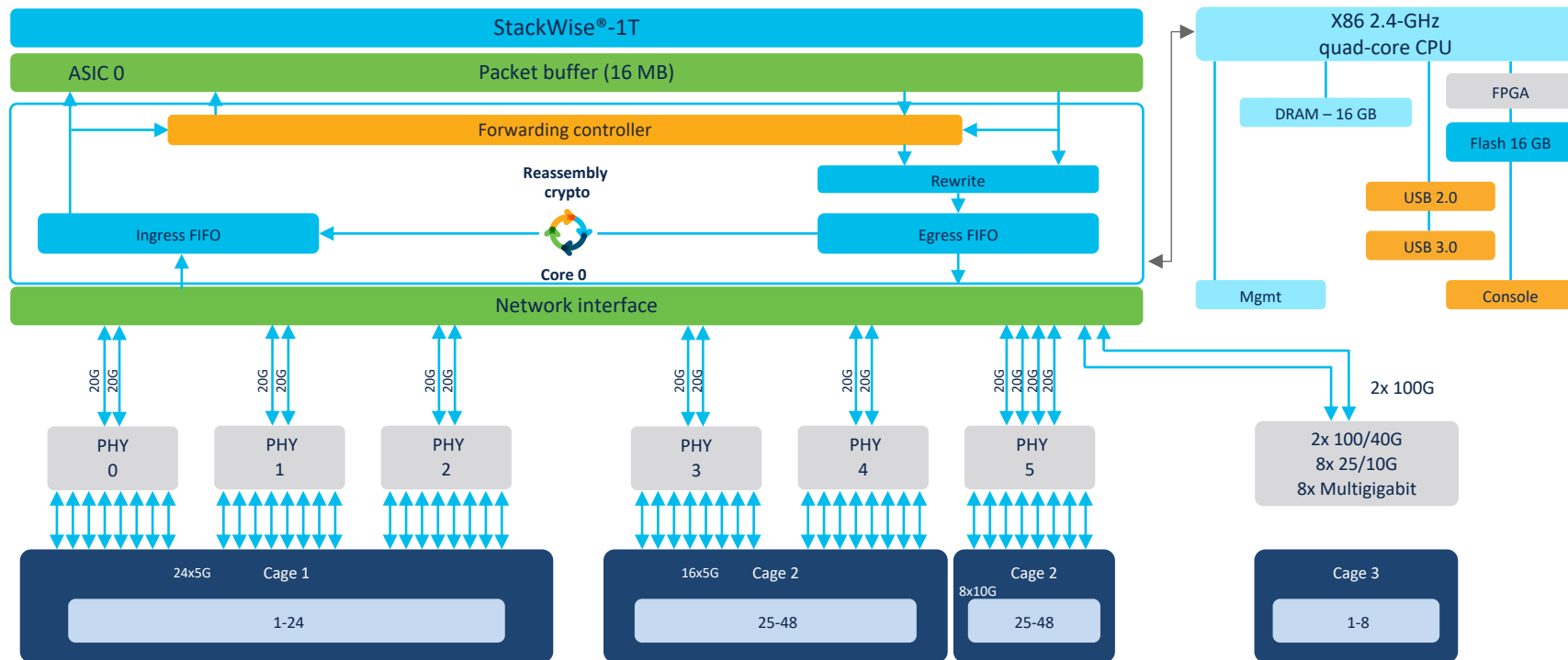
C9300X-48HX SKUs



Cisco Catalyst 9300X models

40 port 1/2.5/5G + 8 port 1/2.5/5/10G copper model

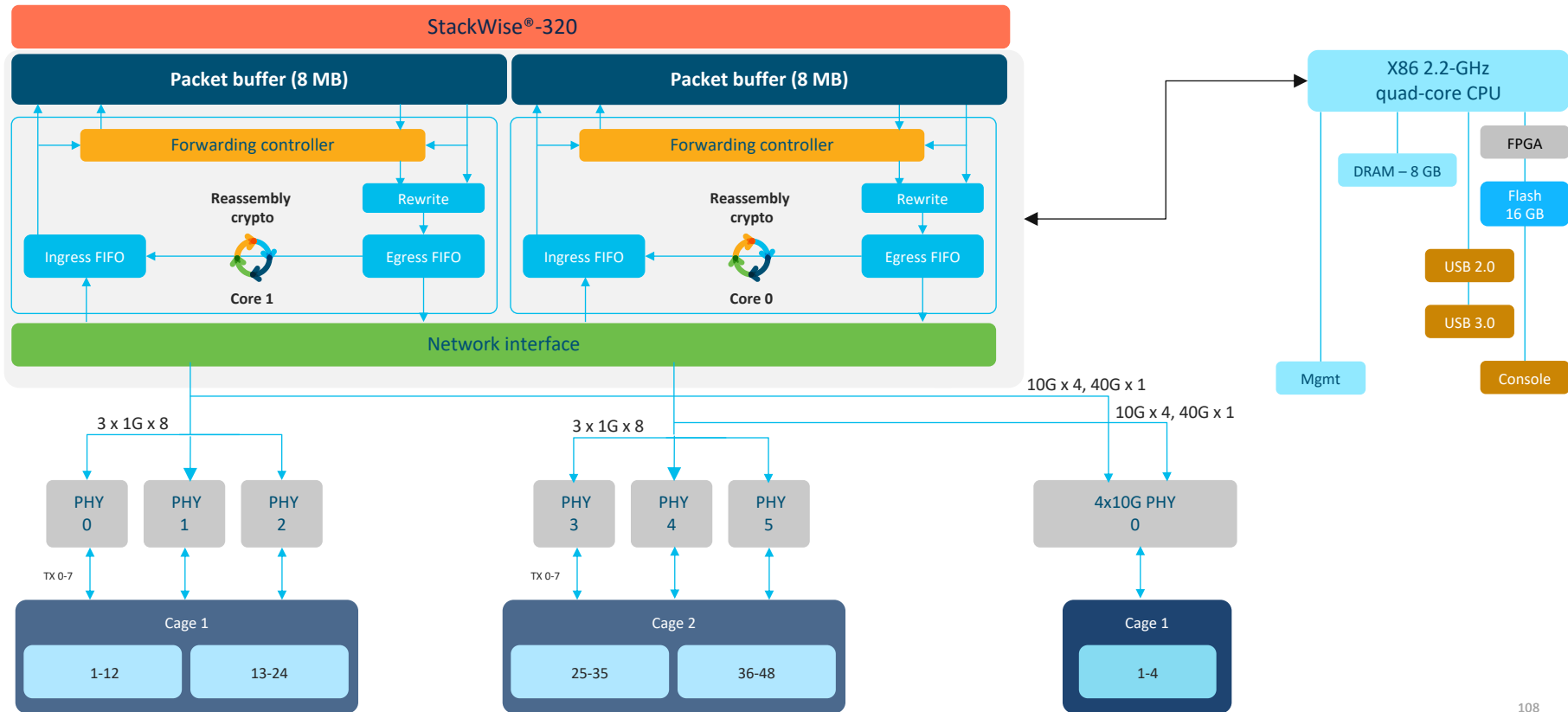
C9300X-48HXN SKUs



Cisco Catalyst 9300L models

48-port 1-Gbps model block diagram

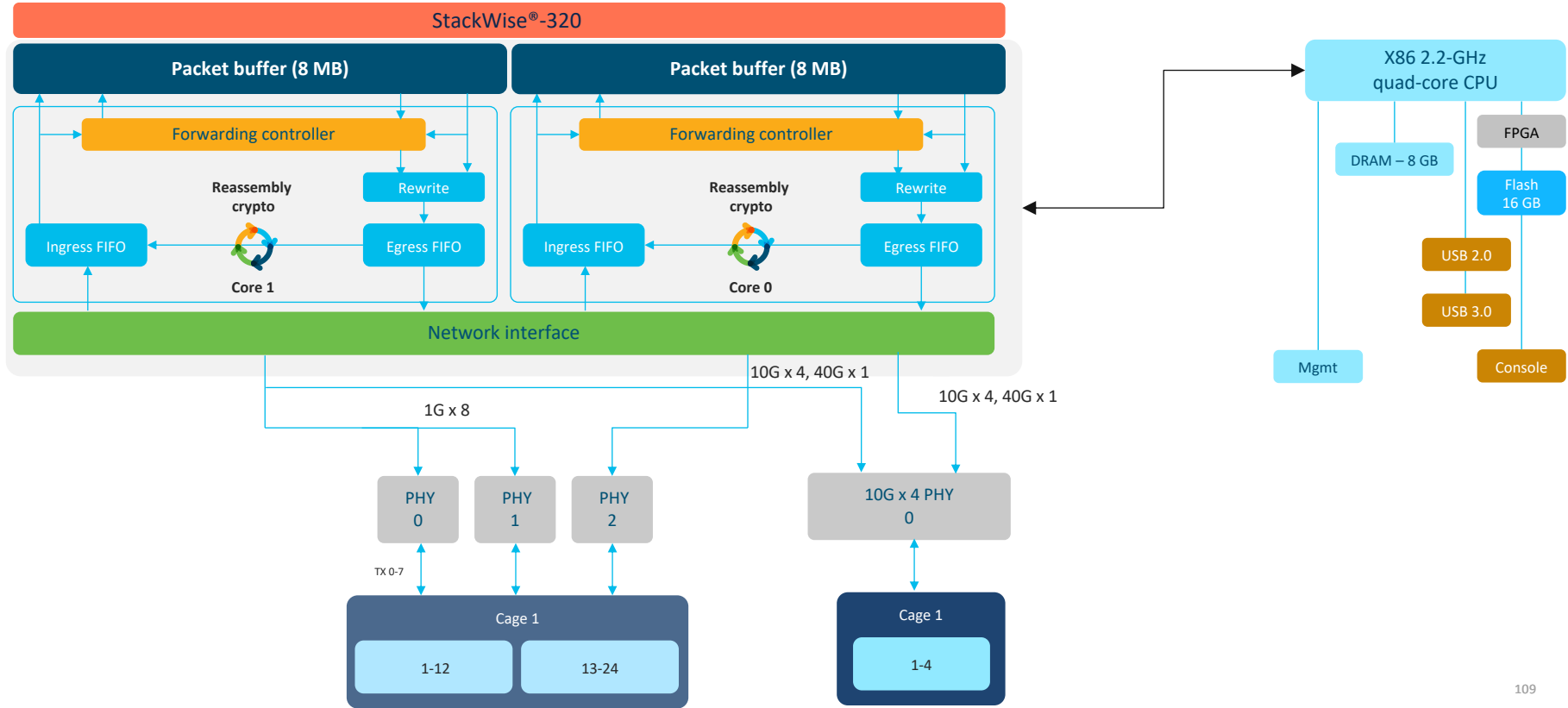
C9300L-48T/P SKUs



Cisco Catalyst 9300L model

24-port 1-Gbps model block diagram

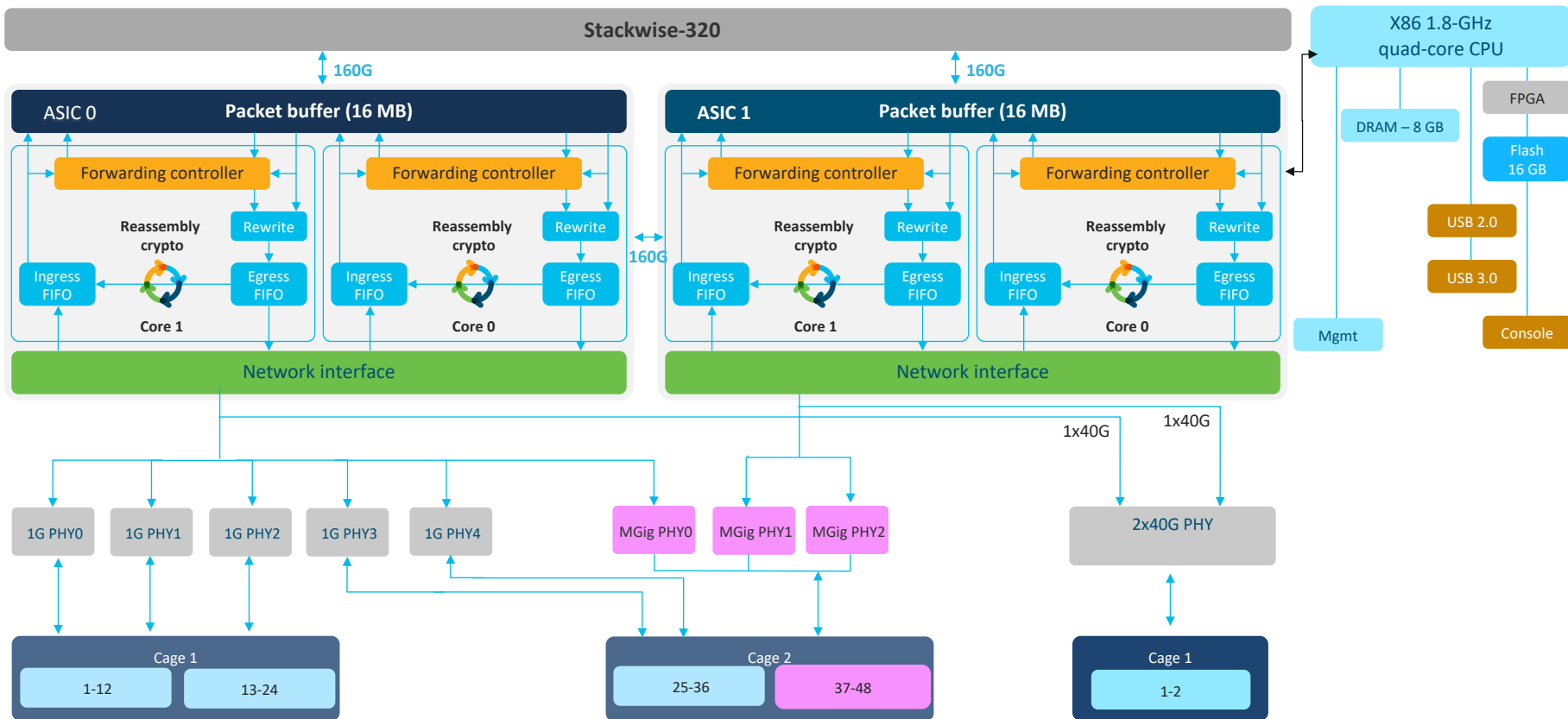
C9300L-24T/P SKUs



Cisco Catalyst 9300L models

48-ports Multigigabit model block diagram

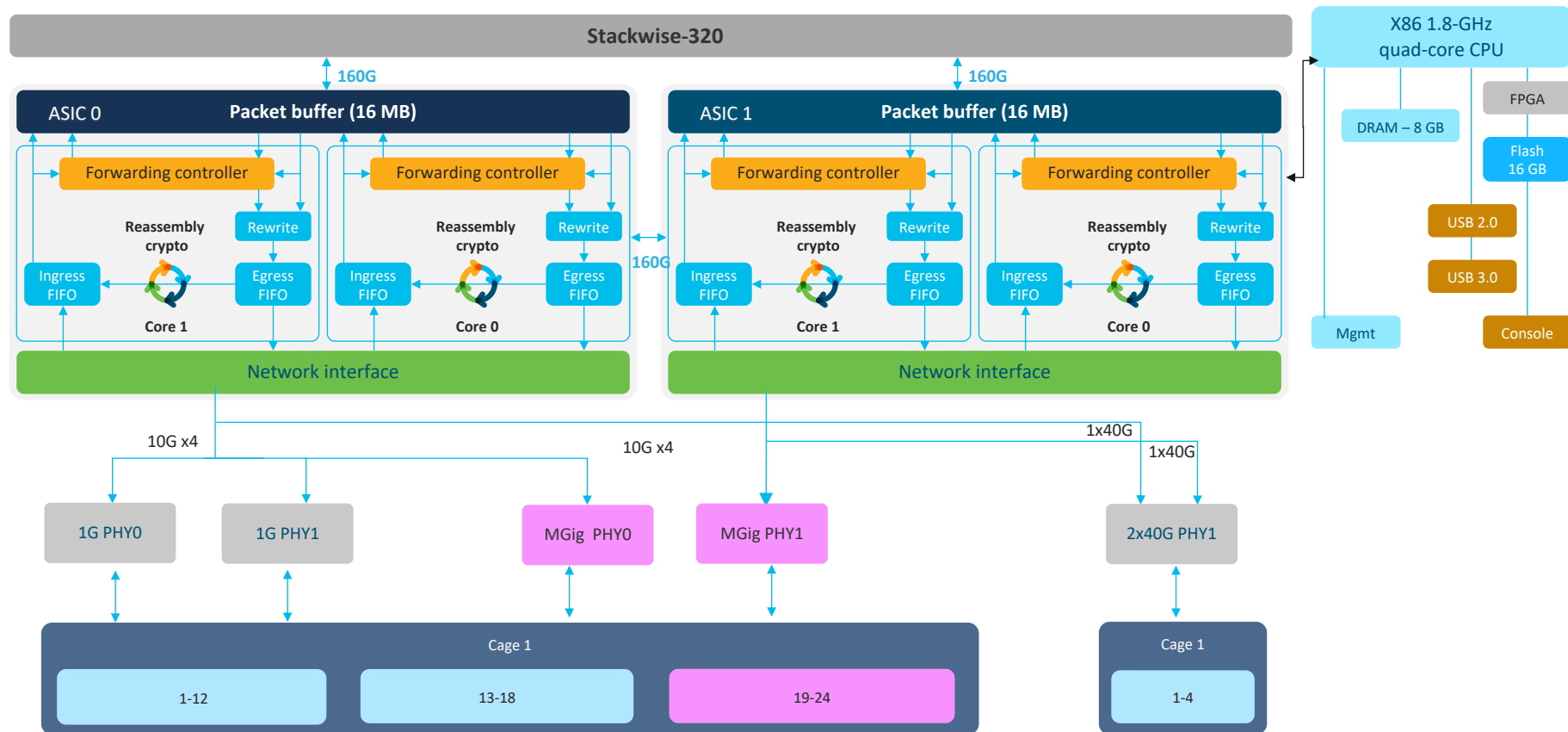
C9300L-48UXG SKUs



Cisco Catalyst 9300L models

24-ports Multigigabit model block diagram

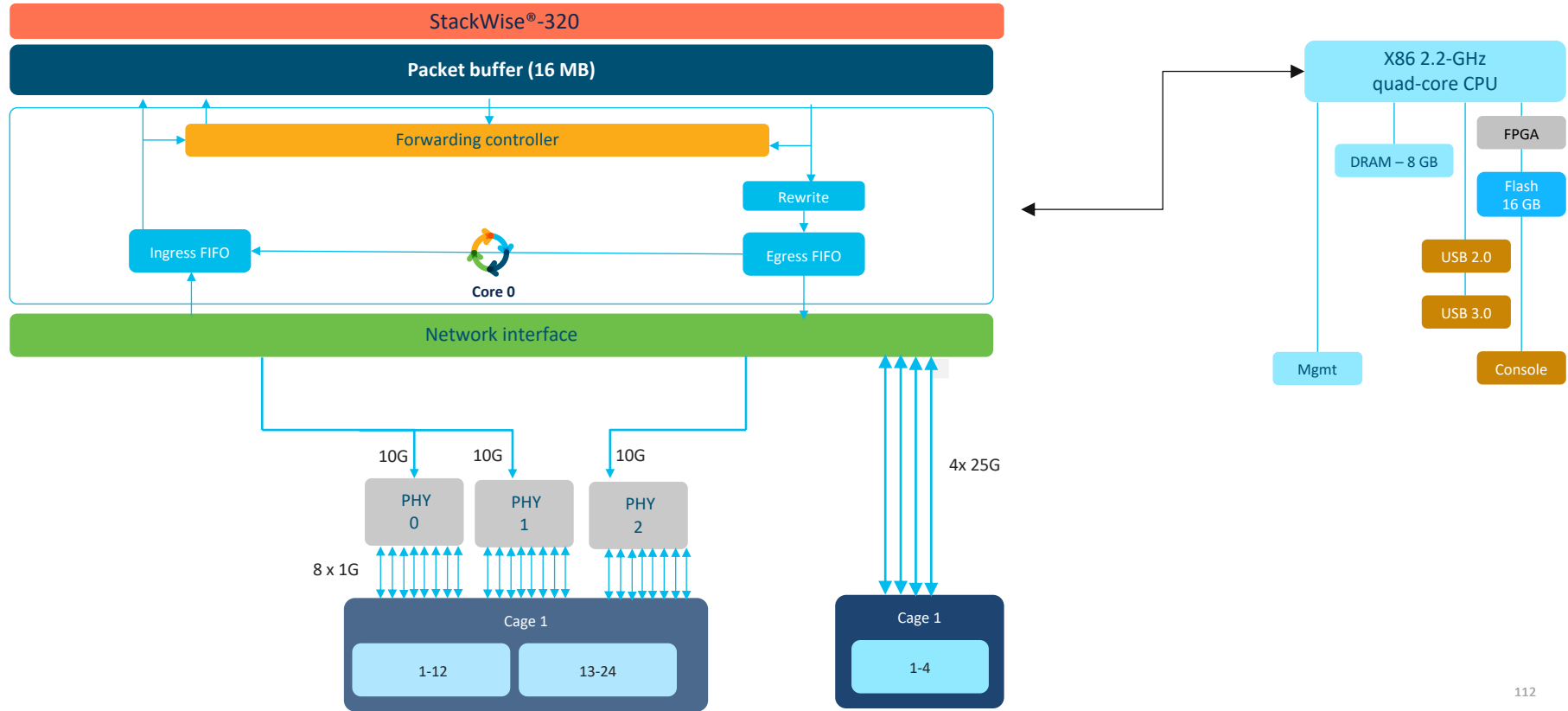
C9300L-24UXG SKUs



Cisco Catalyst 9300LM model

24-port 1-Gbps model block diagram

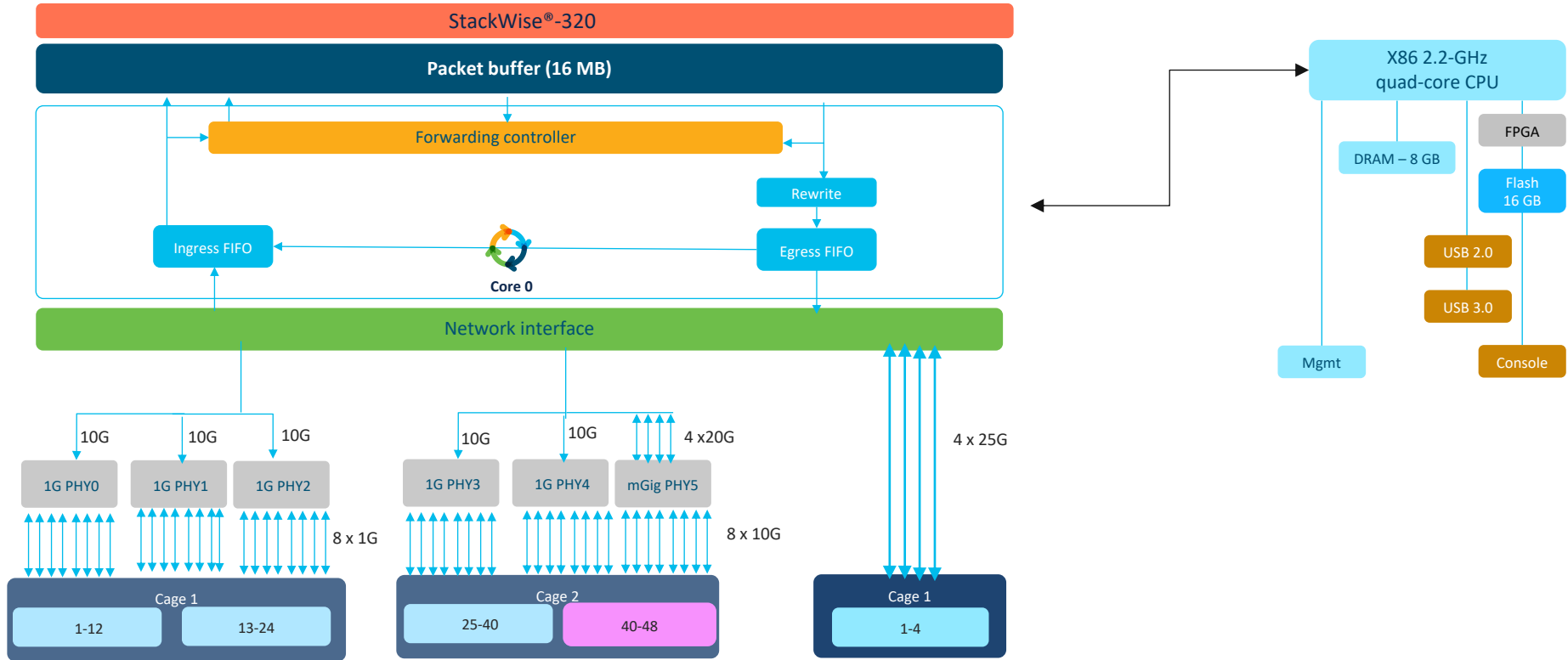
C9300LM-24U SKU



Cisco Catalyst 9300LM model

40-port 1G and 8-port mgig model block diagram

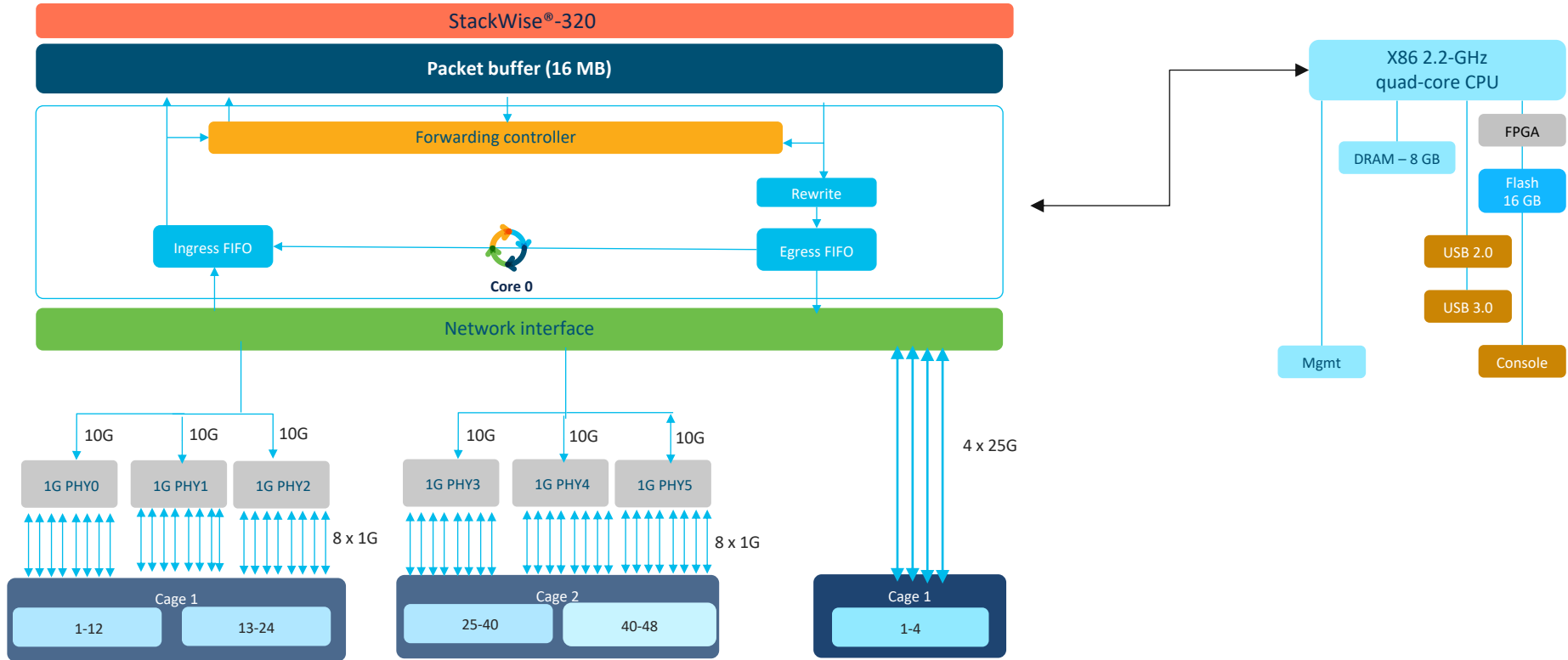
C9300LM-48UX SKU



Cisco Catalyst 9300LM model

48-port 1-Gbps model block diagram

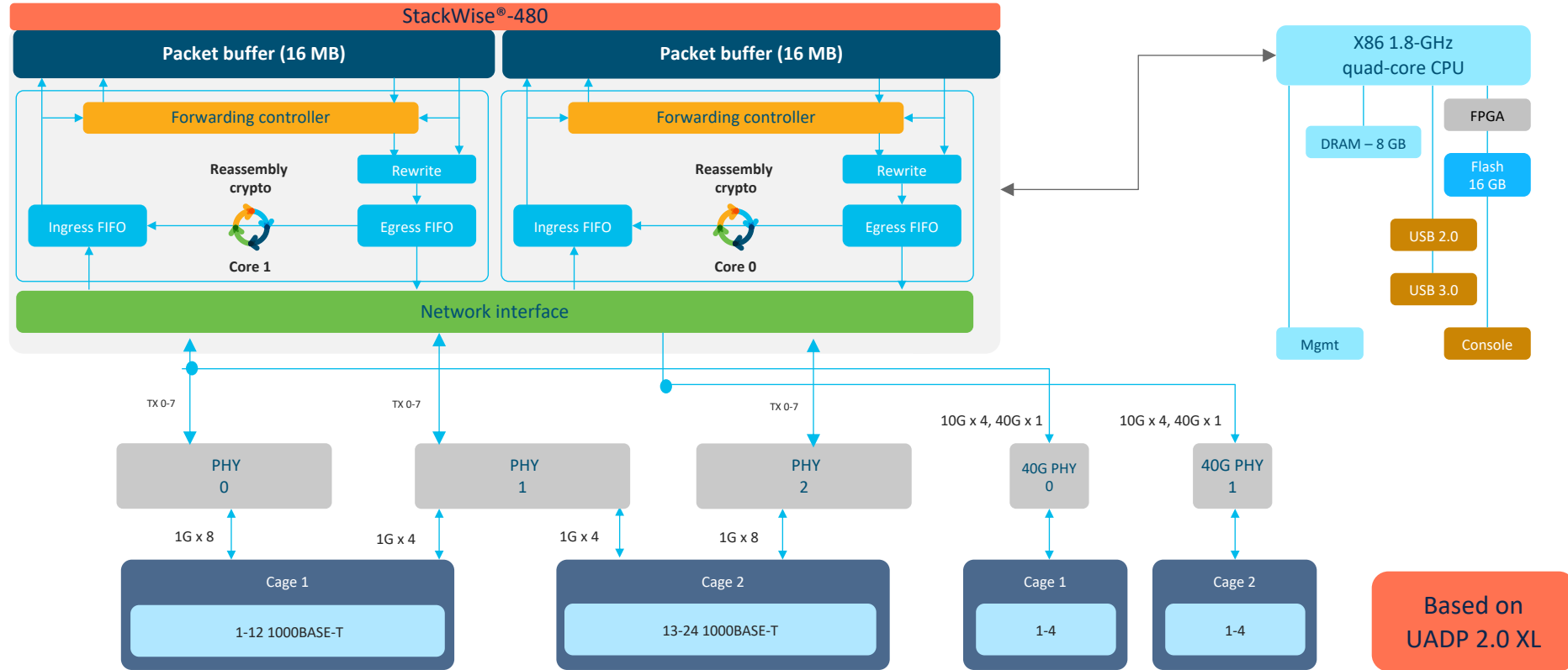
C9300LM-48U SKU



Cisco Catalyst 9300B models

24-port 1-Gbps UPOE model block diagram

C9300-24UB SKU



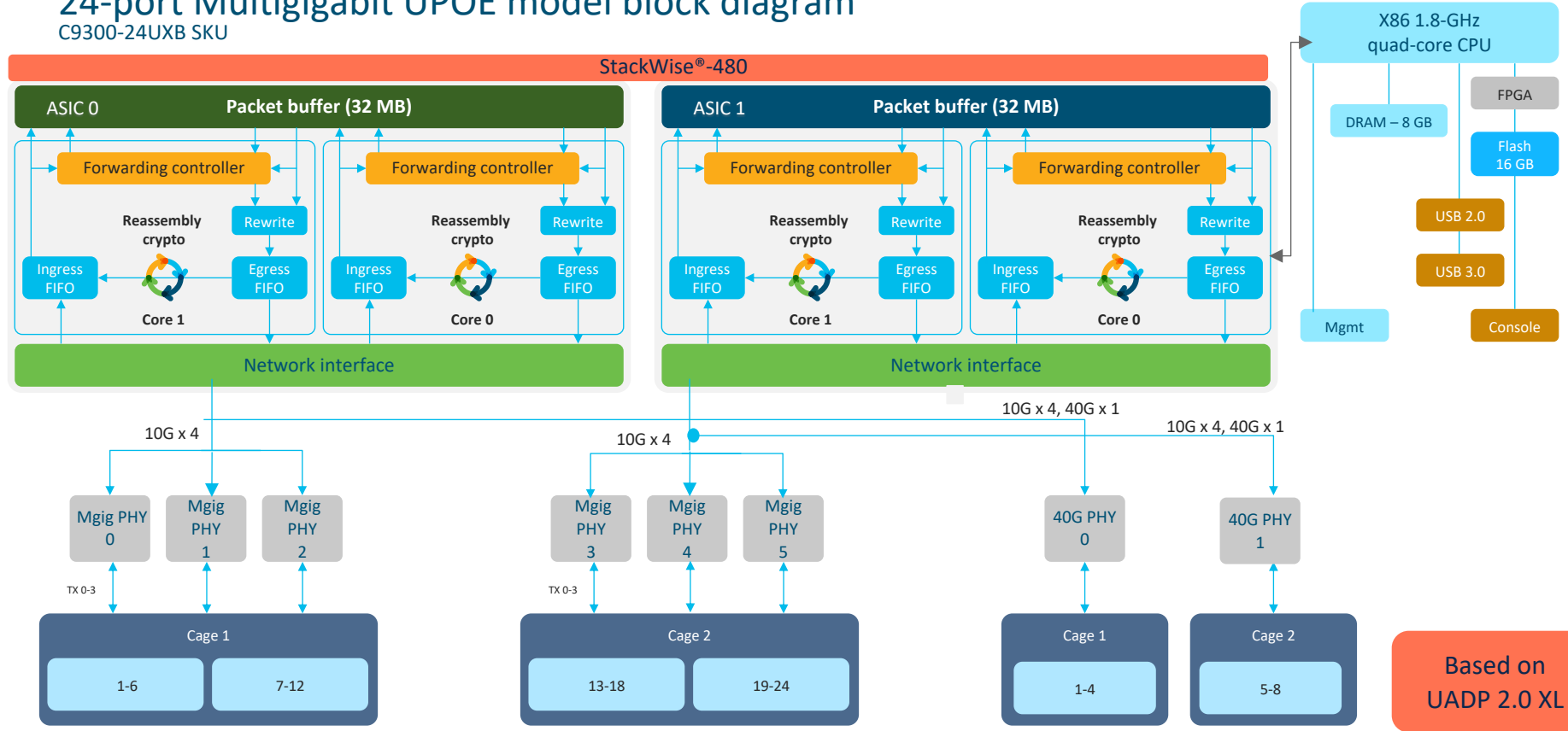
C9300-48UB SKUs



Cisco Catalyst 9300B models

24-port Multigigabit UPOE model block diagram

C9300-24UXB SKU



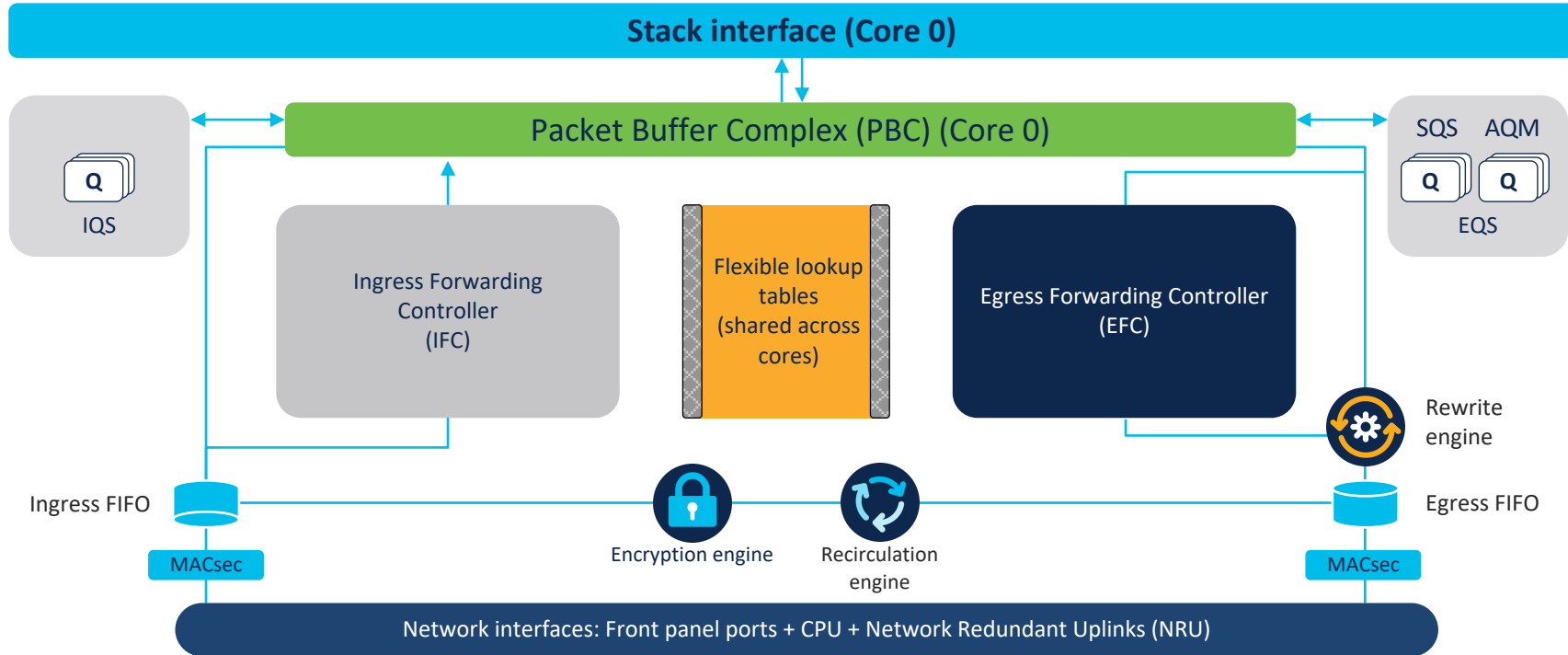
Cisco Catalyst 9300 Series Switches

ASIC port mapping, C9300X-48HX

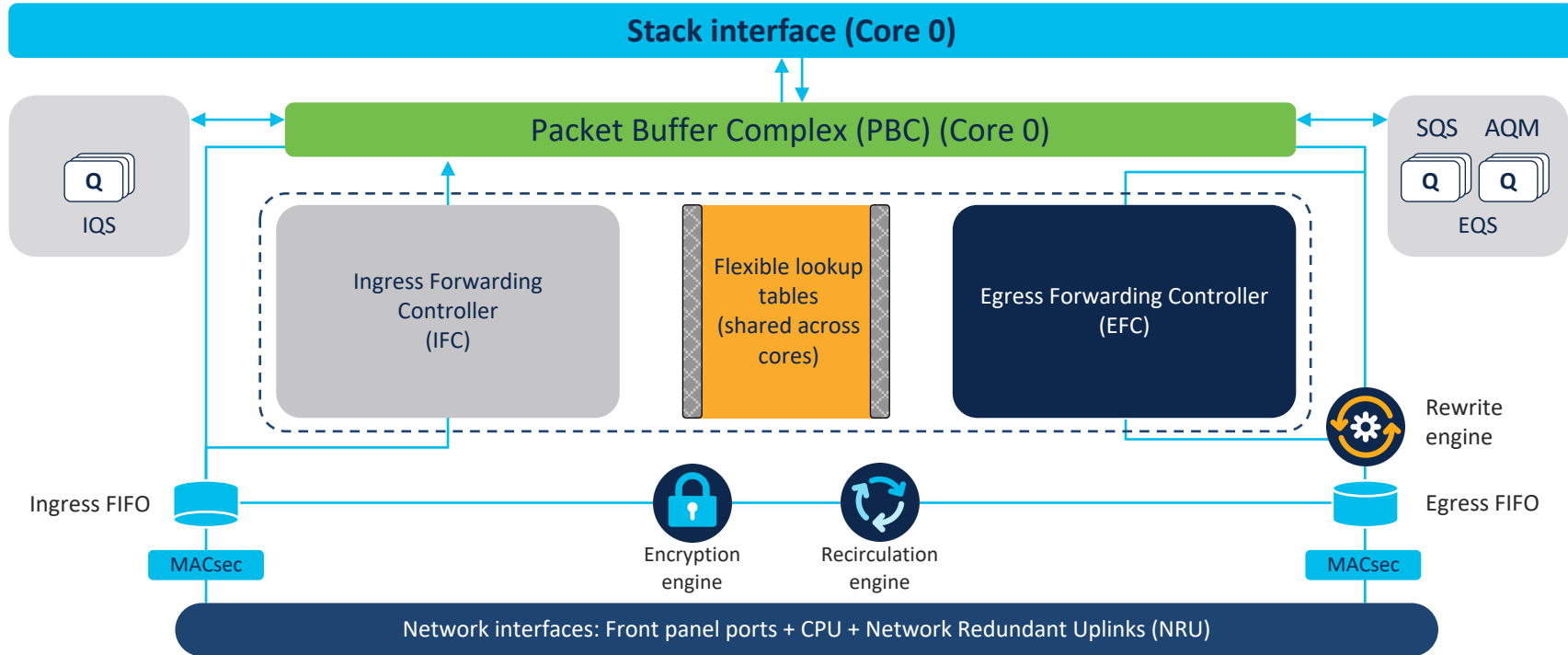
```
Cat9k-Edge#sh platform software fed switch 1 ifm mappings
Interface      IF_ID      Inst Asic Core Port SubPort Mac Cntx LPN GPN Type Active
TenGigabitEthernet1/0/1  0x9        1 1 0 0 0 15 8 1 1 NRU Y
TenGigabitEthernet1/0/24 0x20       1 1 0 23 0 4 31 24 24 NIF Y
TenGigabitEthernet1/0/48 0x38       0 0 0 23 0 4 31 48 48 NIF Y
TenGigabitEthernet1/1/1  0x39       1 1 0 24 0 6 0 49 49 NIF N
TenGigabitEthernet1/1/4  0x3c       1 1 0 27 0 5 3 52 52 NIF N
TenGigabitEthernet1/1/5  0x3d       0 0 0 24 0 6 0 53 53 NIF N
TenGigabitEthernet1/1/8  0x40       0 0 0 27 0 5 3 56 56 NIF N
TwentyFiveGigE1/1/1     0x41       1 1 0 28 0 7 0 57 57 NIF N
TwentyFiveGigE1/1/4     0x44       1 1 0 31 0 4 3 60 60 NIF N
TwentyFiveGigE1/1/5     0x45       0 0 0 28 0 7 0 61 61 NIF N
TwentyFiveGigE1/1/8     0x48       0 0 0 31 0 4 3 64 64 NIF N
TwentyFiveGigE1/1/9     0x49       1 1 0 32 0 3 4 65 65 NIF N
TwentyFiveGigE1/1/12    0x4c       1 1 0 35 0 0 7 68 68 NIF N
TwentyFiveGigE1/1/13    0x4d       0 0 0 32 0 3 4 69 69 NIF N
TwentyFiveGigE1/1/16    0x50       0 0 0 35 0 0 7 72 72 NIF N
HundredGigE1/1/1        0x51       1 1 0 36 0 4 0 73 73 NIF N
HundredGigE1/1/2        0x52       0 0 0 36 0 4 0 74 74 NIF N
HundredGigE1/1/3        0x53       1 1 0 37 0 0 4 75 75 NIF N
HundredGigE1/1/4        0x54       0 0 0 37 0 0 4 76 76 NIF N
AppGigabitEthernet1/0/1  0x55       1 1 0 38 0 0 32 77 77 NIF Y
AppGigabitEthernet1/0/2  0x56       0 0 0 38 0 0 32 78 78 NIF Y
```

ASIC block diagram

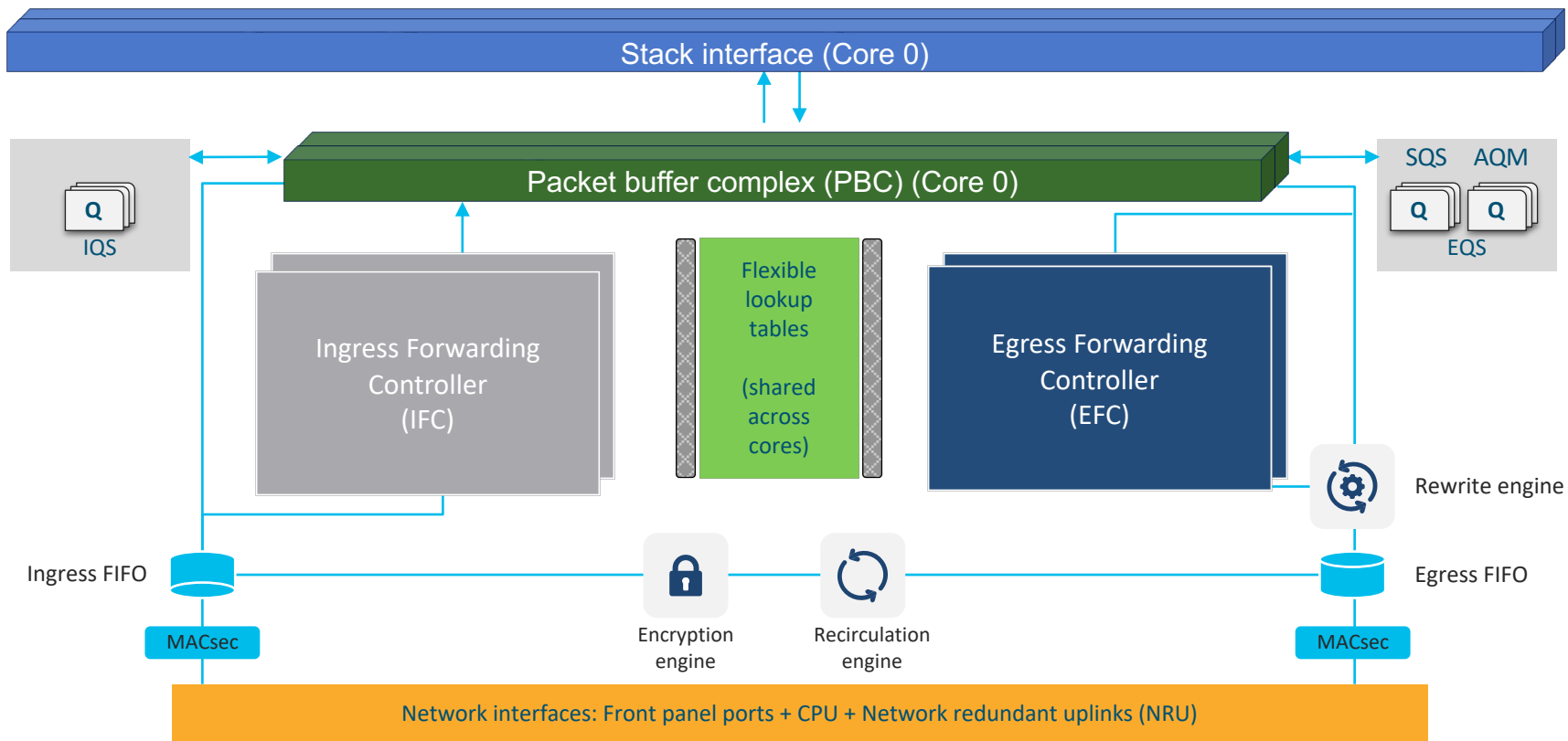
UADP 2.0sec – Core architecture



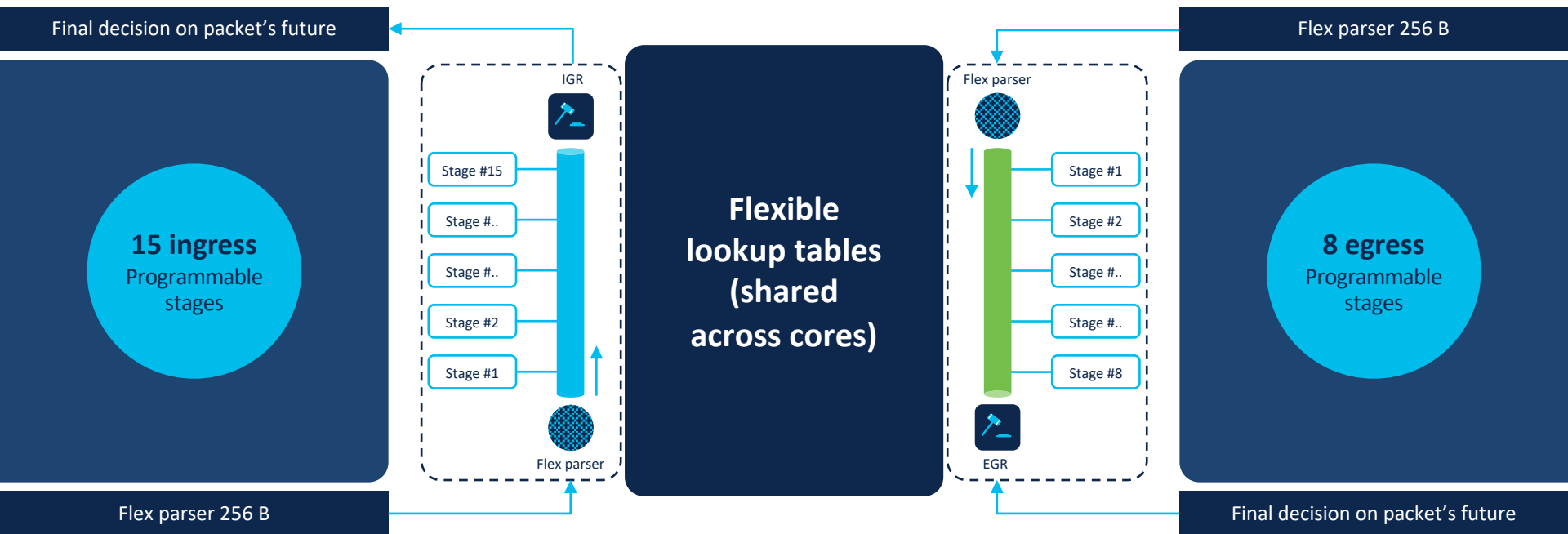
UADP ASIC – Programmable pipelines



UADP 2.0 / 2.0 XL – 2 core ASICs

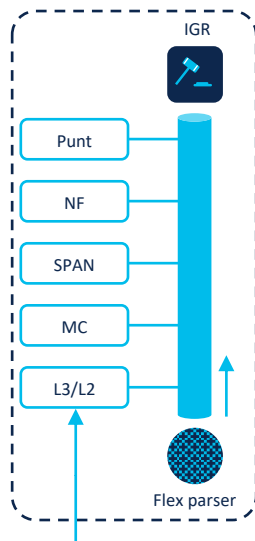


Forwarding – Under the covers



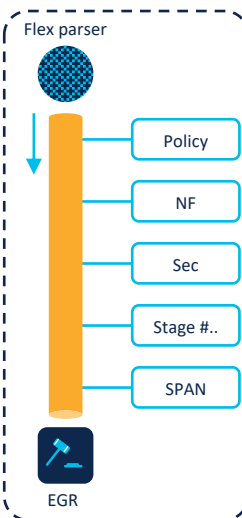
UADP 2.0sec – Sample stages

15 ingress
Programmable
stages



At each stage, two
simultaneous
lookups

**Flexible
lookup tables
(shared
across cores)**



8 egress
Programmable
stages

Packet walks

Abbreviations used

IFC

Ingress Forwarding Controller

PBC

Packet Buffer Complex

IQS

Ingress Queueing and Scheduling

SIF

Stack Interface

EQS

Egress Queueing and Scheduling

EFC

Egress Forwarding Controller

SQS

Stack Queueing and Scheduling

SPQ

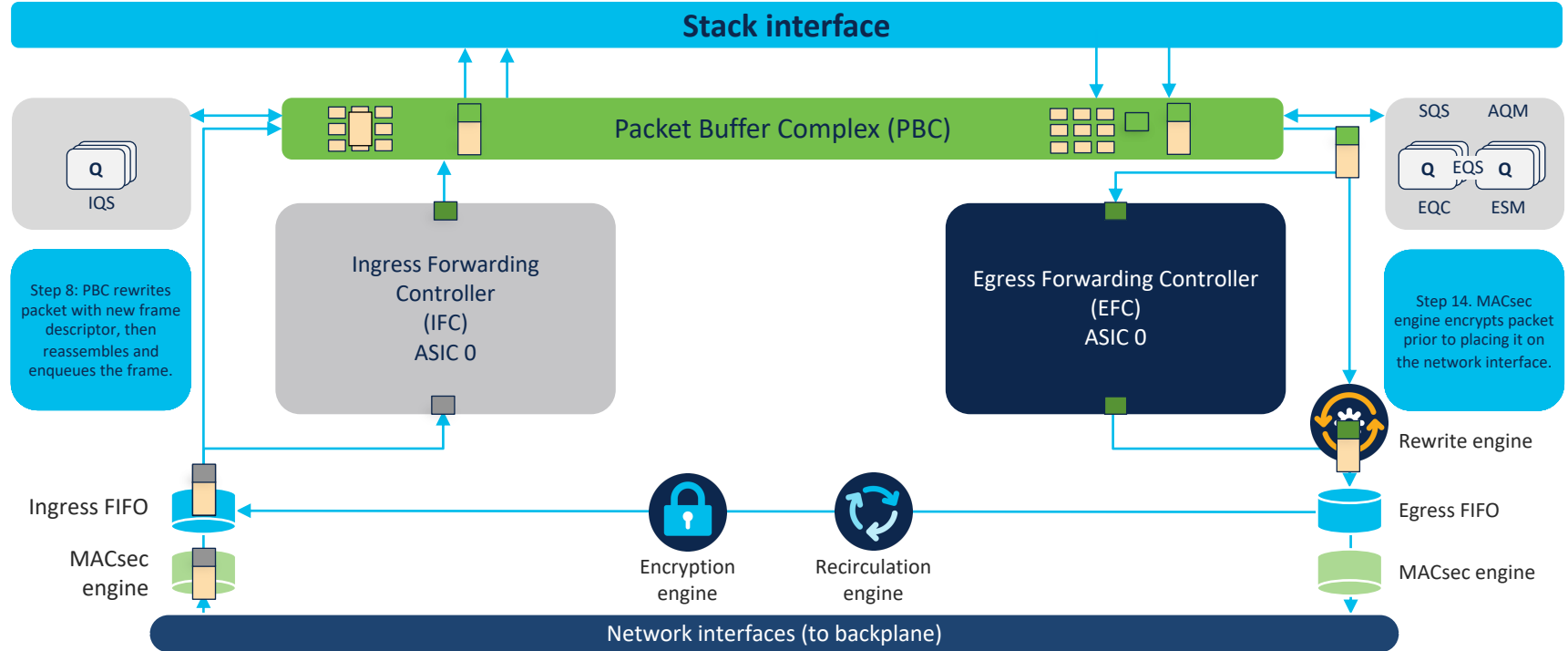
Supervisor Packet Queueing

Unicast forwarding within UADP ASIC (ingress and egress)

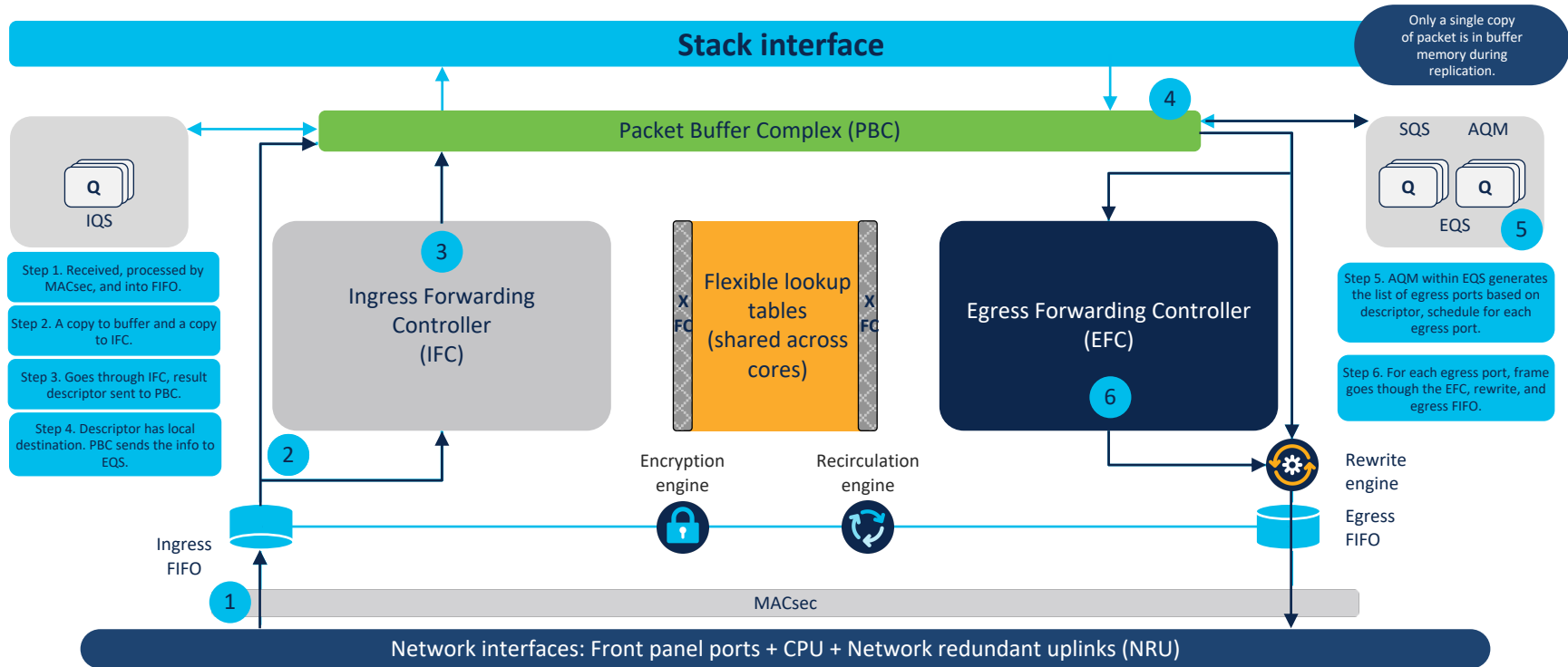


Cisco Catalyst 9300 and 9300X

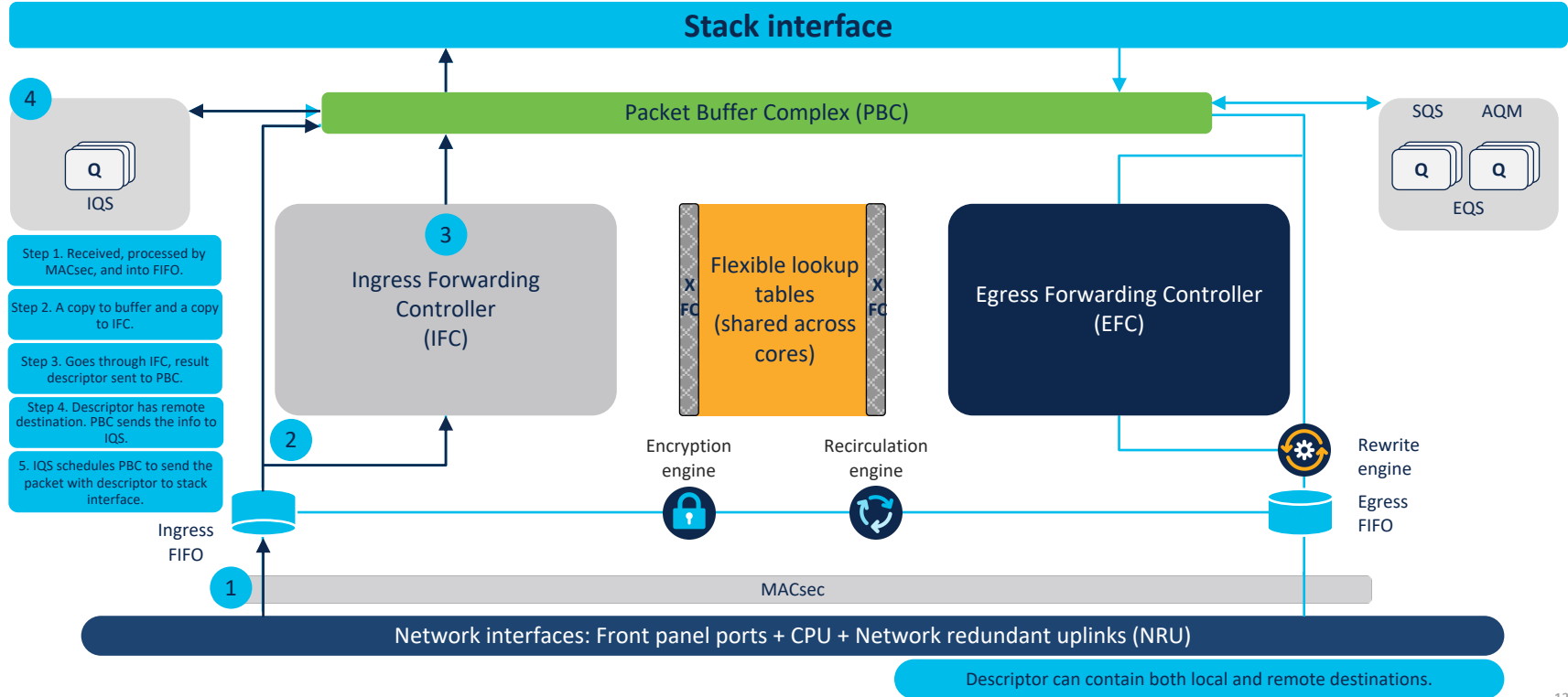
Unicast forwarding across ASIC (ingress and egress)



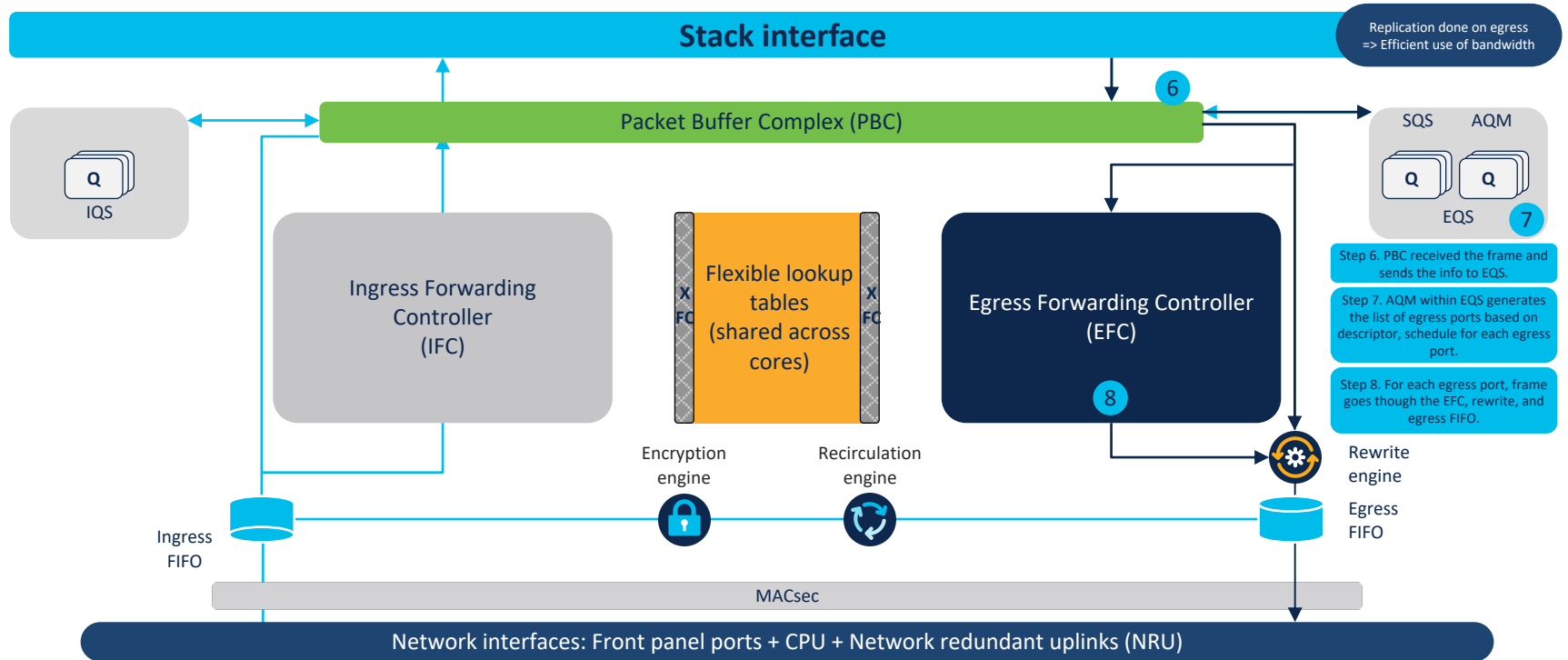
Multicast – Egress local



Multicast – Egress remote on input



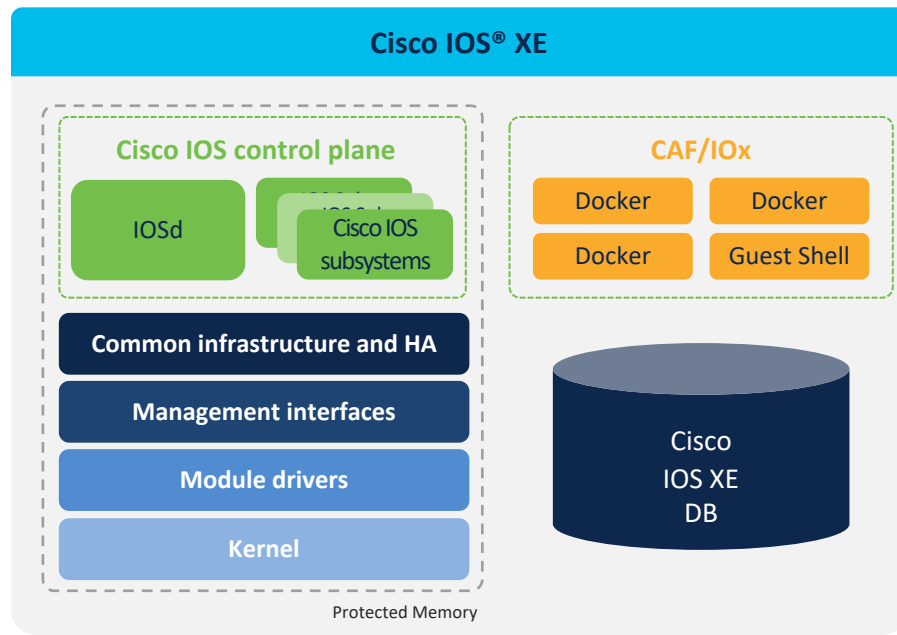
Multicast – Egress remote output



Open IOS XE Innovations



Cisco IOS XE – A modern operating system



Cisco IOS subsystems
Resiliency and high availability

Cisco IOS XE database
Programmability and open models

Cisco IOx and Docker containers
Cisco and third-party app hosting

Open, model-driven, and secure operating system

Ready for software patching

A Software Maintenance Update (SMU) is an emergency point fix positioned for expedited delivery to a customer in case of a network down or revenue-affecting scenario.

Cold patching: Install of an SMU will require a system reload in the first release. It is traffic impacting.

Hot patching: Install of an SMU does not require a reload.



Install Add



Install Activate



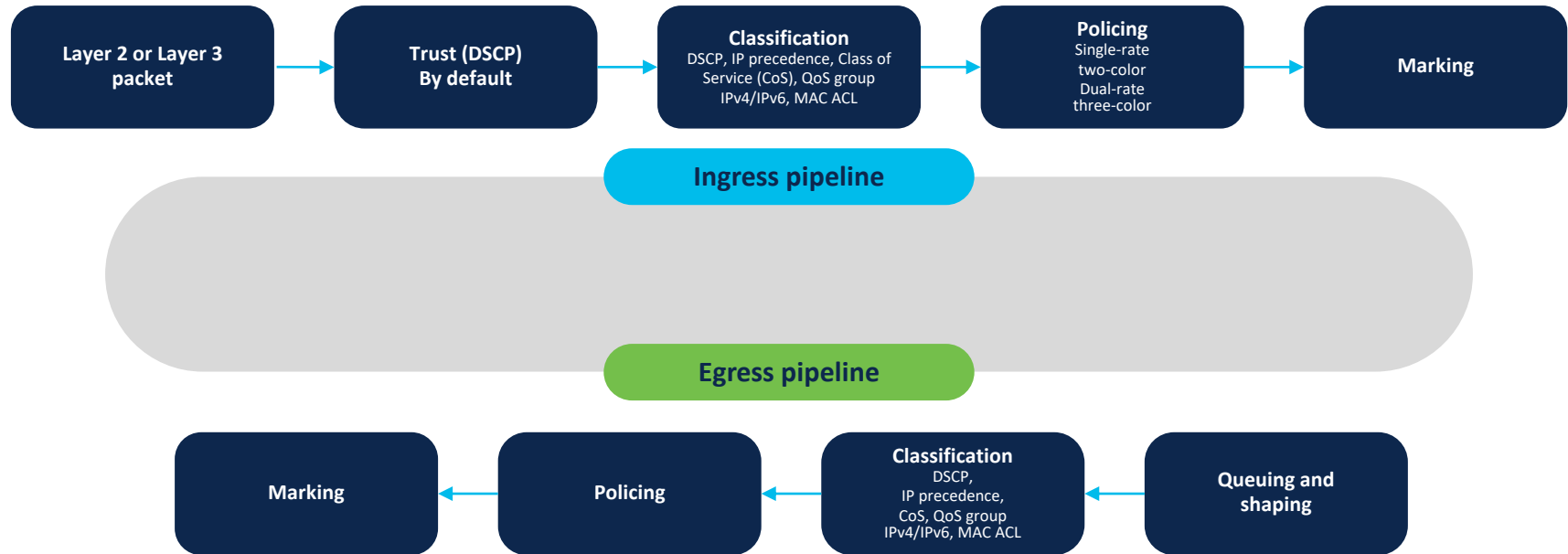
Install Commit

Quality of service

Cisco Catalyst 9300 Series Switches

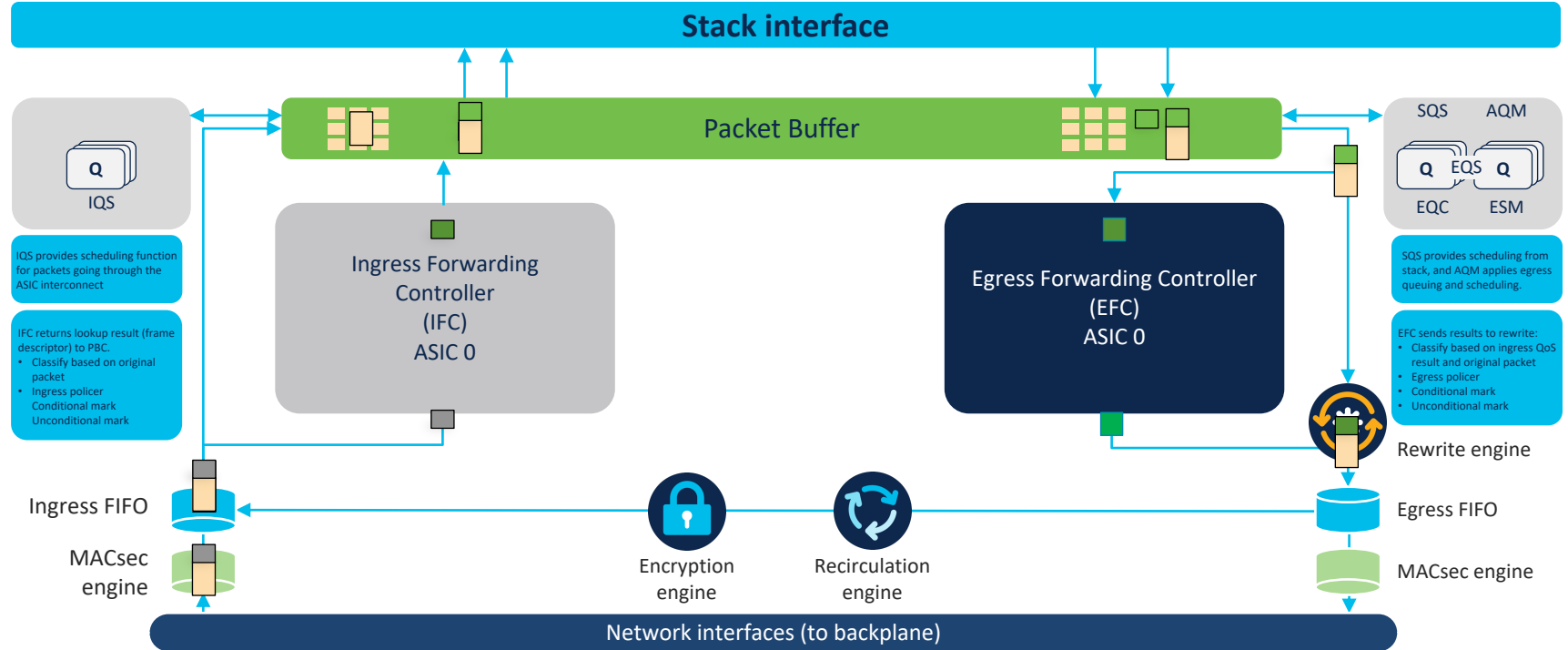
Quality of Service (QoS)

- QoS is enabled by default
- All ports are trusted at Layer 2 and Layer 3 by default

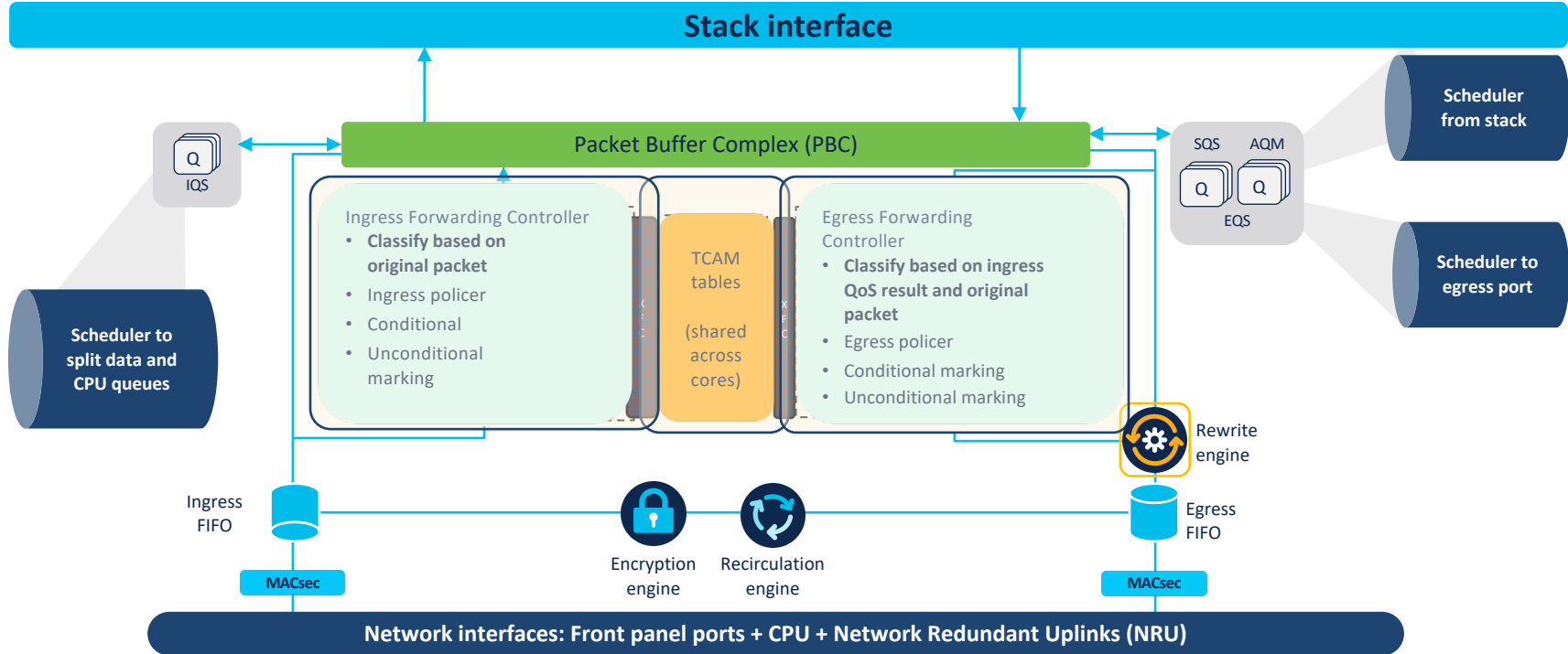


Cisco Catalyst 9300 Series Switches

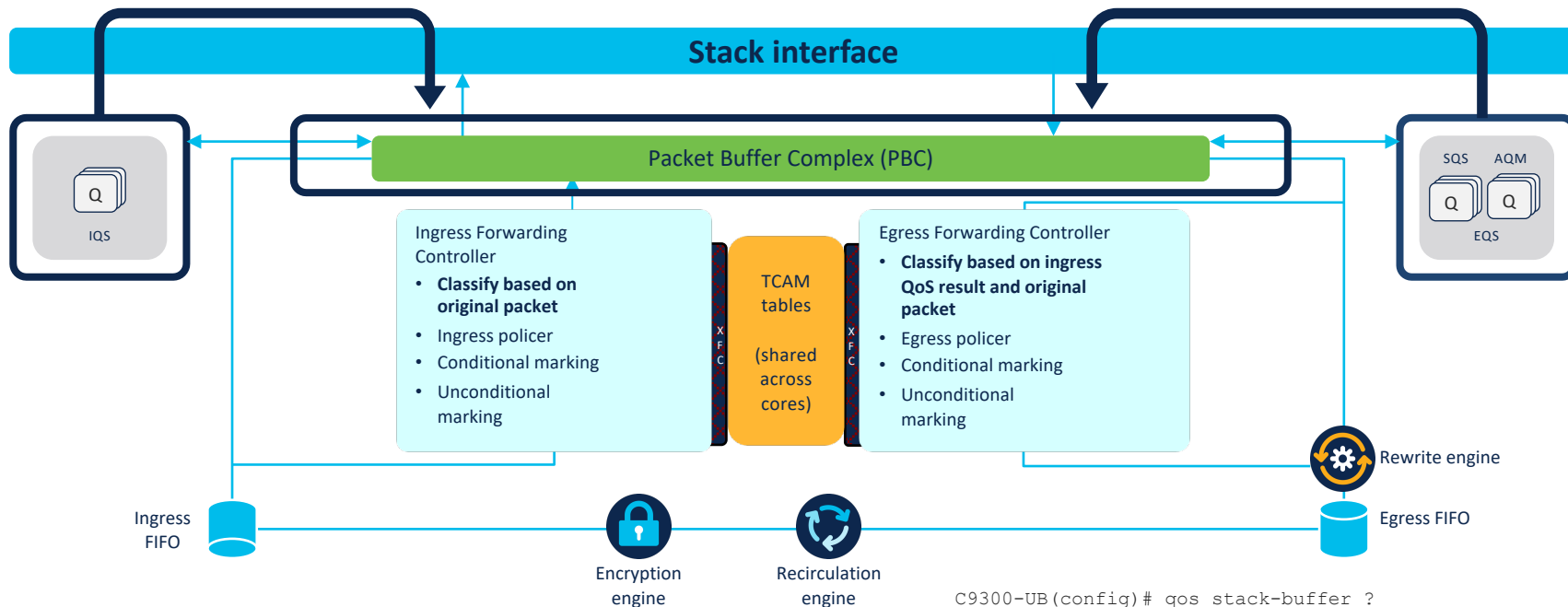
QoS forwarding (ingress and egress)



UADP ASIC – QoS packet processing



UADP ASIC – Free IQS and SQS buffers



- Remove IQS and SQS buffers reservations to increase main buffer space
- Disable stack ports/interfaces

```
C9300-UB(config)# qos stack-buffer ?
disable  Disable stack buffer
enable  Enable buffer for stacking, a default mode
```

*Reload is required after stack port is enabled or disabled

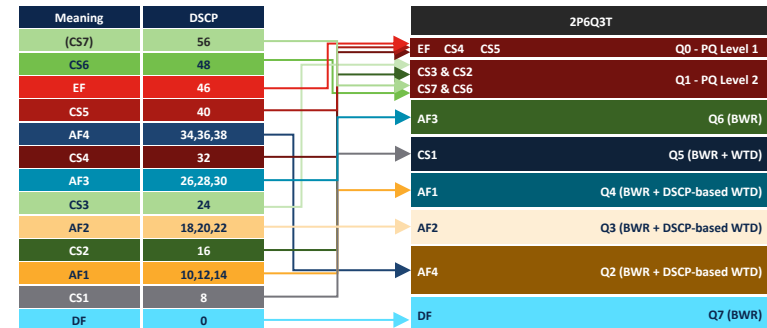
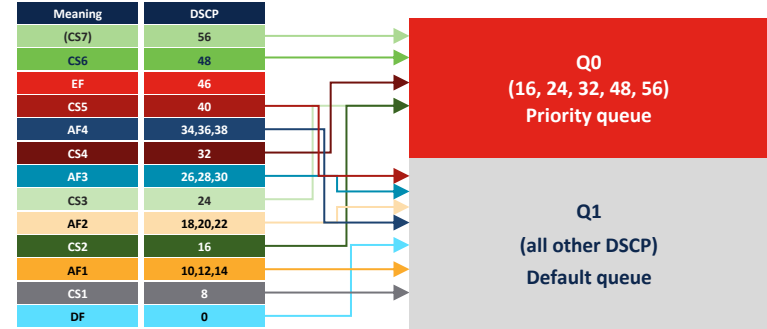
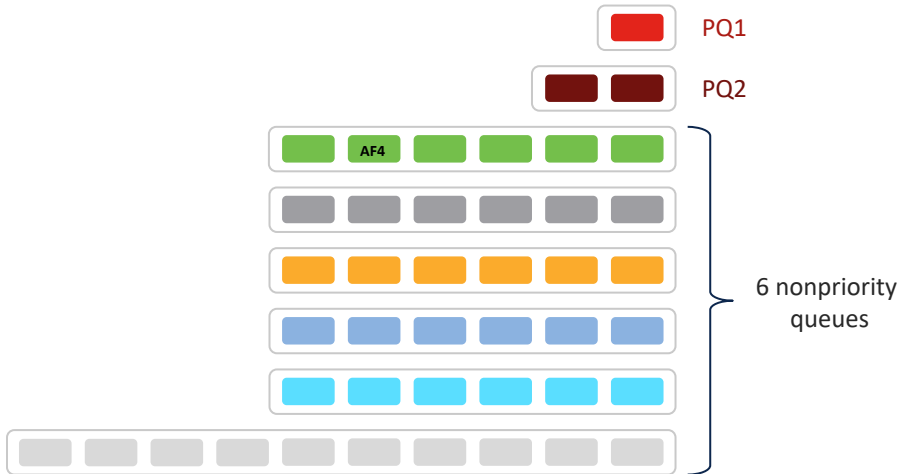
Cisco Catalyst 9300 Series Switches

Hardware queues

Default (2Q3T)



Configurable (8Q3T/2P6Q3T)



Cisco Catalyst 9300 Series Switches

2P6Q3T+WTD wired port egress queuing configuration



Reference

```
class-map match-any VOICE-PQ1
match dscp ef
class-map match-any VIDEO-PQ2
match dscp cs4
match dscp cs5
class-map match-any CONTROL-MGMT-QUEUE
match dscp cs7 cs6 cs3 cs2
class-map match-any MULTIMEDIA-CONFERENCING-QUEUE
match dscp af41 af42 af43
class-map match-any MULTIMEDIA-STREAMING-QUEUE
match dscp af31 af32 af33
class-map match-any TRANSACTIONAL-DATA-QUEUE
match dscp af21 af22 af23
class-map match-any SCAVENGER-BULK-DATA-QUEUE
match dscp cs1 af11 af12 af13
```

Cisco Catalyst 9300 Series Switches

2P6Q3T+WTD wired port egress queuing configuration



Reference

```
policy-map 2P6Q3T
```

```
class VOICE-PQ1
```

```
priority level 1
```

```
police rate percent 10
```

```
class VIDEO-PQ2
```

```
priority level 2
```

```
police rate percent 20
```

```
class CONTROL-MGMT-QUEUE
```

```
bandwidth remaining percent 10
```

```
queue-buffers ratio 10
```

```
class MULTIMEDIA-CONFERENCING-QUEUE
```

```
bandwidth remaining percent 10
```

```
queue-buffers ratio 10
```

```
queue-limit dscp af 43 percent 80
```

```
queue-limit dscp af 42 percent 90
```

Two levels of priority queuing are supported

```
interface range Hu1/0/25  
service-policy output 2P6Q3T
```

[continued]

```
class MULTIMEDIA-STREAMING-QUEUE
```

```
bandwidth remaining percent 10
```

```
queue-buffers ratio 10
```

```
queue-limit dscp af33 percent 80
```

```
queue-limit dscp af32 percent 90
```

```
class TRANSACTIONAL-DATA-QUEUE
```

```
bandwidth remaining percent 10
```

```
queue-buffers ratio 10
```

```
queue-limit dscp af 23 percent 80
```

```
queue-limit dscp af 22 percent 90
```

```
class SCAVENGER-BULK-DATA-QUEUE
```

```
bandwidth remaining percent 5
```

```
queue-buffers ratio 10
```

```
queue-limit dscp values af13 cs1 percent 80
```

```
queue-limit dscp values af12 percent 90
```

```
class class-default
```

```
bandwidth remaining percent 25
```

```
queue-buffers ratio 25
```

If a PQ is enabled,
non-PQs must use
bandwidth remaining

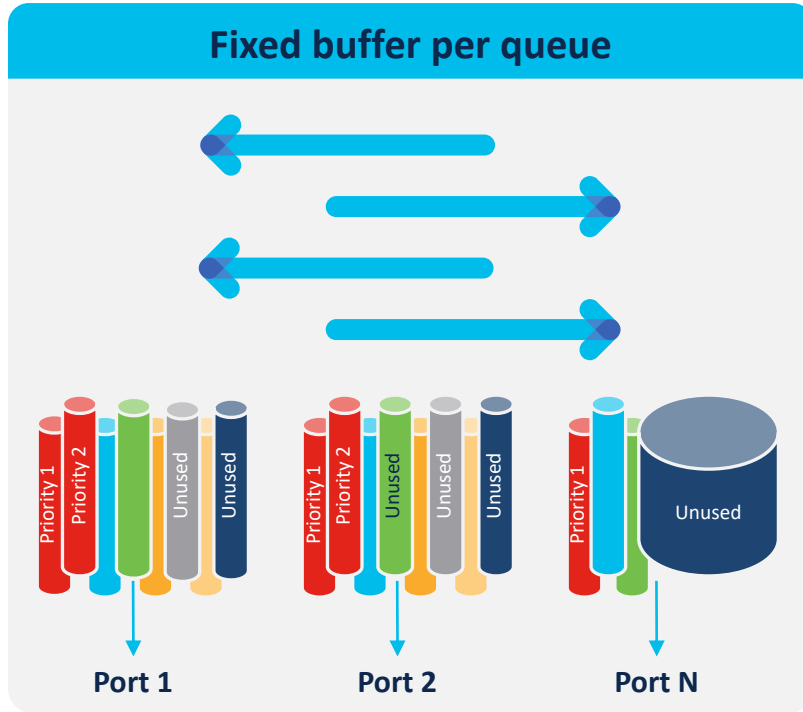
Allocates buffers to
queues

Tunes WTD
to align to an AF PHB

Packet buffer



Reference

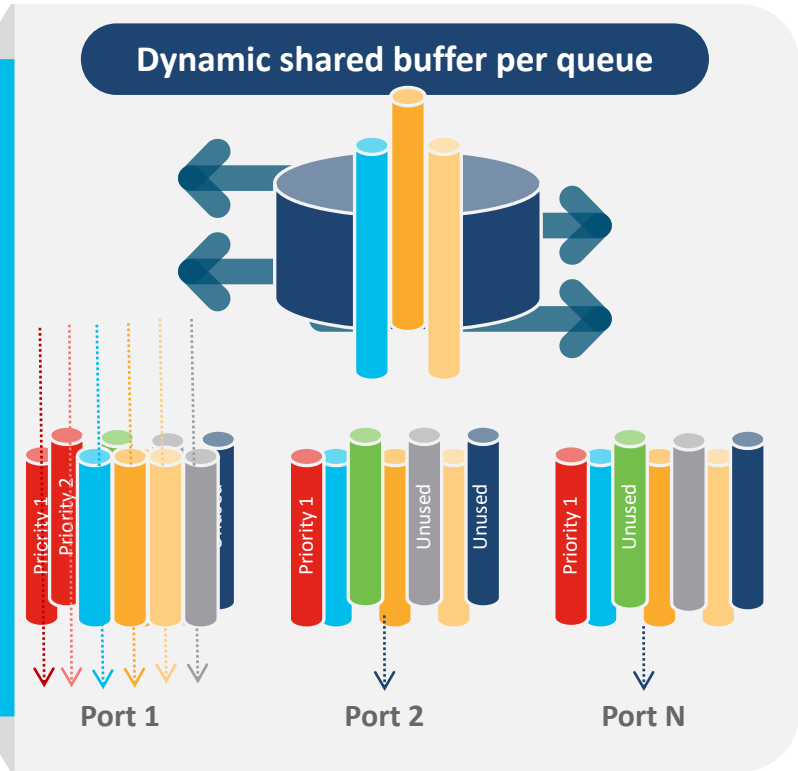


- Reserved buffers are statically allocated for each queue
- Regardless of whether this queue is active or not, these buffers are held up by this queue
- For more queues, the portion of the reserved buffers allocated for each queue can become smaller and smaller

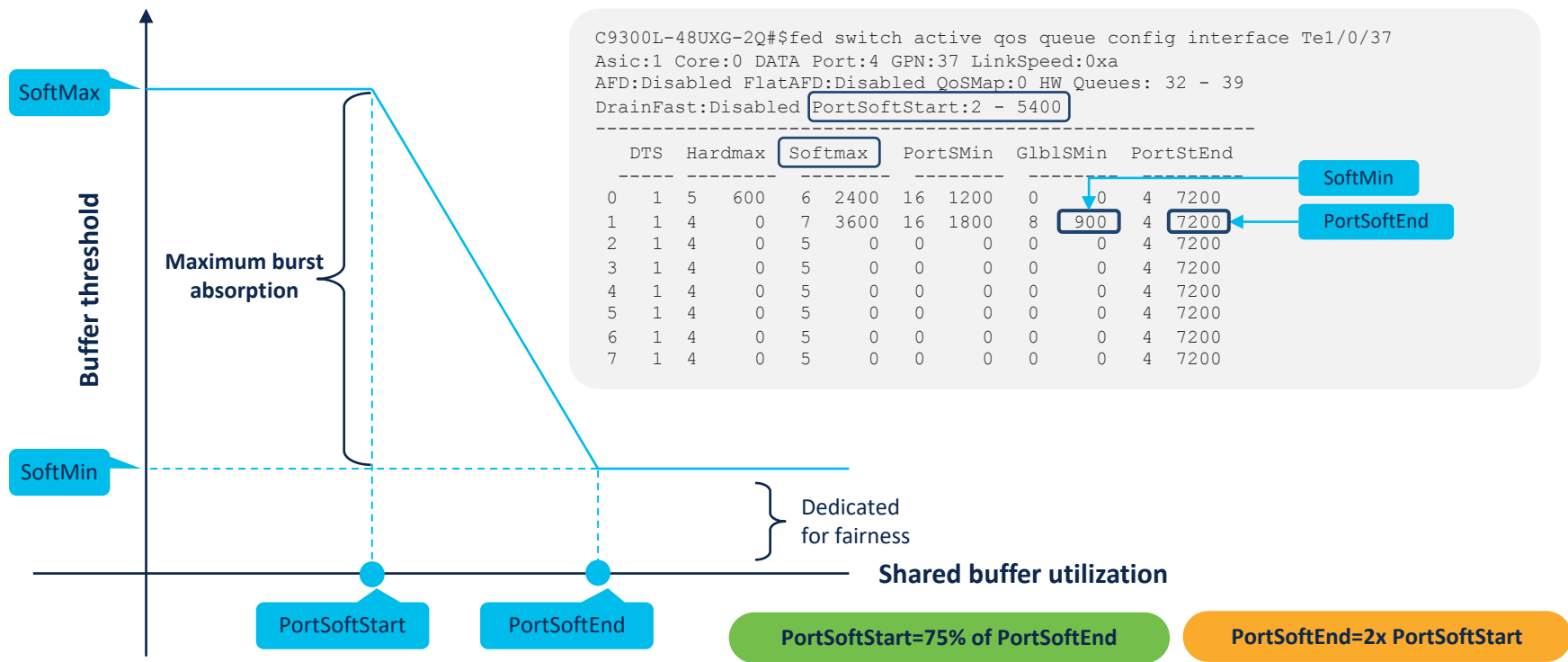
Dynamic threshold and scaling (DTS)

Dynamic shared buffer pool is memory space that all of the ports on the switch share dynamically as they need buffers.

- Dedicated buffer is good for predicated performance for each port
- Shared buffer is good for burst absorption
- DTS provides fair and efficient allocation of buffers: dedicated plus shared
- Configurable dedicated threshold per port or queue
- Configurable global maximum shared threshold
- Automatically adjusted depending on the available shared pool



DTS – Dynamic Threshold and Scaling



Traffic classification

- A class-map can be defined as a logical OR only, such as “match-any”
- “match-all” is also supported on the Cisco Catalyst™ 9000 platform (default)

```
switch(config-cmap) # class-map match-any VOICE
switch(config-cmap) #match ?
access-group      Access group
any               Any packets
class-map         Class map
cos              IEEE 802.1Q/ISL class of service/user priority values
dscp              Match DSCP in IPv4 and IPv6 packets
group-object      Match object-group
ip                IP specific values
mpls              Multi Protocol Label Switching specific values
non-client-nrt    Match non-client NRT
precedence        Match Precedence in IPv4 and IPv6 packets
protocol          Protocol
qos-group         Qos-group
vlan              VLANs to match
wlan              802.11-specific values
```

Marking

```
[class-maps omitted for brevity]
policy-map MARKING-POLICY
  class VOIP
    set dscp ef
  class MULTIMEDIA-CONFERENCING
    set dscp af41
  class SIGNALING
    set dscp cs3
  class TRANSACTIONAL-DATA
    set dscp af21
  class BULK-DATA
    set dscp af11
  class SCAVENGER
    set dscp cs1
  class default
    set dscp dscp table COS2DSCP

table-map COS2DSCP
  map from 5 to 46
  default copy
```

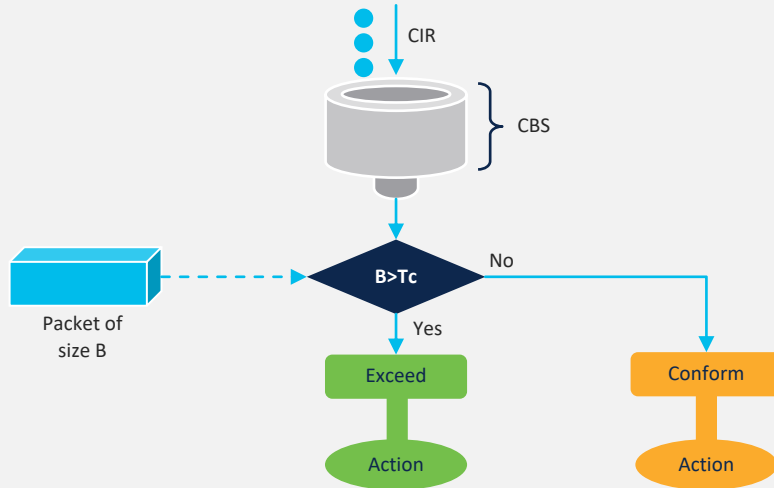
- **Three types of marking policies:**
 - Conditional policer-based marking
 - Unconditional explicit marking
 - Table map-based marking
- **Marking with “set”**
- **Marking with table maps**
- **Table maps can be applied only on class-default**

Cisco Catalyst 9300 Series Switches

Traffic policing

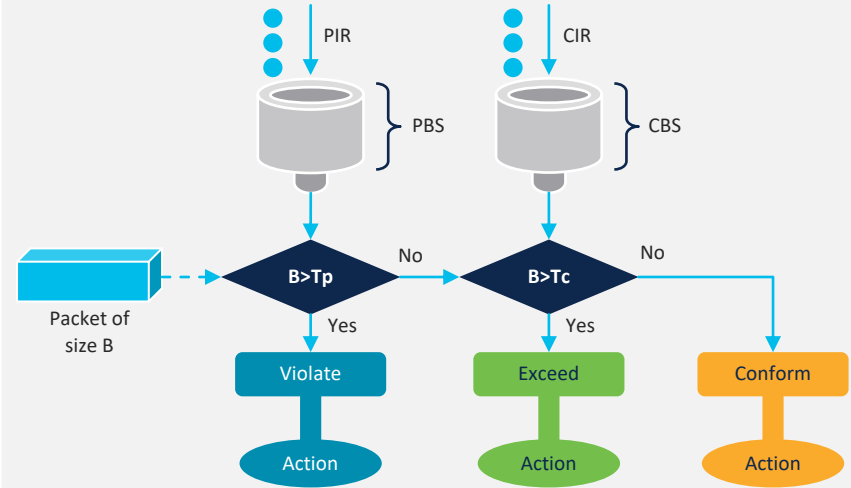
CIR – Committed Information Rate
PIR – Peak Information Rate
PBS- Peak Burst Size
CBS – Committed Burst Size

1 rate 2 color



```
police cir 100000000 bc 3125000  
conform-action set-dscp-transmit af41  
exceed-action drop
```

2 rate 3 color



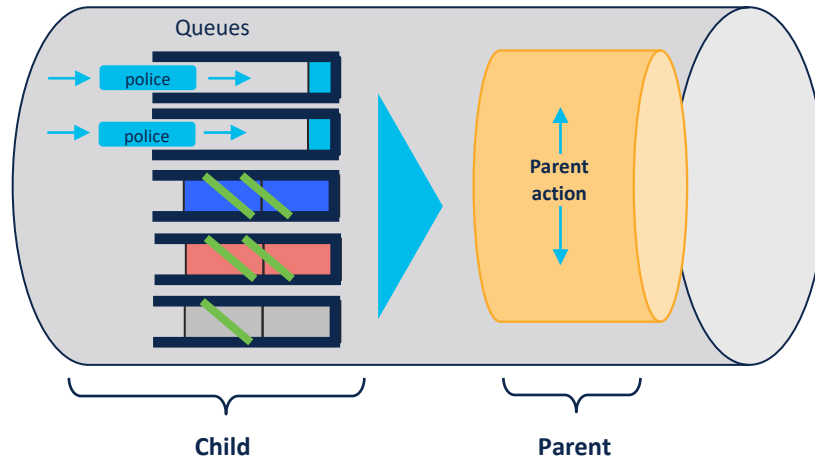
```
police cir percent 10 pir percent 50  
conform-action transmit  
exceed-action set-dscp-transmit dscp table MARKDOWN  
violate-action drop
```

Cisco Catalyst 9300 Series Switches

Hierarchical QoS (HQoS)

HQoS (two-level hierarchy) allows you to perform the following functions:

- Classification
- Policing
- Shaping



Child	Parent
Policing	Shaping
Policing	Marking
Marking	Policing
Marking	Shaping

Access control lists

Cisco Catalyst 9300 Series Switches

Access control lists – four forms of security ACLs

The Cisco Catalyst™ 9300 Series supports four forms of security ACL: RACL, VACL, PACL, and SG ACL

Router ACL (RACL)	VLAN ACL (VACL)	Port ACL (PACL)	Security group ACL (SG ACL)
Used to permit or deny the movement of traffic between Layer 3 subnets	Used to permit or deny the movement of traffic between Layer 3 subnets and VLANs or within a VLAN	Used to permit or deny the movement of traffic between Layer 3 subnets and VLANs or within a VLAN	Used to permit or deny the movement of traffic based on the Security Group Tags (SGTs) that are assigned
- Direction: In, out - Attach point: Layer 3 interface Switch Virtual Interface (SVI) Layer 3 EtherChannel interface	- Direction: Inherently both in and out - Attach point: VLAN	- Direction: In, out - Attach point: Layer 2 switch port interface Layer 2 EtherChannel interface	- Direction: In - Attach point: Layer 2 switch port interface
Standard/extended ACLs	Standard/extended ACLs	Standard/extended/ MAC ACLs	Standard/extended/ MAC ACLs

Cisco Catalyst 9300 Series Switches

Access control lists

Router ACL (RACL)

```
access-list 2 permit 36.48.0.3
access-list 2 deny 36.48.0.0 0.0.255.255
access-list 2 permit 36.0.0.0 0.255.255.255

interface gigabitethernet2/0/1
 ip access-group 2 in
```

Port ACL (PACL)

```
access-list 2 permit 36.48.0.3
access-list 2 deny 36.48.0.0 0.0.255.255
access-list 2 permit 36.0.0.0 0.255.255.255

interface gigabitethernet2/0/1
 switchport
 ip access-group 2 in
```

VLAN ACL (VACL)

VLAN ACLs

```
ip access-list extended SERVER1_ACL
 permit ip 10.1.2.0 0.0.0.255 host 10.1.1.100
 permit ip host 10.1.1.4 host 10.1.1.100
 permit ip host 10.1.1.8 host 10.1.1.100
 exit
```

Define a VLAN map that will drop IP packets that match SERVER1_ACL and forward IP packets that do not match the ACL.

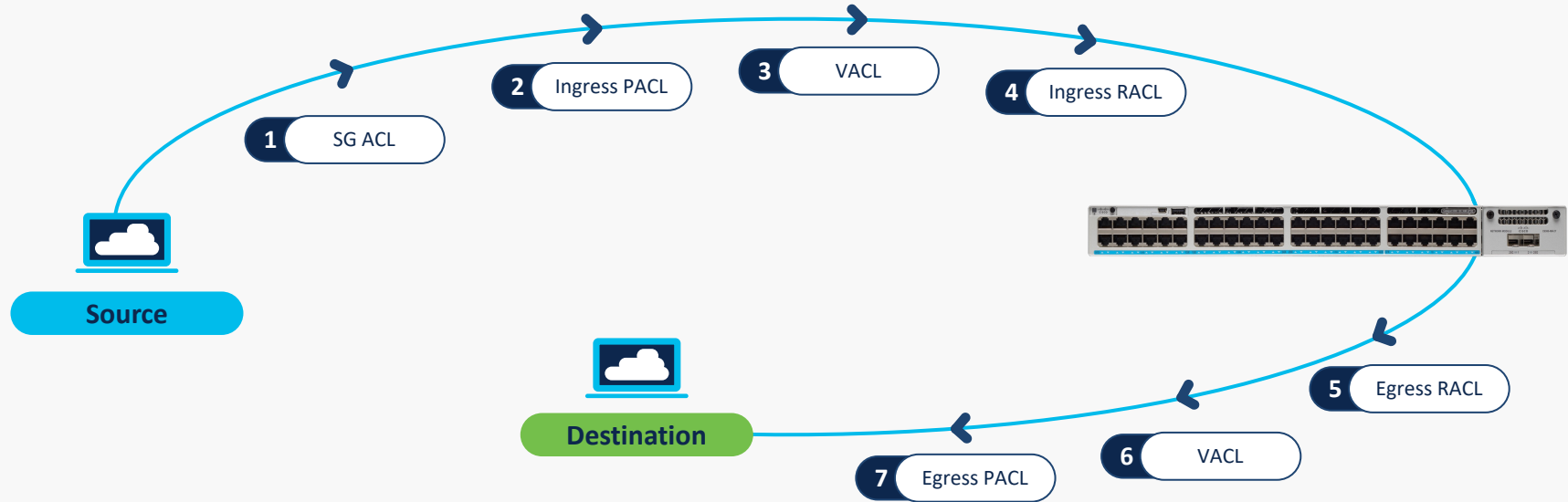
```
vlan access-map SERVER1_MAP
 match ip address SERVER1_ACL
 action drop
vlan access-map SERVER1_MAP 20
 action forward
 exit
```

Apply the VLAN map to VLAN 10.

```
vlan filter SERVER1_MAP vlan-list 10
```

Cisco Catalyst 9300 Series Switches

Access control lists – Order of processing



Cisco Catalyst 9300 Series Switches

Access control lists – Hardware support

Create an ACL or classification policy, using the CLI or Network Management System (NMS)

```
ip access-list extended Internet
permit ip any host 10.2.2.4
permit ip any host 10.5.2.33
permit ip any host 10.11.0.0
permit ip any host 10.4.0.0
```

1



No hardware resources
Drop packet

2

Full hardware support

- Router ACLs
- VLAN ACLs
- Port-based ACLs
- Role-based ACLs

3

Hardware-assisted ACL features

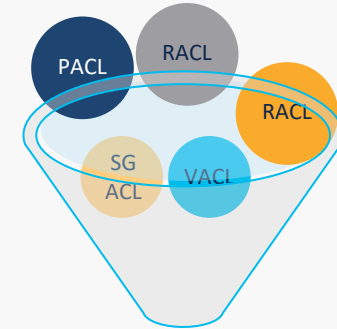
- NetFlow
- NAT and PAT
- PBR
- WCCP
- Cisco TrustSec®

4

Cisco Catalyst 9300 Series Switches

Access control lists – Hitless TCAM updates

- **Allows updates to an ACL without interrupting traffic**
- Multiple features updated at once
 - IPv4, IPv6, MAC
 - PACL, RACL, VACL, and SG ACL
- Hitless update is enabled by default; can't be disabled
- Hitless update feature requires free ACL TCAM space for reprogramming but doesn't consume any additional TCAM resources
- If not enough space in TCAM, falls back to old ACL method (deny)



ACL updates



Application hosting

New strategic capabilities with app hosting on Catalyst 9000 switches

Existing hardware

Managed via CLI
or Cisco DNA Center

Real-time processing

Lower latency

Save bandwidth



IT operations and
monitoring tools



Security agents
and functions



Cloud gateways
with serverless
edge compute



Customer-specific
applications

Consolidate physical
infrastructure



ThousandEyes



Enhance visibility and
security enforcement

codilime



Reduce app latency and
optimize app traffic

Cybervision



NS1.

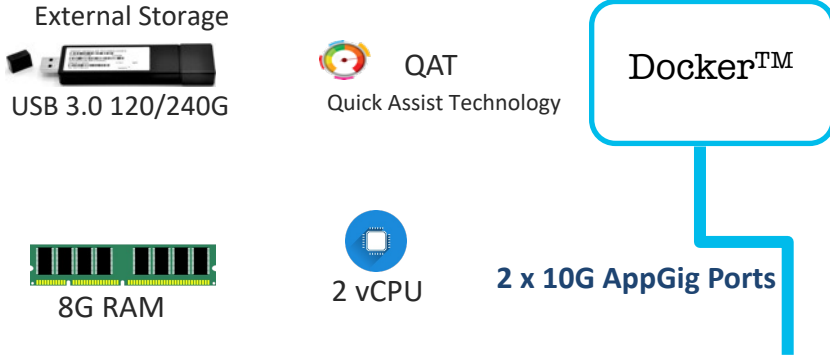


Third-party app hosting

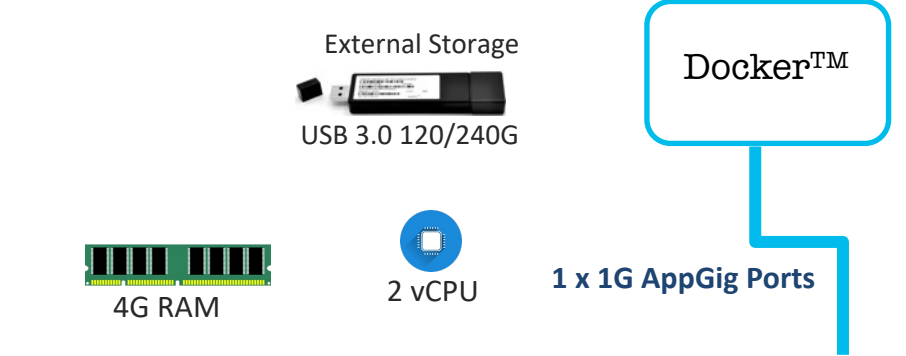
Rich ecosystem
partnership with
25+ certified
apps and 200+
active customers

Transforming Catalyst 9300 into a compute platform

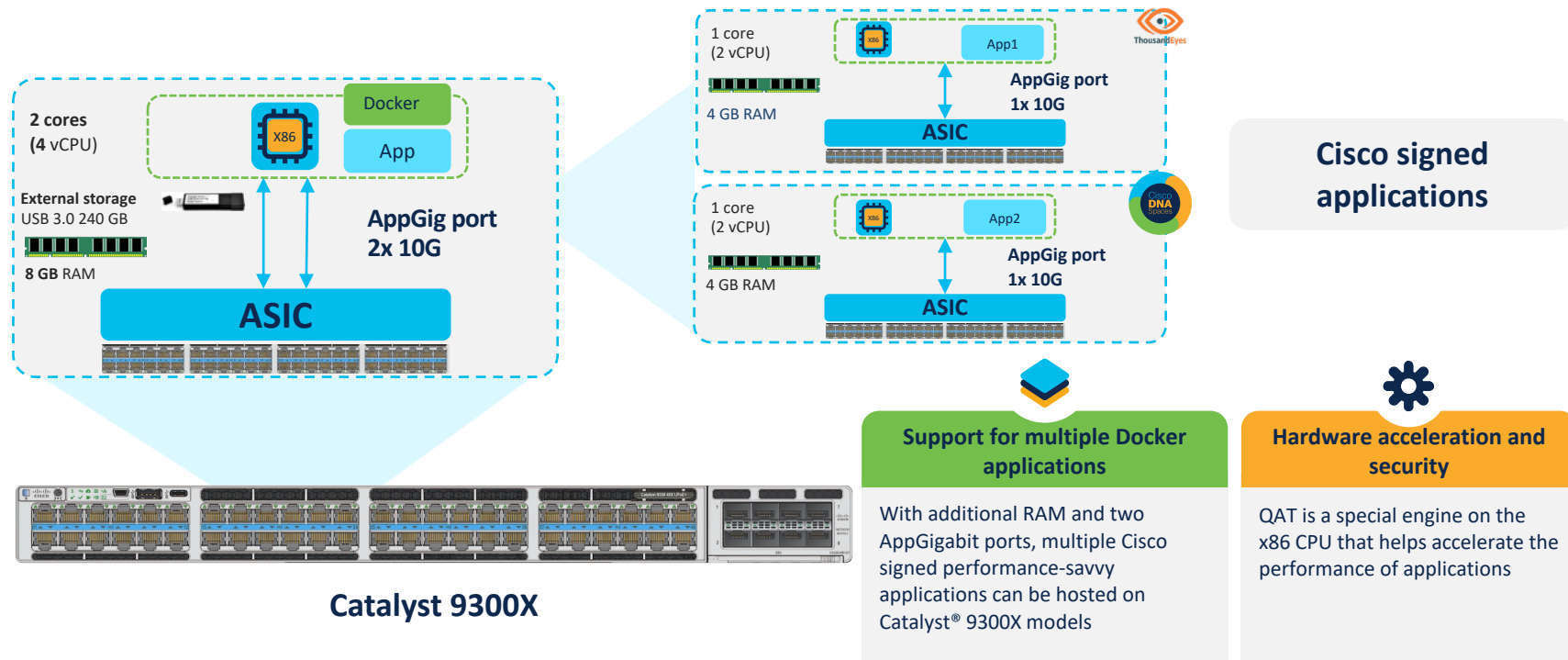
Enhanced Application Hosting Infrastructure on Catalyst 9300X models



Application Hosting Infrastructure on Catalyst 9300 models



Enhanced application hosting infrastructure on Catalyst 9300X models

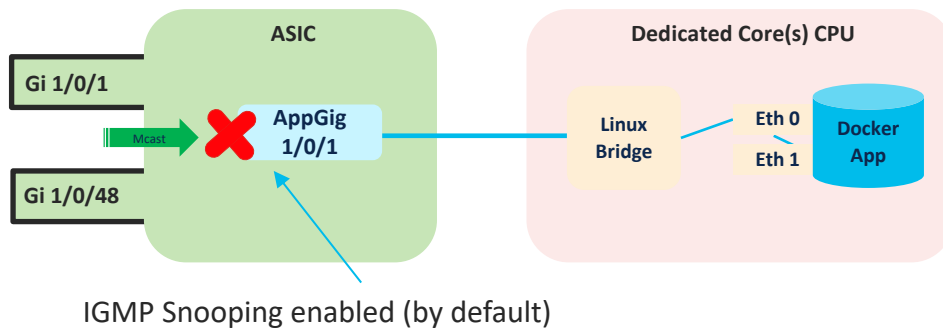


MCAST support for APPGig interface on C9300X

Multicast support in AppGig interface

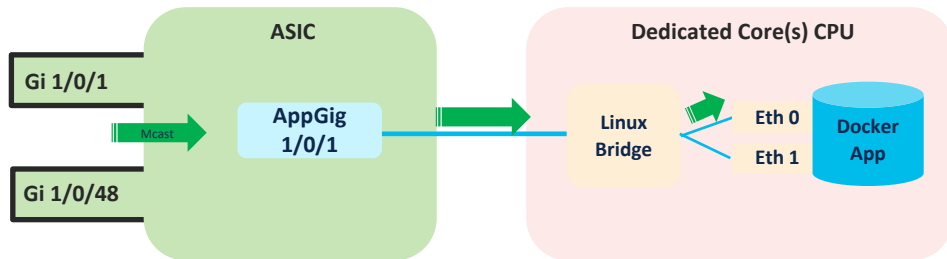
By Default, C9K switch don't allow the multicast packets to be forwarded on AppGig Port.

Avoiding unnecessary traffic to be forwarded to the application.



App Hosting Configuration for Multicast

Multicast Traffic is required for certain applications to function properly.



```
app-hosting appid Media_App
app-vnic AppGigabitEthernet trunk
vlan 10 guest-interface 0 ← Per application interface
    guest-ipaddress 192.168.13.2 netmask 255.255.255.0
    mirroring
    multicast ← Allow Multicast Traffic
app-default-gateway 192.168.13.1 guest-interface 0
```

Media Application
Examples

SONY



...

Allowing multicast traffic to an application based on application's configuration

Security

- Trustworthy Solutions
- IPsec
- GRE over IPsec
- MACsec
- ETA

Cisco Catalyst 9000 platform trustworthy solutions

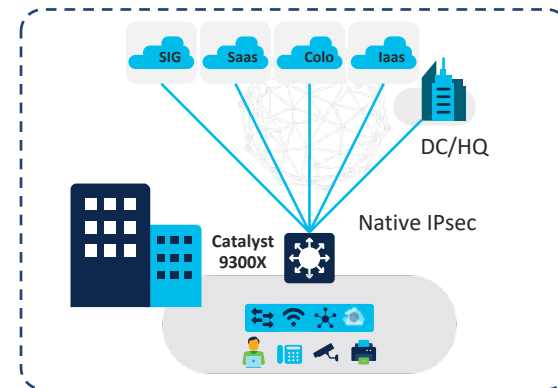


Cisco Trustworthy Solutions use industry best practices to help ensure full development lifecycle integrity and end-to-end security

Catalyst 9300X – Purpose built for the new edge



Cisco Catalyst 9300X



Encryption	Authentication
AES-128-CBC	HMAC/SHA1
AES-128/256-GCM	GMAC
Tunnel mode	
Encapsulation – ESP	
IKEv2	

Static virtual tunnel interface

IPv4/IPv6

OSPF/BGP

PBR + Set interface*

NAT traversal*

Multicast routing*

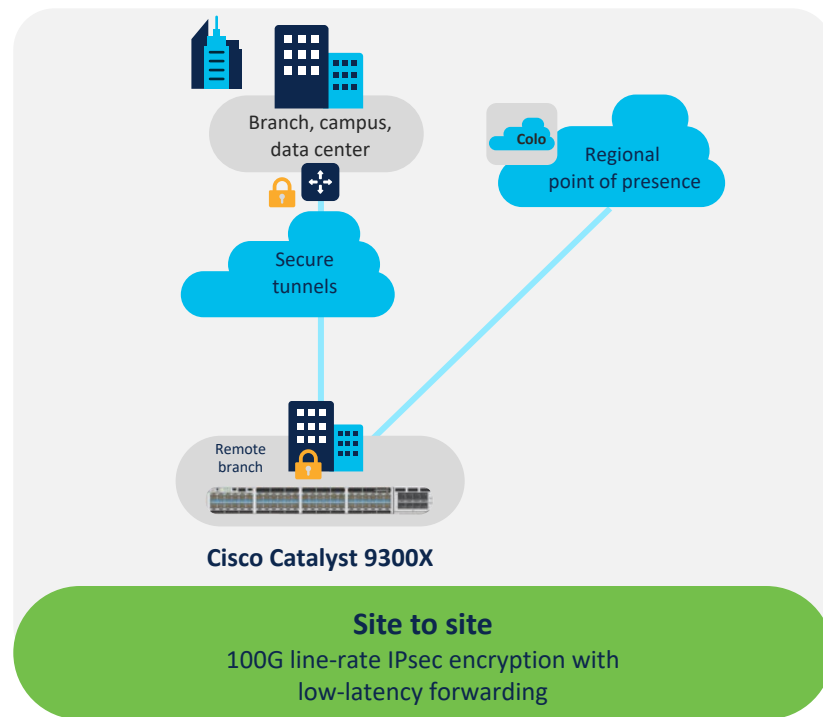
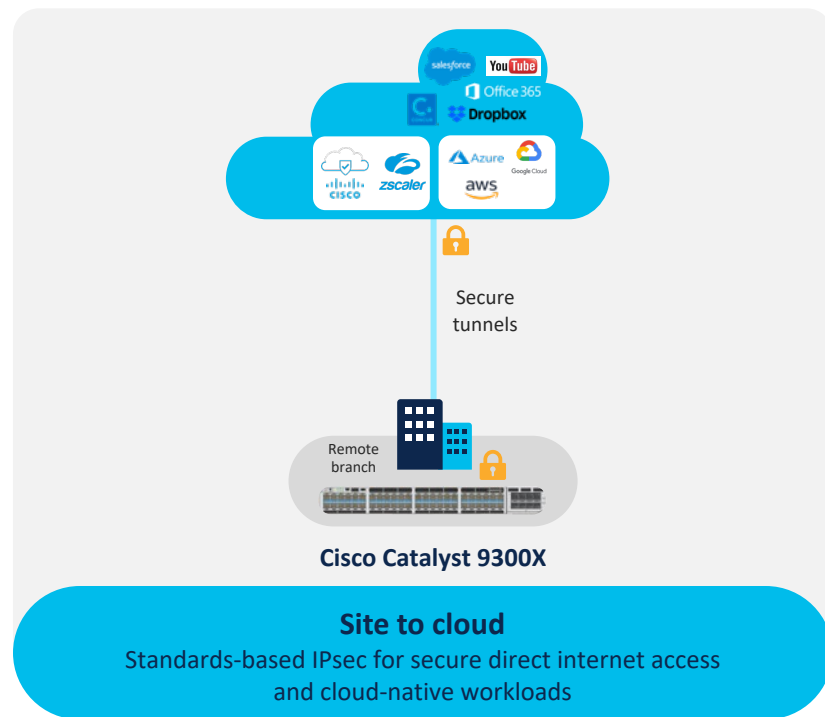
Layer 3 segmentation over IPsec*

Layer 2 extension over IPsec*

* Roadmap.

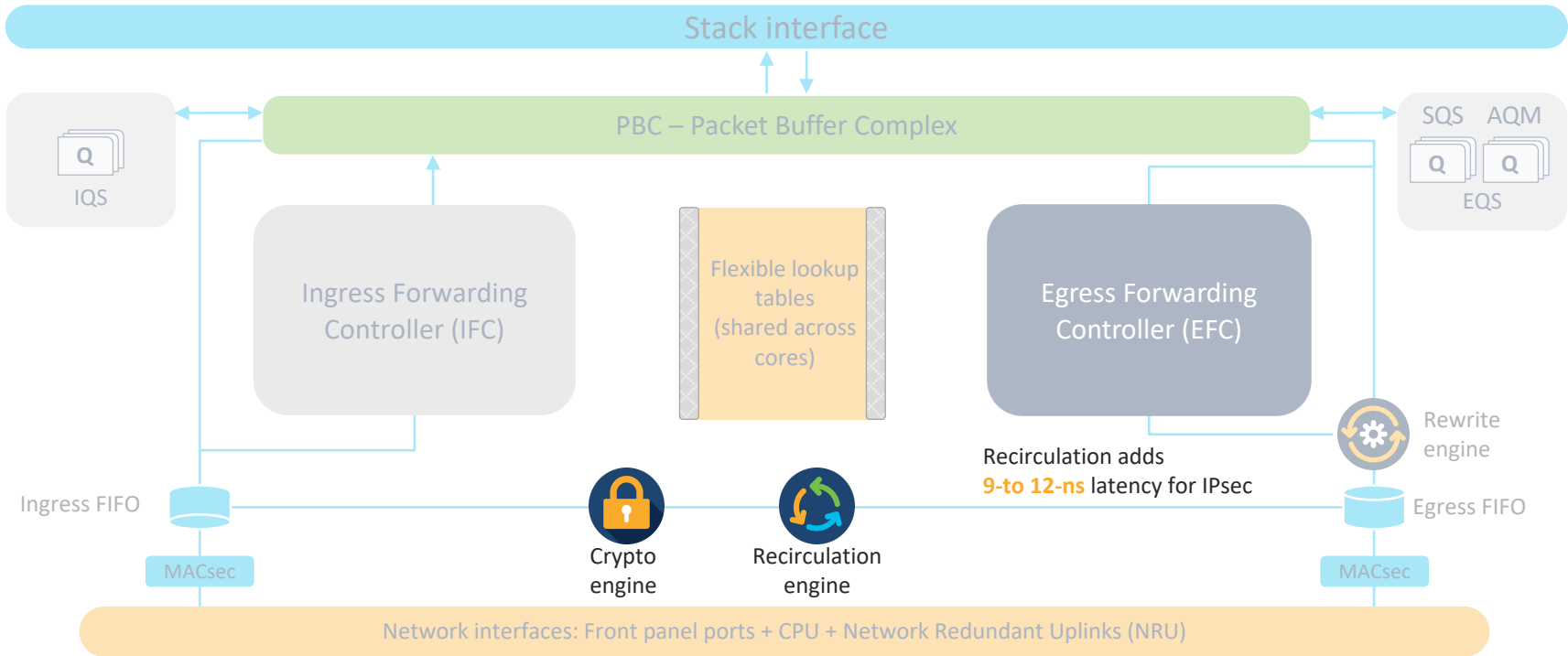
Catalyst 9300X – Purpose built for the new edge

Secure connectivity to anywhere



* Roadmap.

UADP 2.0sec – Crypto engine

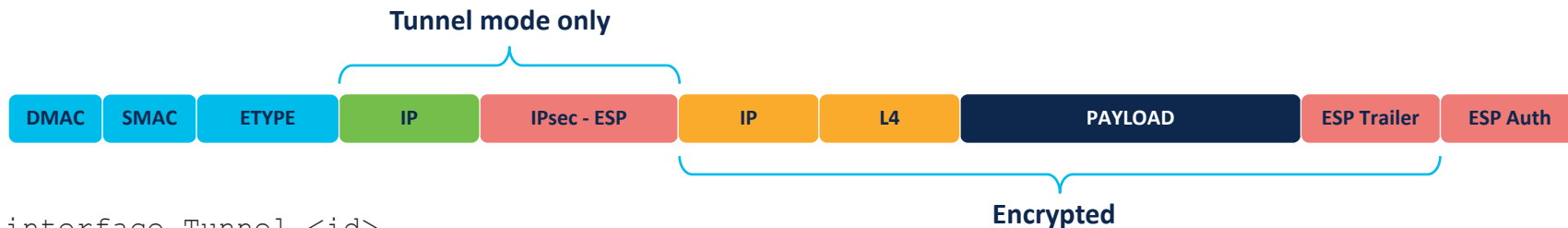


IPsec Static Virtual Tunnel Interface (SVTI)



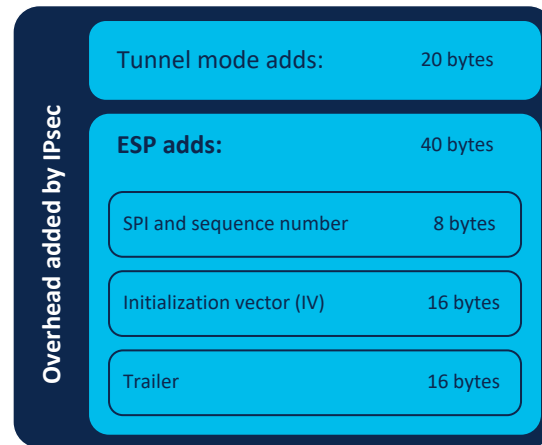
- SVTI provides a virtual routable interface using IP-in-IP encapsulation
- SVTI terminates IPsec tunnel and is used to assign protection parameters
- SVTI interface is UP when Secure Associations (SAs) are established
- SVTI interface has a single destination

IPsec with SVTI



```
interface Tunnel <id>
  tunnel mode ipsec {ipv4 | ipv6}
  tunnel protection ipsec profile default
```

- IP in IP → Less overhead
- Mixed mode – IPv4 over IPv6 (tunnel mode ipsec ipv4 v6-overlay) or vice versa



Supported IKEv2 proposal

IKEv2 (SW) proposal	Encryption	Integrity	Diffie–Hellman
Models supported	• des* • 3des* • aes-cbc-128 • aes-cbc-192 • aes-cbc-256 • aes-gcm-128 • aes-gcm-256	• md5* • sha1* • sha256 • sha384 • sha512	• 1 – 768 MODP* • 2 – 1024 MODP* • 5 – 1536 MODP* • 14 – 2048 MODP • 15 – 3072 MODP • 16 – 4096 MODP • 19 – 256 ECP • 20 – 384 ECP • 21 – 521 ECP • 24 – 2048 (256 sub groups) MODP

* CLI will show that these options are deprecated on Catalyst® 9300X.

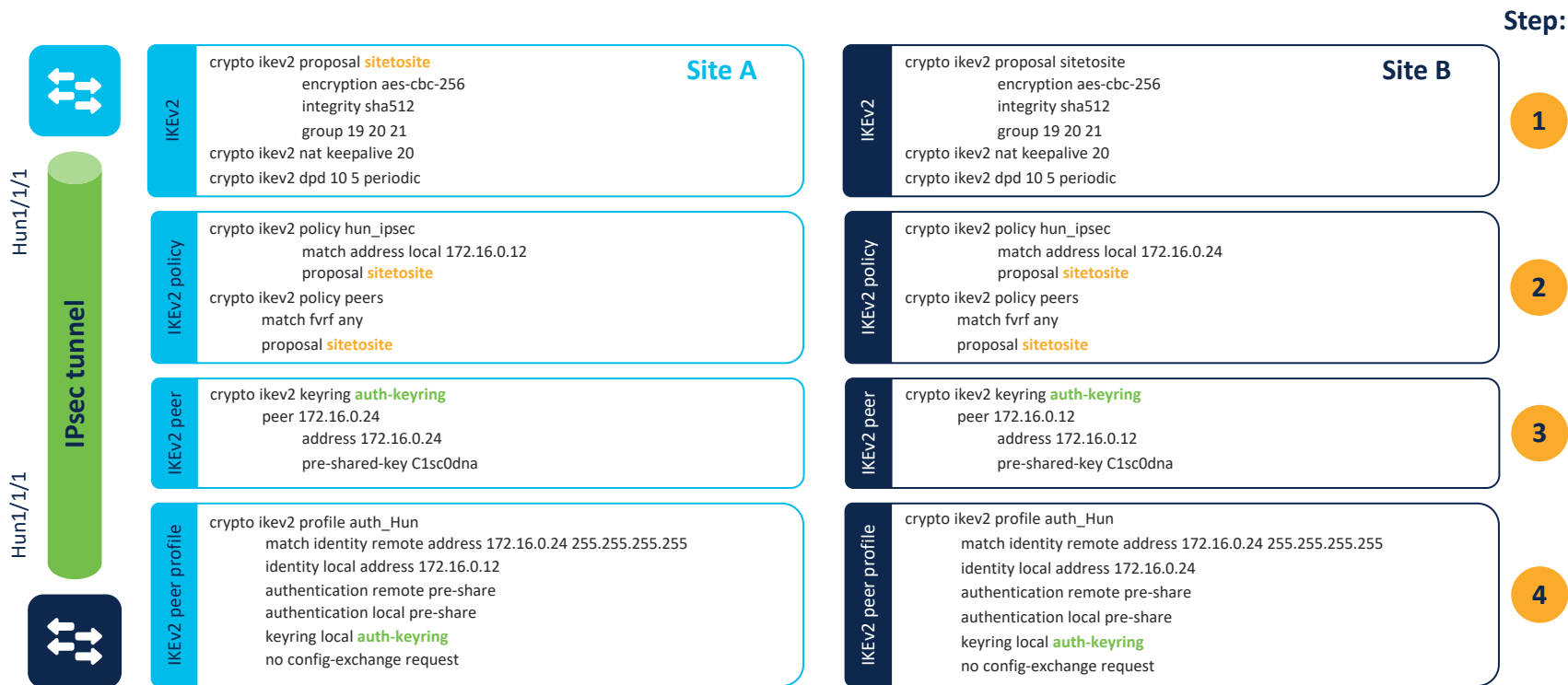
Supported transform sets (hardware)

Transform set (HW) encryption	Bandwidth
esp-aes + esp-sha-hmac	Up to 15 Gbps
esp-gcm 128 (gmac is derived)	Up to 100 Gbps
esp-gcm 256 (gmac is derived)	Up to 100 Gbps

Catalyst® 9300X IPsec performance

	Catalyst 9300X
IPsec throughput (for all tunnels total)	100 Gbps
Total number of tunnels at FCS	128 (2 SAs per 128 tunnels + 128 rekey = 384 SAs)
New established tunnels per second	25

IPsec site-to-site/point-to-point with Pre-Shared Key (PSK)



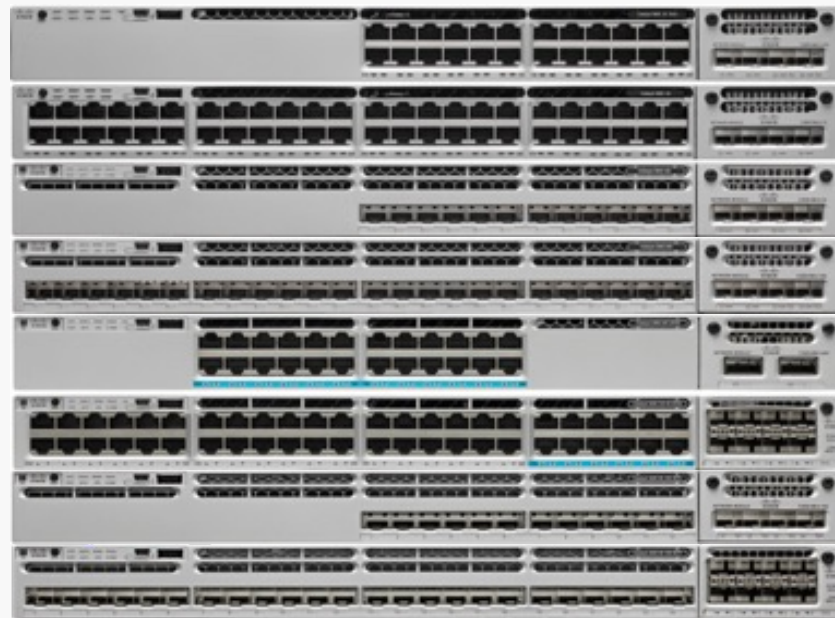
IPsec site-to-site/point-to-point



IPsec support in stacking

- IPsec is supported in Catalyst® 9300X-only stack
- Distributed IPsec processing is not supported
- Active switch will process IPsec encapsulation and decapsulation
- High availability, xFSU are not supported
- IPsec tunnels will reset during failovers

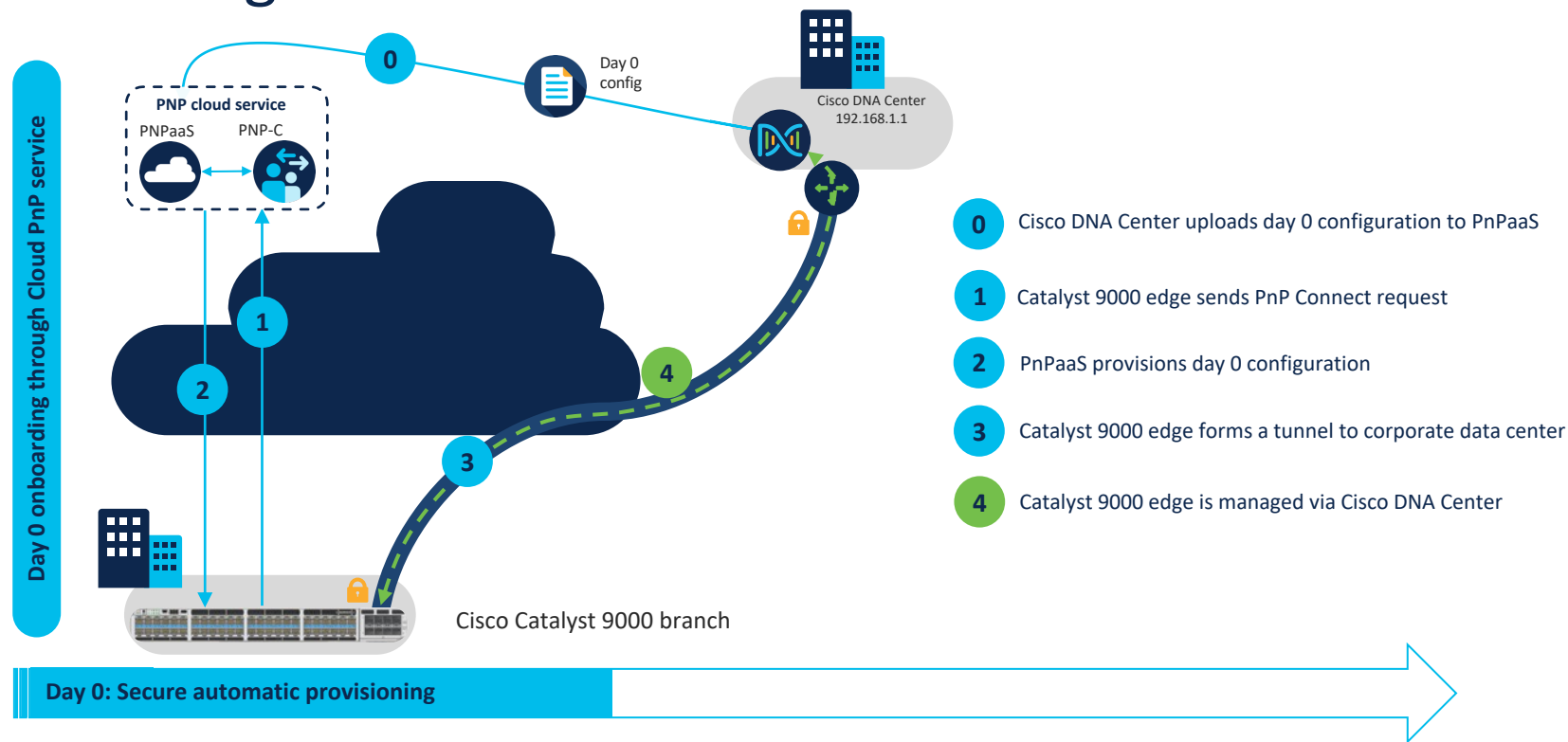
Catalyst 9300X stack



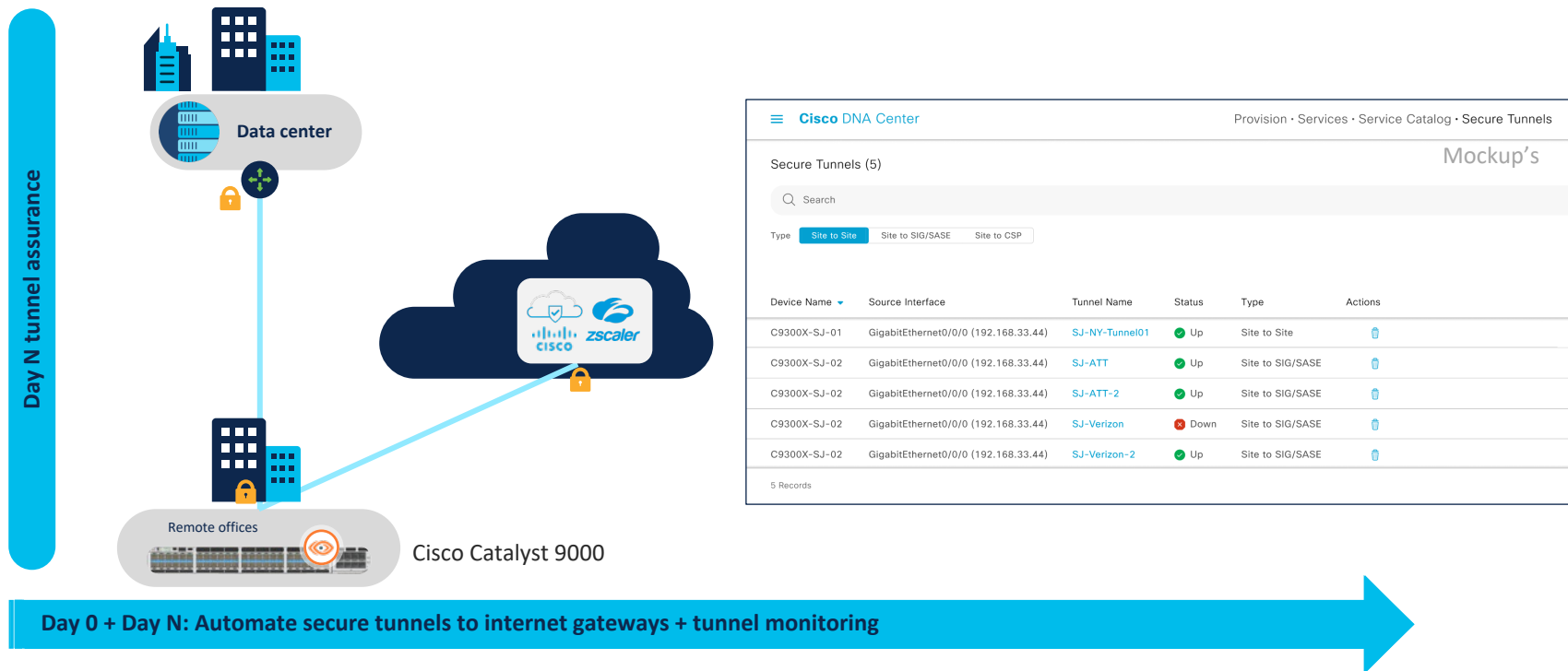
Catalyst 9000 edge – automation and monitoring

	 Turnkey*	 DIY
		 
Day 0: Onboarding	 Cisco DNA Center	Zero-Touch Provisioning (ZTP)
Day 1: Tunnel provisioning	 Cisco DNA Center	NETCONF/RESTCONF, Python, Ansible, Terraform, CLI
Day N: Tunnel monitoring	 Cisco DNA Center	SNMP, telemetry

Day 0 automation workflow for the Catalyst 9000 edge



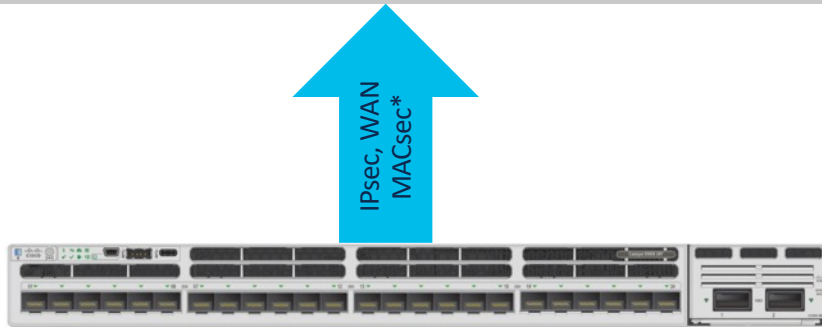
Tunnel monitoring via Cisco DNA Center



HSEC K9 key for Catalyst 9300X

HSEC K9 Key

- New add-on license in addition on top of subscription based on Cisco DNA Advantage
- Legally required by US law, requiring authorization prior to use.
- Can only be obtained for 9600X, 9500X and 9300X switches.



Notes

- Required for enabling IPsec on 9300X switches.
- Without the HSECK9 Key IPsec cannot be enabled.
- With stack is recommended individual HSEC K9 keys per member switch.

How

- Authorization code (SLAC – Smart Licensing Authorization Code) required on the system.
- One time code installation on the switches. No subsequent action needed.

* roadmap

Orders via CCW (drop shipped from Cisco) can have SLAC installed at factory prior to shipping.

HSEC Key – Install and Activate

Step 1

Obtain HSEC K9 Key(s) in advance in CSSM

HSEC to be present in same SA/VA as device.

Step 2

Device generates a request for authcode (CLI command)

`license smart authorization request add hsec9 local`



Each device in a stack of switches must request authcode manually. A single consolidate request from master switch in stack not possible (roadmap)

Step 3

CSSM responds with authcode

Method of communication differs based on reporting option (CSLU, On-prem)

Airgapped reporting requires manual generation of authcode on CSSM.

Step 4

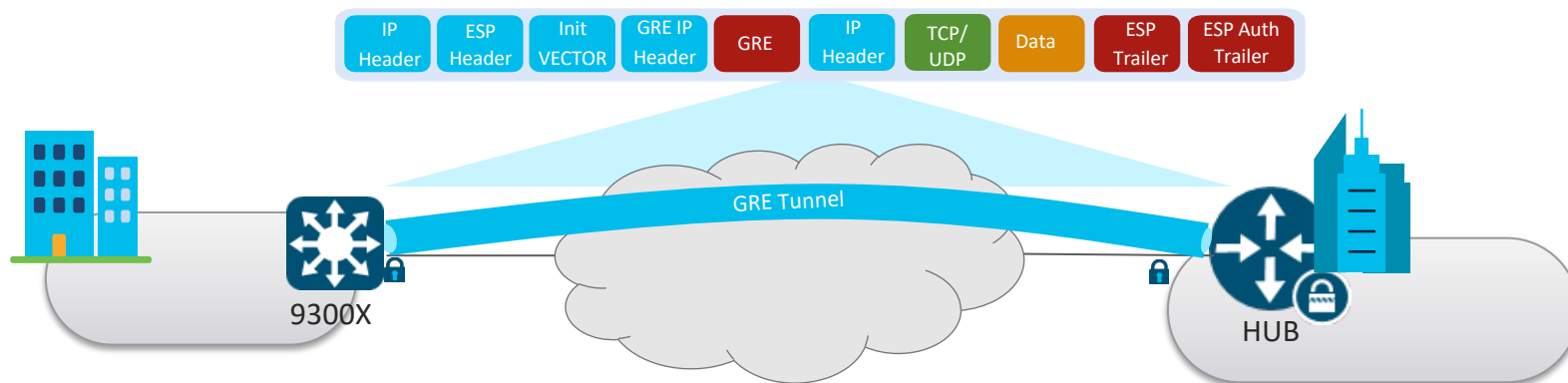
Authcode installed on device.

Once installed, authcode persists across reloads/config erases.

One time activity. No recurring reporting needed.

HSEC K9 Key can be preinstalled at factory while ordering after 17.6.2

Catalyst 9300X - GRE Over IPsec



GRE Over IPsec

- Encrypt using IPsec and Encapsulate with GRE
- Leverage existing GRE tunnels
- Enables Unicast and Multicast routing

IKEv2

EIGRP/OSPF/BGP

Tunnel Mode

Policy Based Routing

ESP Encapsulation

Multicast Routing

IPv4/IPv6

MPLS L3 VPN

Example configuration

```
interface <interface>
no switchport
ip address 4.1.1.1 255.255.255.0
no shut
!
crypto ikev2 keyring ikev2_key
  peer mypeer
    address 0.0.0.0 0.0.0.0
    pre-shared-key cisco123
!
crypto ikev2 profile ikev2_prof
  match identity remote address 102.1.1.1 255.255.255.0
  authentication remote pre-share
  authentication local pre-share
  keyring local ikev2_key
  dpd 10 2 periodic
!
crypto ipsec transform-set tfs esp-gcm 256
  mode tunnel
!
crypto ipsec profile ipsec_prof
  set security-association lifetime kilobytes 102400
  set security-association lifetime seconds 900
  set transform-set tfs
  set ikev2-profile ikev2_prof
!
interface Loopback24
ip address 23.1.1.1 255.255.255.255
!
ip route 23.1.1.0 255.255.255.0 4.1.1.2
!
interface Tunnel24
ip address 123.1.1.1 255.255.255.0
tunnel source 23.1.1.1
tunnel mode gre ip      (default mode is GRE, no need to explicitly define for ipv4)
tunnel destination 23.1.1.2
tunnel protection ipsec profile ipsec_prof
```

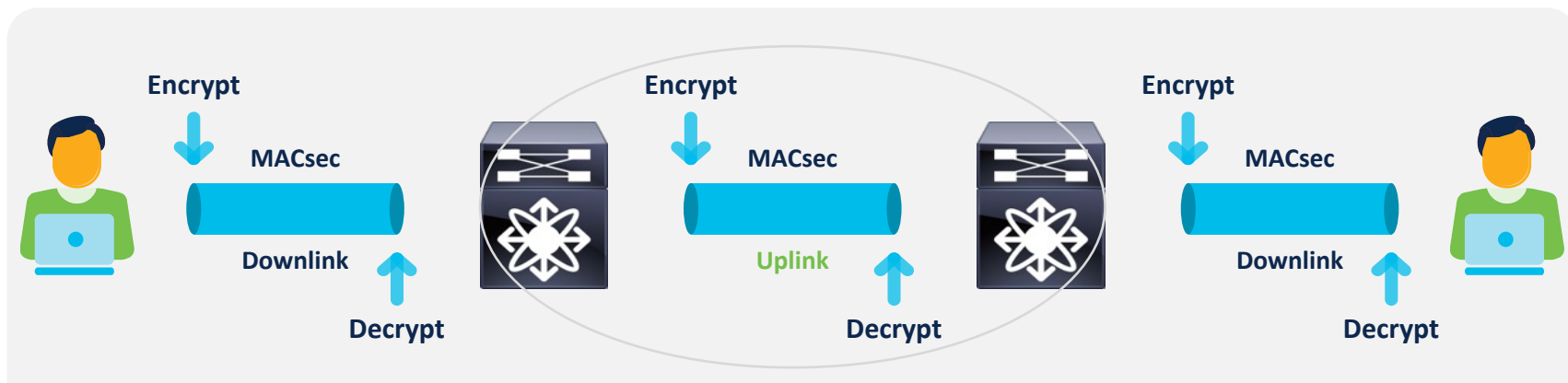
Feature Restrictions

- GRE over IPsec is not VRF aware
- Multipoint GRE is not supported
- SVTI and GRE over IPsec with same tunnel source and destination is not supported.
- 60 GRE over IPsec sessions supported (different than IPsec tunnel scale)



MACsec

Hop-by-hop encryption via 802.1AE



- Packets are encrypted on egress, decrypted on ingress
- Offers line-rate encryption on all ports and speeds (1G, 2.5G, 5G, 10G, 25G, 40G, and 100G)
- Transparent to all upper-layer protocols
- Supports switch-to-switch and switch-to-host MACsec
- 256-bit MACsec-capable between switch to switch
- Manual or 802.1X modes supported

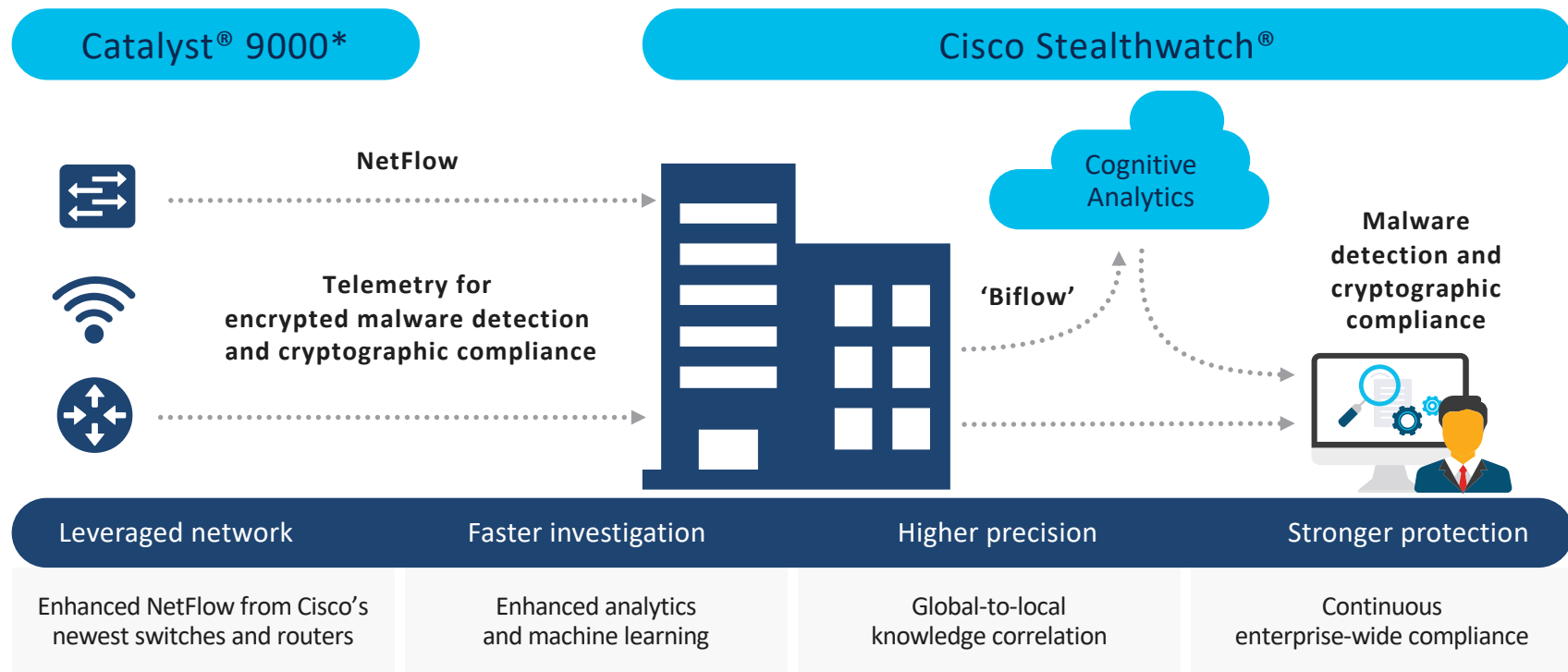
MACsec-256 link encryption

Hop-by-hop encryption via 802.1AE

MACsec	
Switch to switch	128 bits Security Association Protocol (SAP)
	128 bits MACsec Key Agreement (MKA)
	256 bits MKA
Host to switch	128 bits MKA
	256 bits MKA

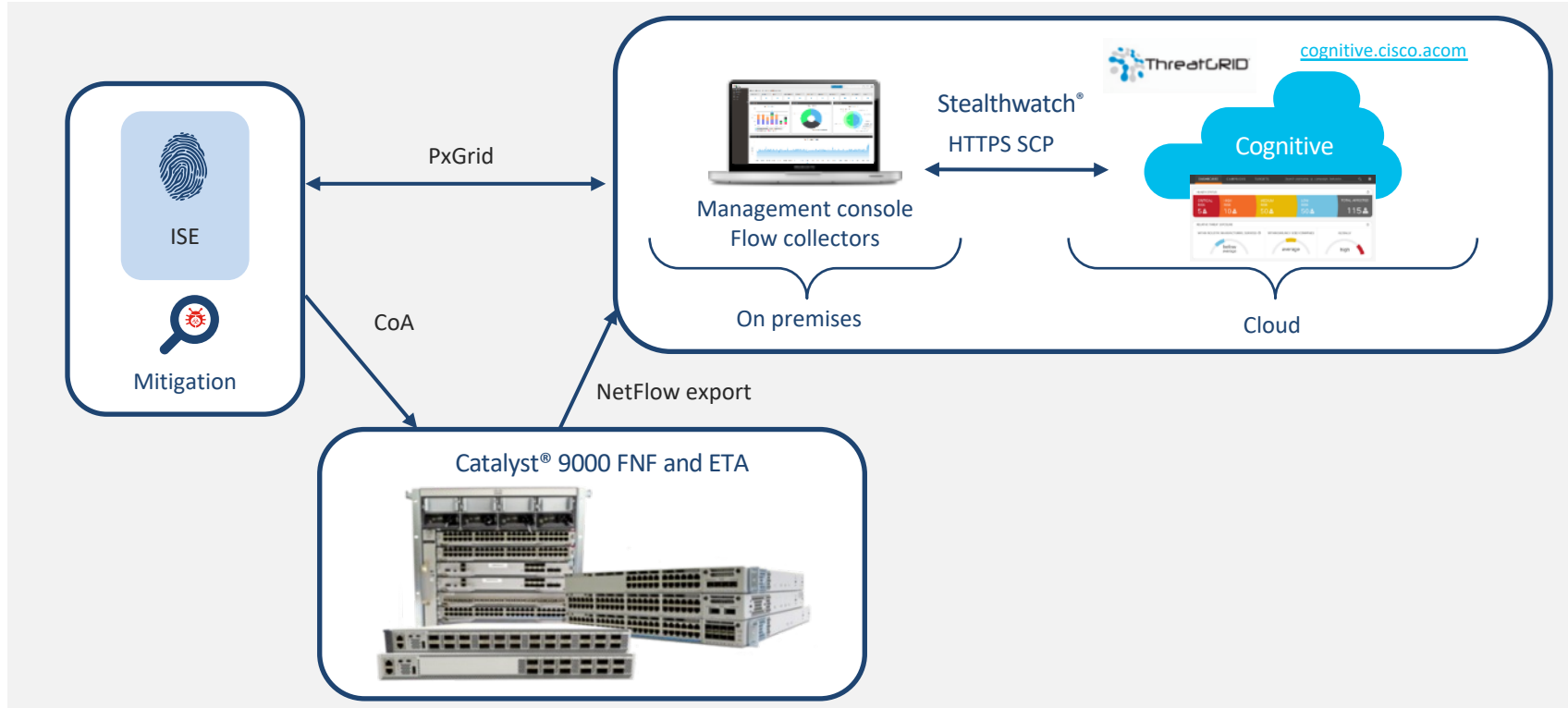
- Supported on all models including uplink modules (modular and fixed SKUs)
- For C9300-48UXM and C9300-48UN switch models, is supported only on the first 16 downlink ports

ETA - Finding Malicious Activity in Encrypted Traffic



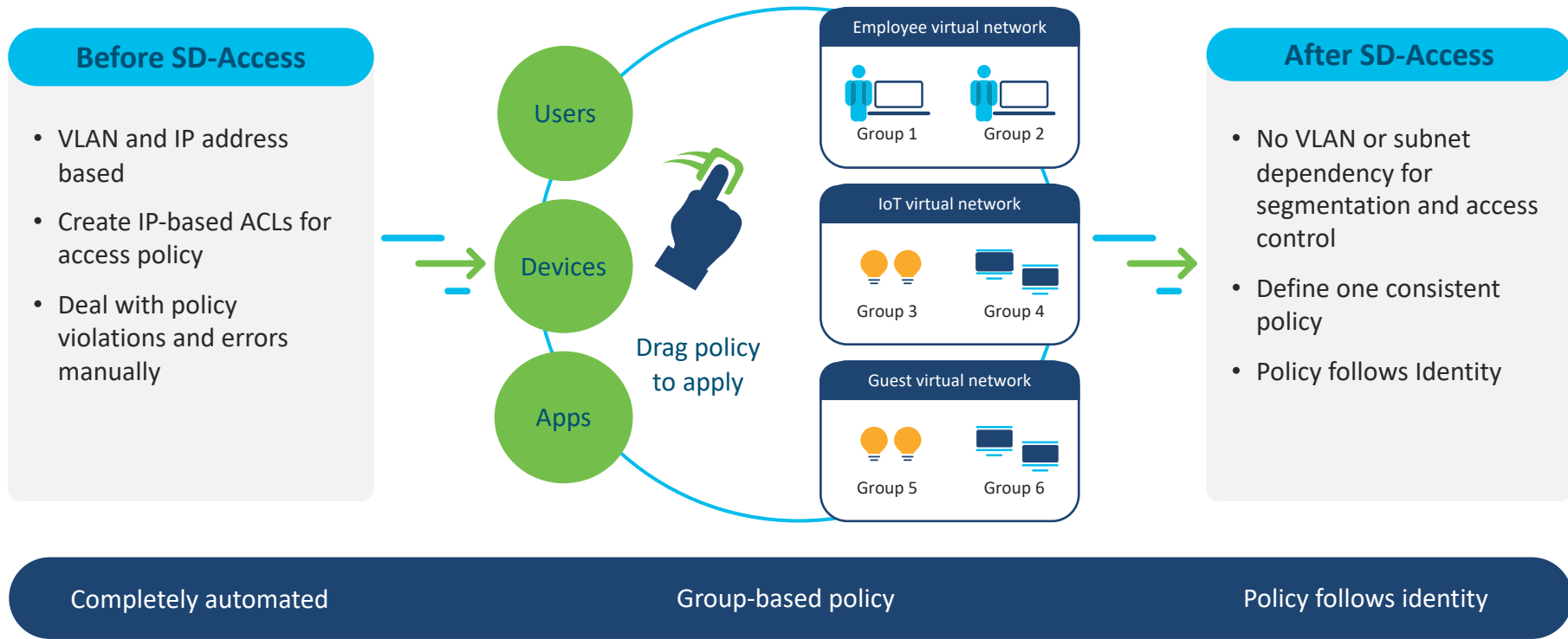
*ETA support for the Catalyst 9600 is on the roadmap

ETA Solution with Catalyst 9000 Portfolio



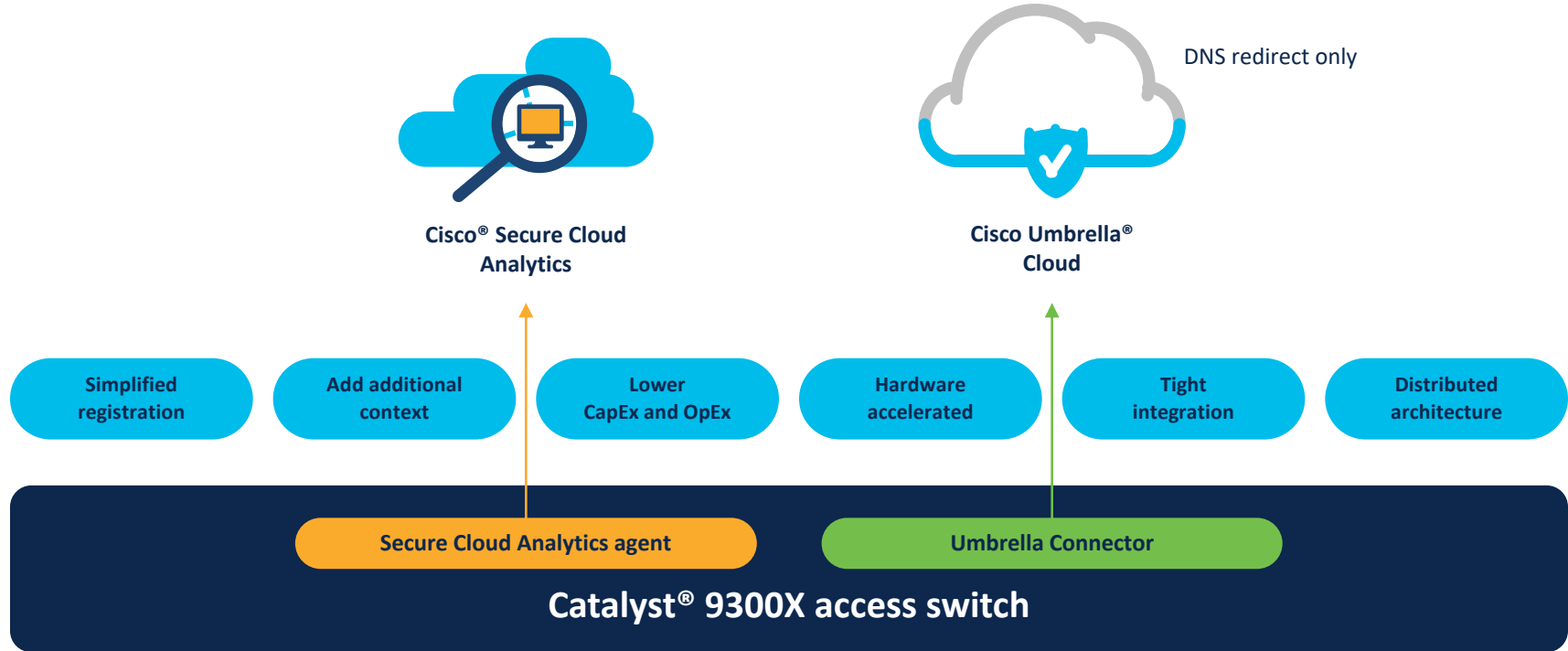
Segmentation Agility with Security

Secure onboarding of users and devices with flexible authentication and segmentation



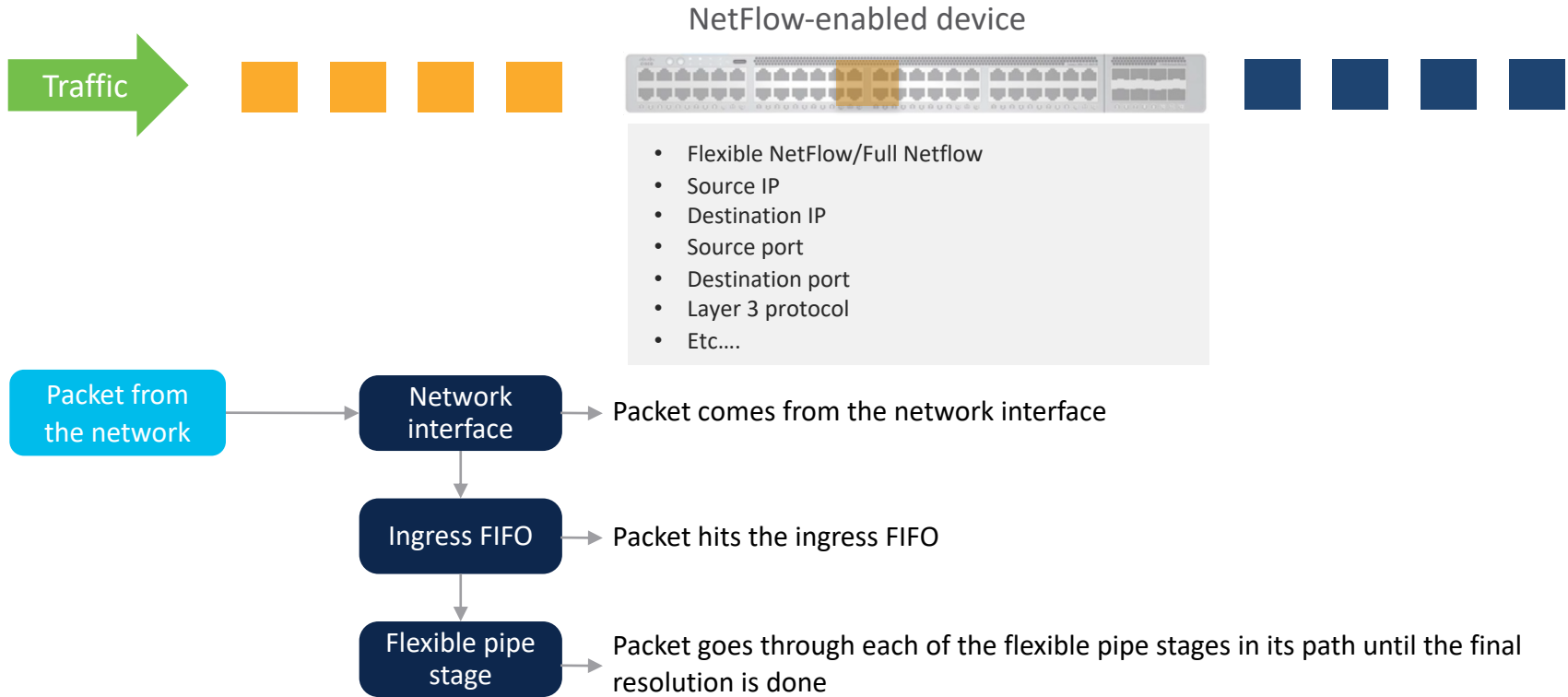
Cloud security at access

Native integration of Cisco Cloud Security

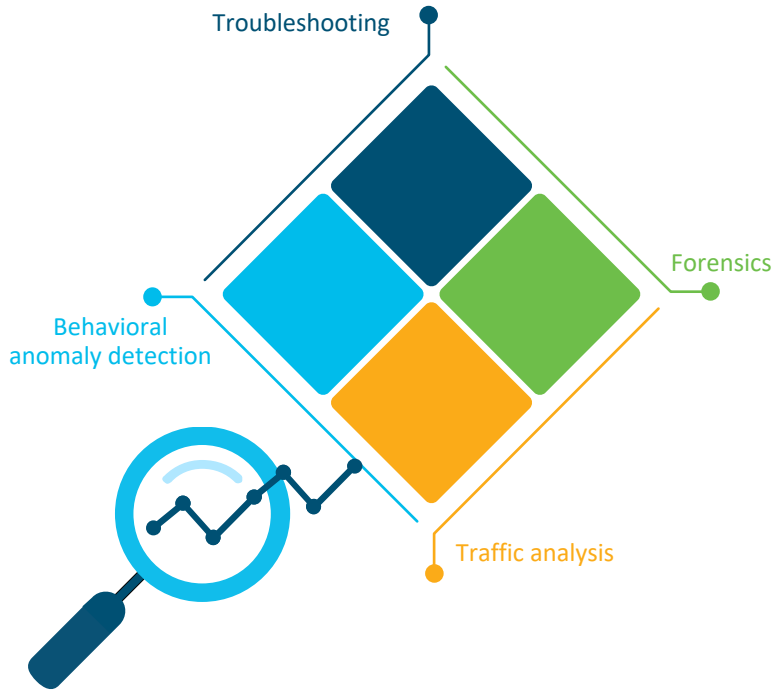


Full Flexible NetFlow

Packet processing



Benefits of Full Flexible NetFlow



Multiple monitors per interface



Configuration

- Traffic type support
- IPv4
- IPv6
- Datalink



Interface type

- Switch port
- Non switch port (routed port)
- VLAN configure
- Port-channel member interface

Multiple monitors for different traffic types per interface per direction

AVB and PTP

1588v2 PTP features on Catalyst 9300 Series Switches

- **PTP default profile: PTPv2**
 - **Hardware-assisted PTP implementation**
 - **2-step PTP message exchange**
 - **PTP multicast messaging**
 - **IEEE 1588 Best Primary Clock Algorithm (BMCA)**
 - **Transport:**
 - Layer 2 (default)
 - Layer 3 (IPv4 UDP)
 - **Single PTP domain**
 - **Customizable PTP domain**
 - **Configurable PTP timers**
- **Boundary clock:**
 - Delay request-response mechanism
 - Peer delay mechanism
 - **Transparent clock:**
 - End-to-end delay messages
 - Peer-to-peer delay messages
 - **PTP interfaces:**
 - Layer 2
 - SVI (Layer 3)
 - Native Layer 3
 - EtherChannel

Complete PTP end-to-end solution on Catalyst® 9000 switches

Audio Video Bridging (IEEE 802.1BA)

Fewer cables and a transparent collaboration experience

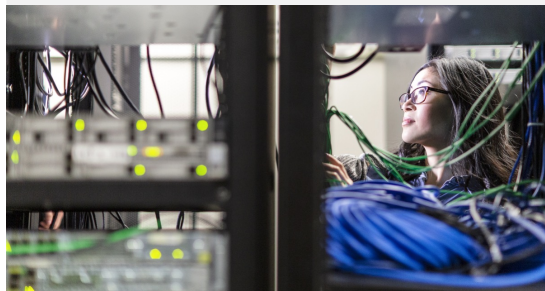
Traditional AV networks



Quality of experience

- Improved time – synchronized audio/video (latency <2 milliseconds)
- Standard QoS to simplify and automate switch configuration
- Ability to scale with higher bandwidth, 1/10G

Digital AV network (Dante, Cobranet, AVB)



Scalability

- Allows device interoperability
- Eliminates proprietary networks
- Increases flexibility to add new media applications

Media on AVB over Cisco® hardware



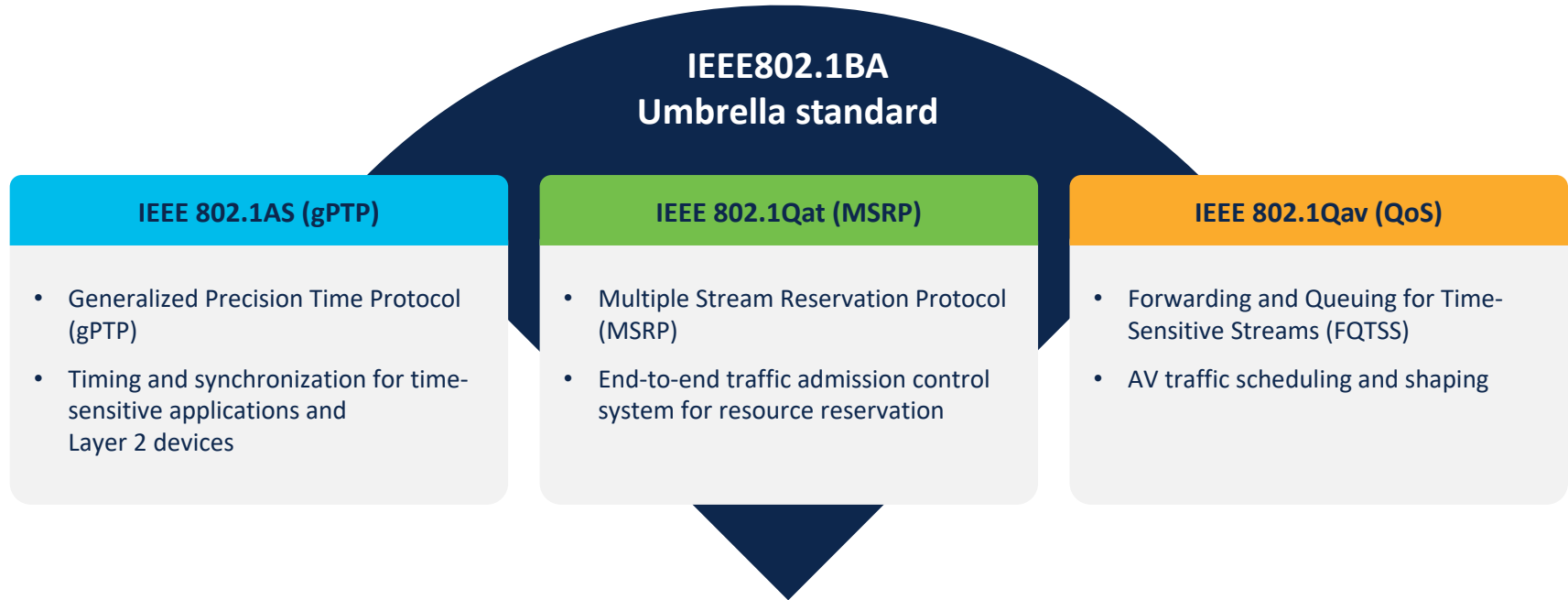
Lower TCO

- Lower cost and complexity (60% CapEx and 35% OpEx savings) over 5 years*
- Added functionality and control
- No proprietary license fee per endpoint

* Source: Axon and Axis Report.

IEEE AVB

Encompasses the following IEEE standards



AVB restrictions and known issues

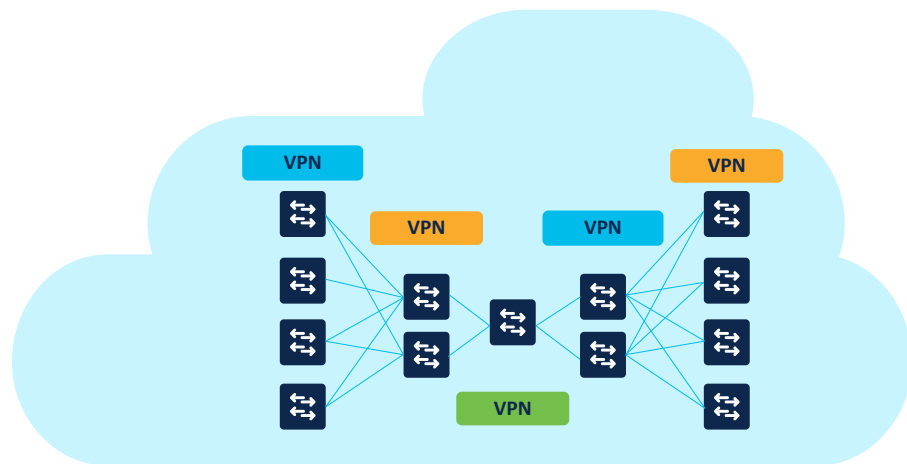
- AVB is not supported on stacking
- AVB is not supported on EtherChannel interfaces
- C9300-48UXM and C9300-48UN SKUs support PTP/AVB on the first 16 ports (1 to 16) and the first 32 ports respectively and all Uplinks
- AVB is supported only on **networks with Spanning Tree Protocol enabled**

AVB/PTP support	SKU	Software
Yes	Catalyst® 9300 modular uplink models	16.8.1 Network Advantage
Yes	Catalyst 9300 1G fiber	16.11.1 Network Advantage
Yes	Catalyst 9300L	16.11.1s Network Advantage
Yes	Catalyst 9300X	17.5.1 Network Advantage

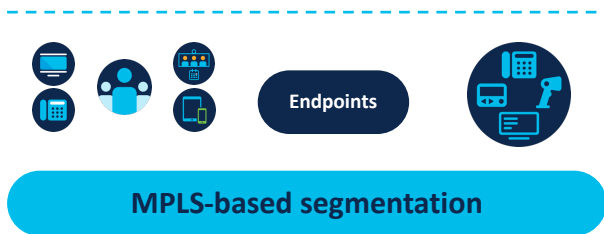


Flexible design and overlay architectures

Advanced routing/MPLS in campus



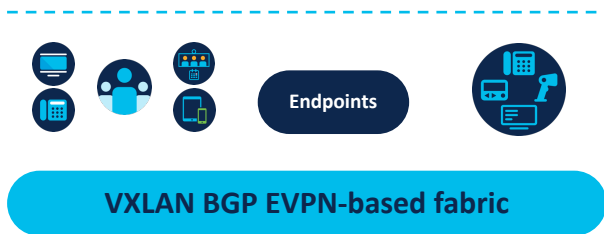
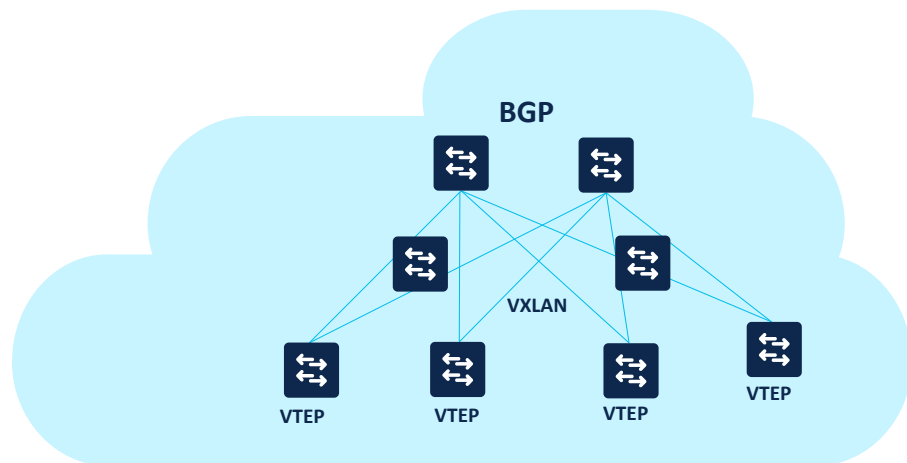
- Standard, collapsed, routed access design
- Bringing MPLS to access with routed access design
- Traditional label-based segmentation with L3VPN
- P2P and P2MP overlay over MPLS
- Multicast over VPN
- 6PE/6VPE
- MPLSoGRE, EoMPLSoGRE*
- Inter-AS Option A and B



9300/9300L/9300X	
Role	PE
VRFs	256

* Supported with 16.12.

VXLAN BGP EVPN in the campus

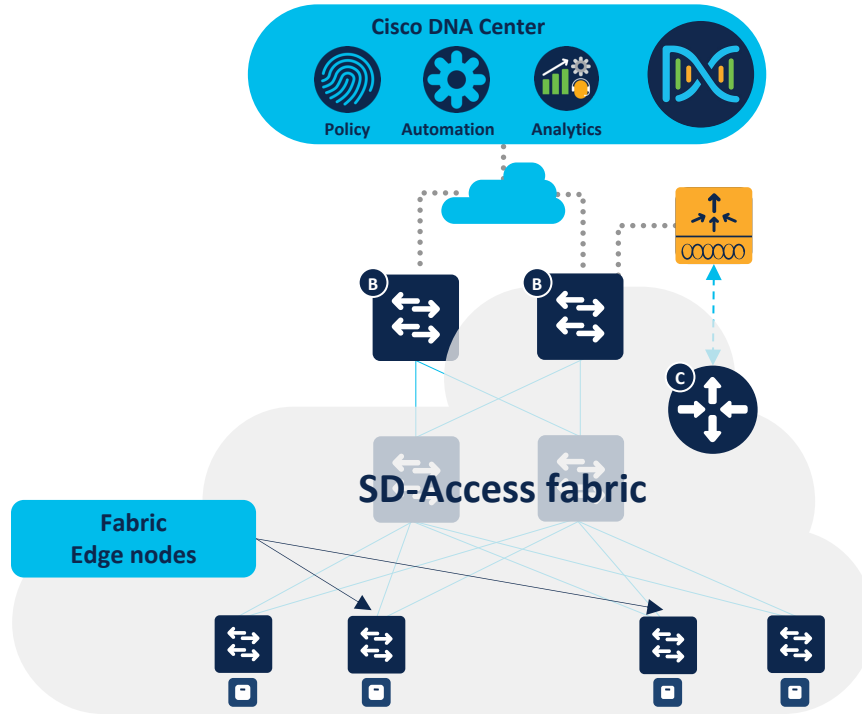


- Standard, collapsed, routed access design
- Bringing VXLAN to routed access design
- BGP control plane learning
- VXLAN bridging and routing support
- Anycast gateway support
- Ingress replication and multicast for BUM traffic
- Border handoff with VRF Lite and L2/L3VPN*
- Catalyst® 9300 supported in Virtual Tunnel Endpoint (VTEP) role

9300/9300L/9300X	
Role	VTEP/LEAF

* Supported with 16.12.

Cisco Software-Defined Access (SD-Access)



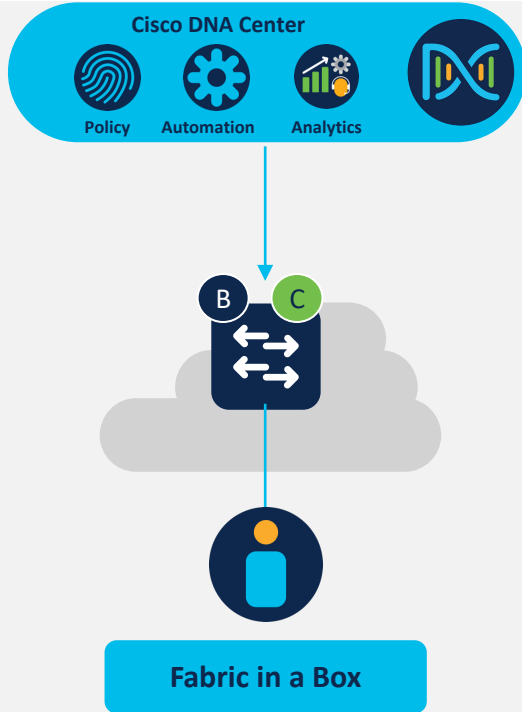
Role	9300/9300X	9300L
Fabric edge	Yes	Yes
Fabric control plane	Yes	Yes
Fabric border	Yes	Yes

	9300/9300X	9300L
Number of user VRFs	256	256
Cisco Catalyst 9800 Series embedded WLC	200 APs	50 APs

B – Border node

C – Control plane node

Fabric in a box in SD-Access



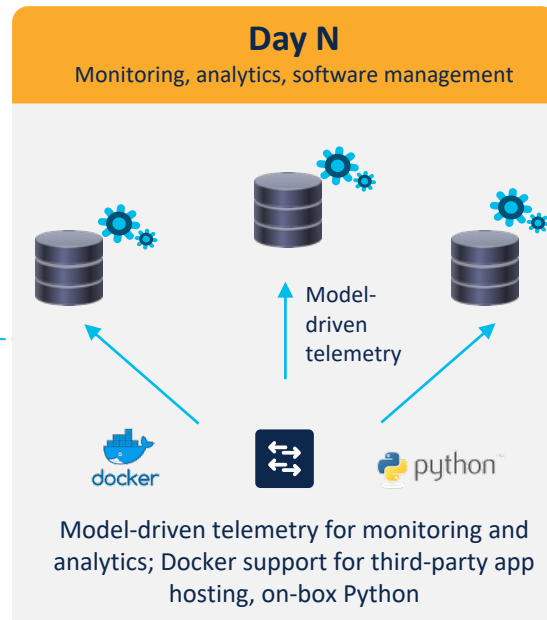
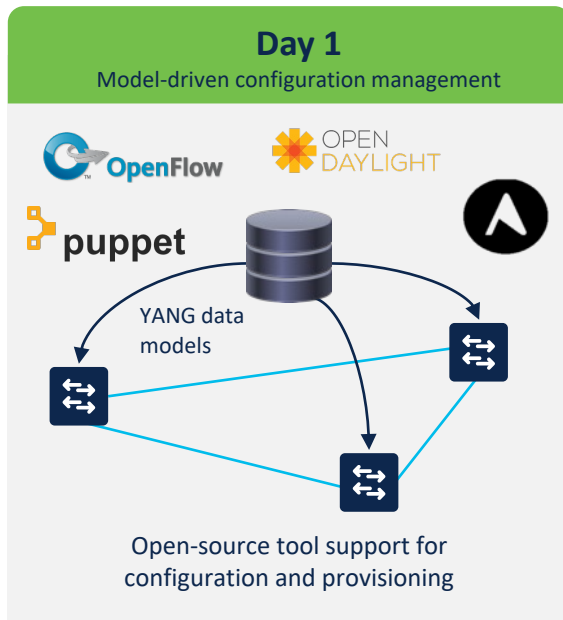
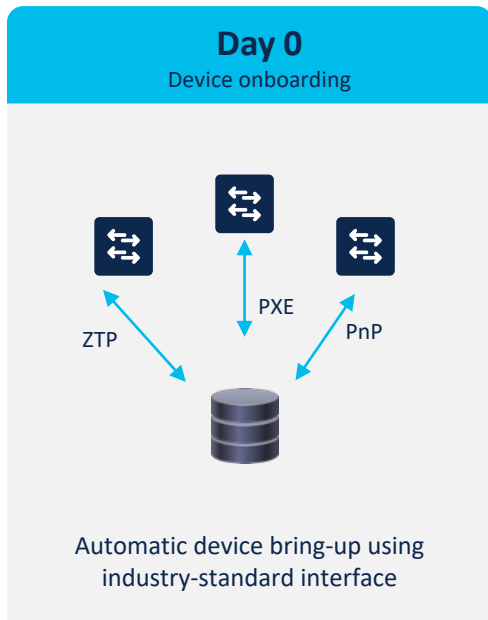
- Fabric edge + Fabric border + Control plane on Cisco Catalyst 9000
- Reduces the cost to deploy SD-Access for “mini” sites

Day 0-N Provisioning



Catalyst 9300 Series Switches

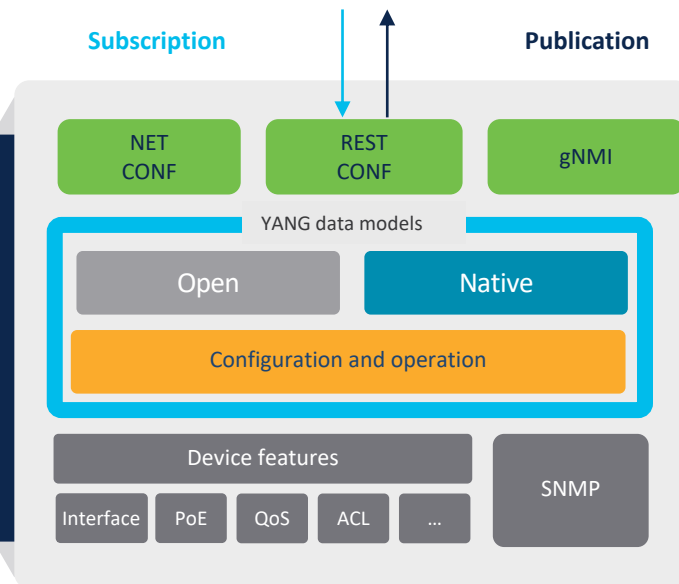
Simplify network operations with open-standards APIs



Plug-in to operational in minutes

Model-driven telemetry

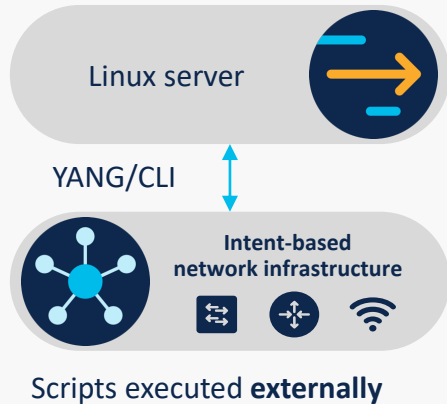
- Support for any YANG subtree
- Structured data
- XML encoding
- Periodic or on change
- Reduced CPU load



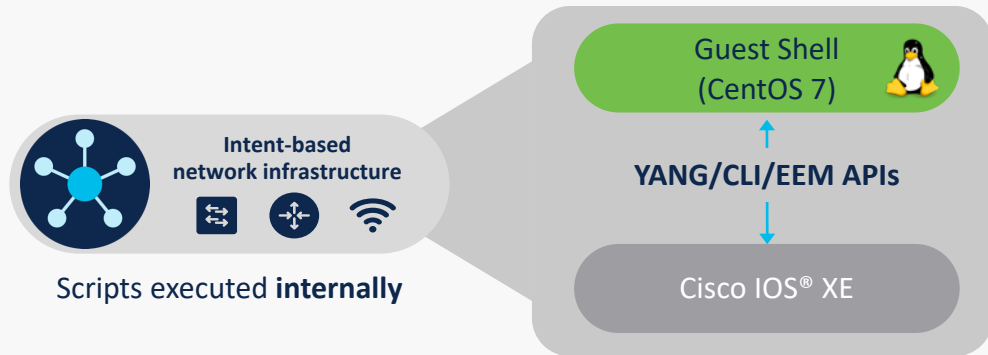
**Export enriched, consistent, and concise data with context from devices
for a better user and operator experience**

Using Python with Cisco IOS XE devices

Off-box Python

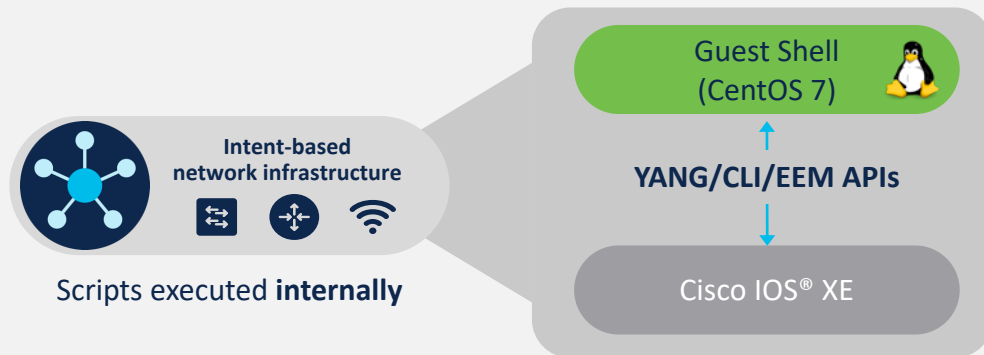


On-box Python (Guest Shell)



Guest Shell

- Fault and resource isolation
- Secure Linux shell environment
- Python interpreter
- Integrated with ZTP and EEM
- Disabled by default
 - `switch# guestshell enable`



Note: Additional config needed from 16.8.1: app-hosting appid guestshell vnic management guest-interface 0

Manageability

Embedded WebUI



Ease of access



Build configurations



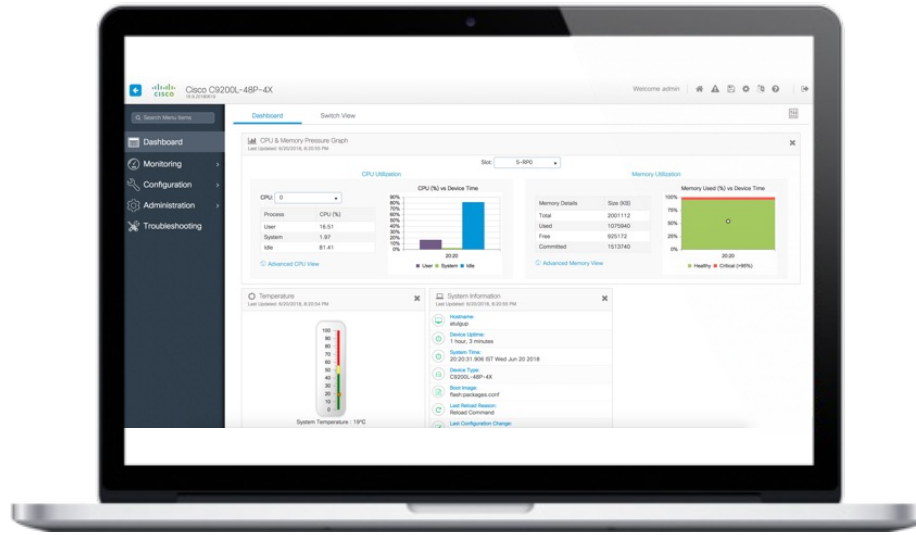
Intuitive interface



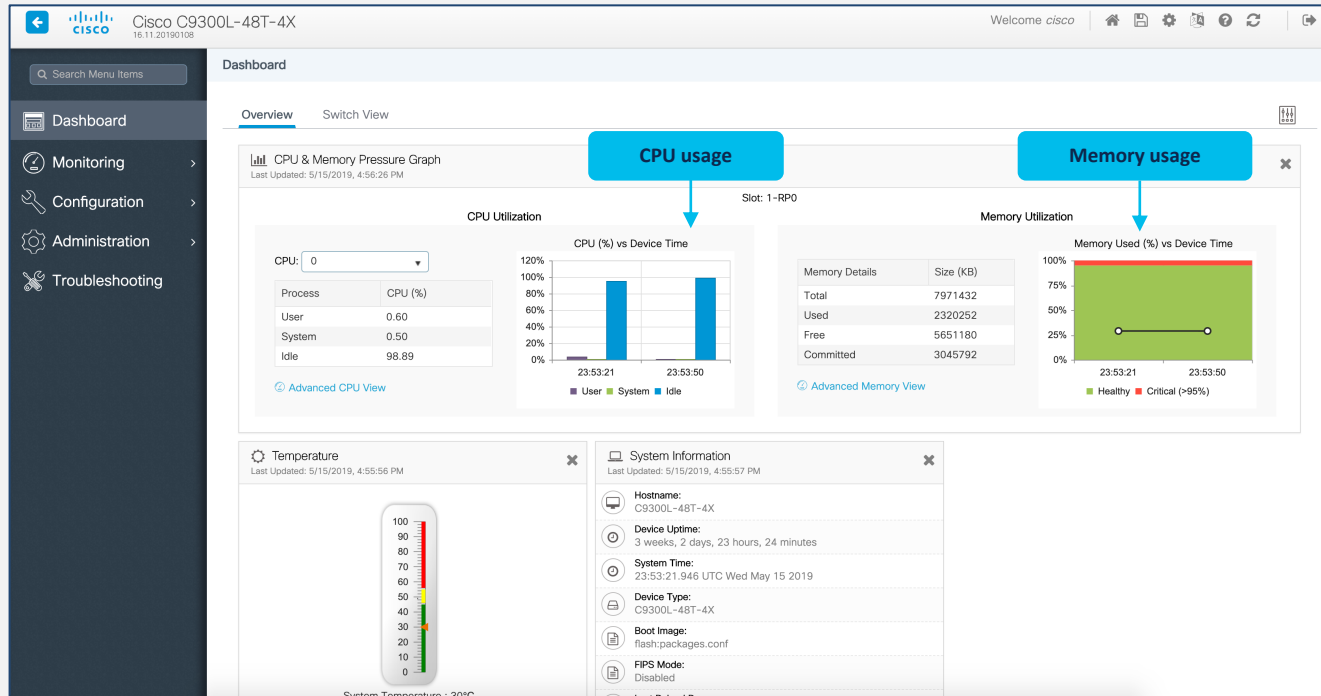
Switch view



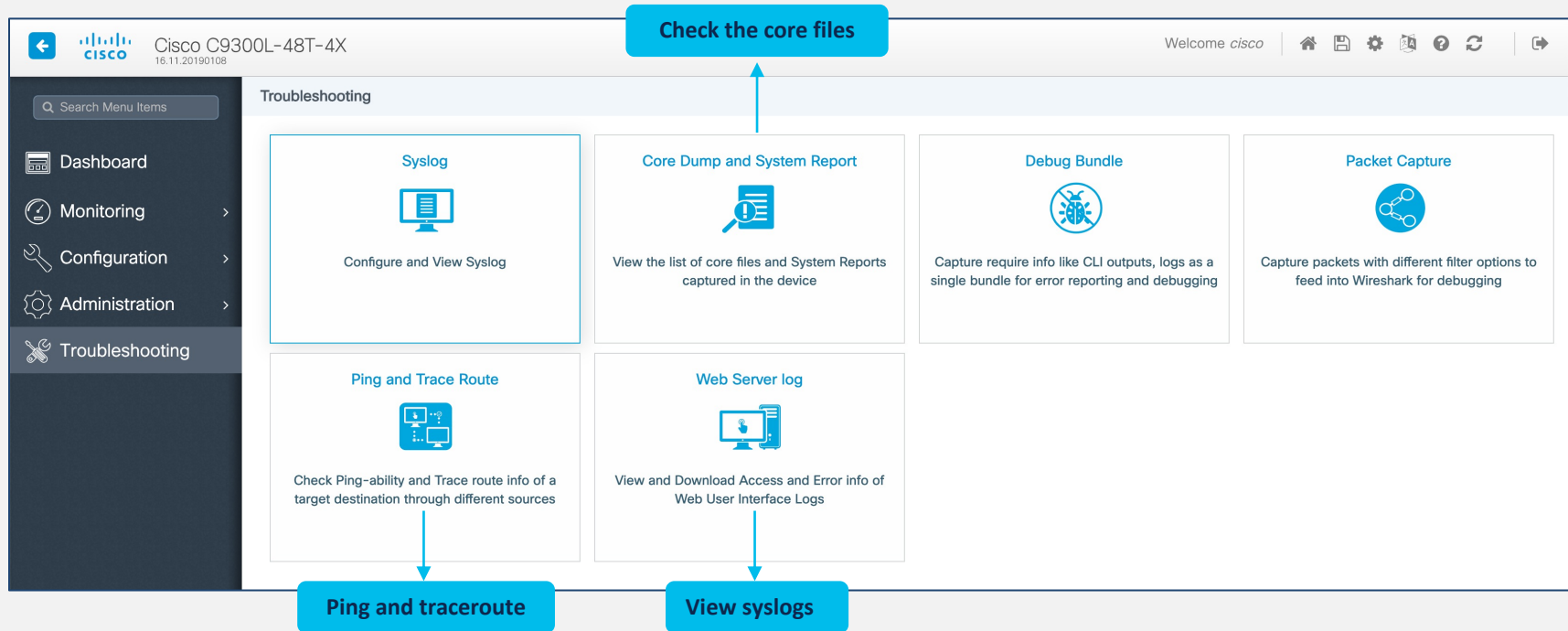
Troubleshooting



Embedded WebUI – Dashboard



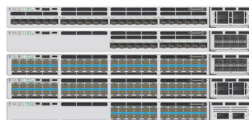
Embedded WebUI – Troubleshooting wizard



Catalyst 9300X differentiation

Catalyst 9300 Series – Market-leading fixed switches

Catalyst® 9300X



Catalyst 9300



Mixed (Catalyst 9300 + 9300X)



Deployment type	High-speed access and distribution	Access	Access and distribution
Stacking	1 terabit	480G	480G
StackPower	✓ (+ higher power budget)	✓	✓
Hardware-based IPsec	✓	✗	✗
Dense uplinks	Up to 100G	Up to 40G	Up to 100G
Fiber models	Up to 25/10G SFP+	Up to 1G SFP	Up to 25/10G SFP+
Max 10G copper ports (1RU)	48	24	48
App hosting	✓ (~2x app hosting capacity)	✓	✓



IBN innovations



Full SD-Access, Fabric-in-a-Box, embedded wireless controller



Wired Assurance, SD-Access, AVC, FNF



ETA, MACsec-256



On-box app hosting



HA, hot patching, StackPower, UPOE+



Cloud integrations: Secure Network Analytics, Cisco Umbrella®, Cisco DNA Spaces

Catalyst 9300X for continued market leadership

Legend

Best

Partial

Bad

Competitive challenges



CX6300



Threats

- Higher Multigigabit density
- 50G uplinks



720XP



Threats

- 2x 100G uplinks
- 4x 25G uplinks



EX4400

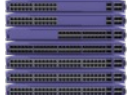


Threats

- 90W PoE with Multigigabit ports
- 24- and 48-port offerings along with 48-port fiber



5520



Threats

- 24- and 48-port models with 90W PoE, MACsec and fabric support

Leadership with Catalyst® 9300/9300X

	Catalyst 9300/X	Aruba CX6300	Arista 720XP	Juniper EX4400	Extreme 5520
Hardware differentiation					
48 Multigigabit ports + 90W Cisco UPOE®+	Best	Bad	Bad	Partial	Partial
12 or 24x 10/25G SFP+/SFP28 (collapsed core/distribution) SKU	Best	Bad	Bad	Bad	Bad
Support 25/40/100G uplinks	Best	Partial	Partial	Partial	Partial
Stackwise-1T (backplane stacking) and StackPower	Best	Bad	Bad	Bad	Bad
Stack members	8	10	12	10	8
Enterprise-grade campus features differentiation					
Full stack security: Encrypted Traffic Analytics, MACsec 128-bit/256-bit link encryption, line-rate IPsec, Cisco TrustSec®, Full Flexible NetFlow, FabricSec	Best	Bad	Bad	Bad	Partial
High availability: Stackwise-1T, StackPower, NSF/SSO, xFSU (<30 seconds downtime), patching	Best	Partial	Partial	Partial	Partial
IoT convergence: Embedded wireless controller, Wide Area Bonjour/SD-Bonjour, IEEE 1588 AVB/PTP, application hosting, robust edge compute capability	Best	Bad	Bad	Bad	Partial
Segmentation: SD-Access, EVPN-VXLAN, SGT, GBP, MPLS, VPLS, EoMPLS	Best	Partial	Partial	Partial	Partial
Application visibility and service assurance: Cisco® ThousandEyes integration, NBAR2, AVC, Flexible NetFlow	Best	Partial	Partial	Partial	Partial

Win with Catalyst 9300 leadership and differentiation against the competition.

Catalyst 9300X for continued market leadership

Legend

Best

Partial

Bad

Competitive challenges

Aruba		Threats	- Higher Multigigabit density 50G uplinks
ARISTA		Threats	2x 100G uplinks 4x 25G uplinks
Juniper		Threats	90W PoE with Multigigabit ports 24- and 48-port offerings along with 48-port fiber
Extreme		Threats	24- and 48-port models with 90W PoE, MACsec and fabric support

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Win with Catalyst 9300 leadership and differentiation against the competition.





Turn this technical overview into a purchase-ready BOM

Send the exact model or BOM and your deployment requirements. Layer23-Switch can review compatibility, availability, and quote options.

- ✓ Exact model or Cisco PID and quantity
- ✓ Port count, media type, PoE budget, and uplink speed
- ✓ Redundancy, licensing, support, and accessory needs
- ✓ Ship-to country, target date, and lead-time constraints

REQUEST A BOM REVIEW

www.layer23-switch.com



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