
TECHNICAL DECISION MAKER PRESENTATION

Cisco Catalyst 9200 Series

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

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Cisco Catalyst 9200 Series Switching Architecture

Extend intent-based networking everywhere

Agenda

- Catalyst 9200 Series switching overview
- System Architecture
- Cisco IOS® XE
- High availability
- Intent-based networking
- QoS
- Security
- POE innovations
- Programmability
- Application visibility
- Manageability



Extending intent-based networking everywhere

Catalyst 9600 Series
Lead Modular Core

New

Catalyst 9400 Series
Lead Modular Access



Catalyst 9500 Series
Lead Fixed Core

Catalyst 9300 Series
Lead Fixed Access



Catalyst 9200 Series switches



Fast, Flexible and light ASIC
Cisco UADP 2.0 mini



Resiliency
Redundant PS, Fans



Security
Macsec-128



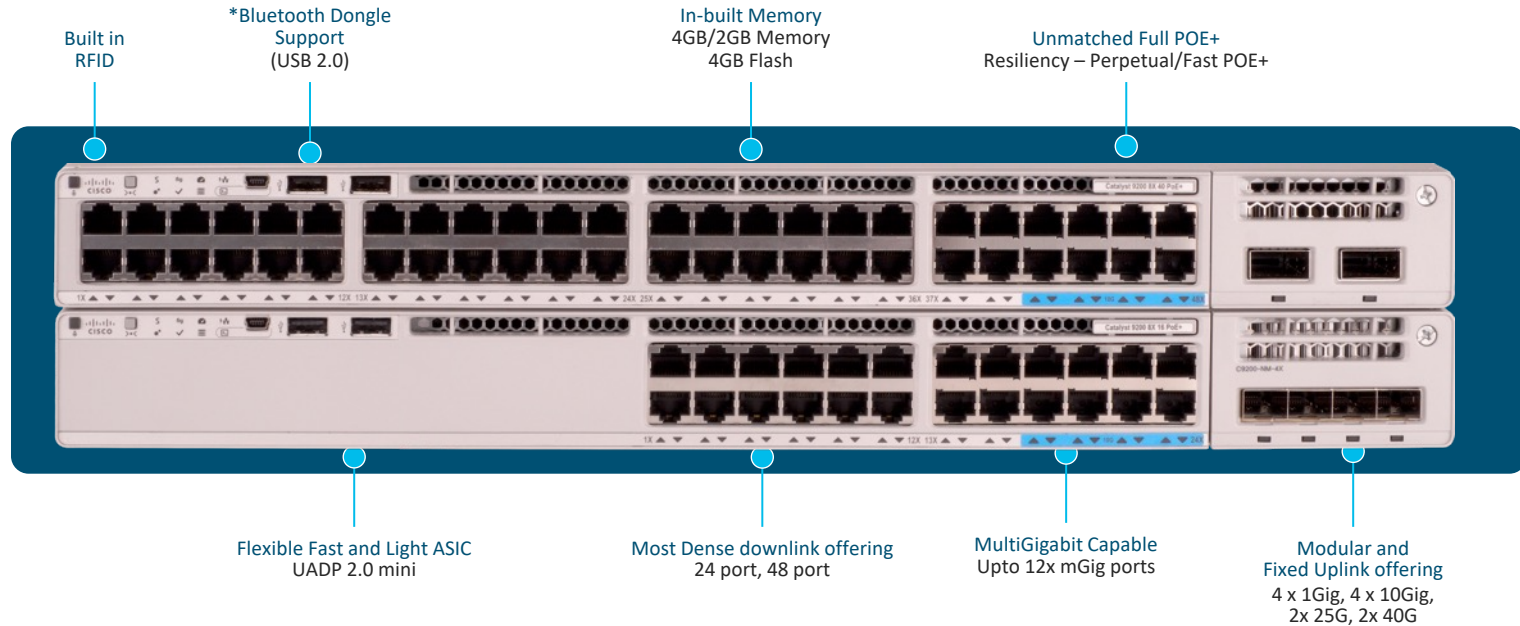
Programmability
YANG Models



SD-Access
Edge Node

**Catalyst 9200 Series switches built on
industry leading Catalyst 9000 switching attributes**

The New Catalyst 9200 Series switches



* Hardware Capable

Catalyst 9200 Series switching 1G Model SKUs

Catalyst 9200 Series switching SKUs

9200 (Modular Uplinks and Fans)

Data



24X1G Ports

48X1G Ports

POE+



24X1G Ports

48X1G Ports

4 x 1G and 4 x 10G Uplinks

9200L (Fixed Uplinks and Fans)

Data



24X1G Ports

48X1G Ports

POE+



24X1G Ports

48X1G Ports

4 x 1G and 4 x 10G Uplinks

Modular Power Supplies available on all the SKUs

Catalyst 9200 Series switching Multigigabit Model

9200 (Modular Uplinks and Fans)

POE+



8xmGig Ports

POE+



8xmGig Ports

Modular 4 x10G, 2 x 40G, 2 x 25G Uplinks

9200L (Fixed Uplinks and Fans)

POE+



8xmGig Ports

POE+



12xmGig Ports

8xmGig Ports

Fixed 4 x10G, 2 x 25G Uplinks

All models support Full PoE+

Modular Power Supplies available on all the SKUs

Cisco Catalyst 9200-Enhanced VRF Model

Cisco Catalyst 9200 Series switching SKUs for SD-Access Fabric Edge

Cisco Catalyst 9200-24PB

24x 10M/100M/1G Downlink Ports



4 x 1/10G SFP/SFP+ Uplink Module

Cisco Catalyst 9200-48PB

48x 10M/100M/1G Downlink Ports



4 x 1/10G SFP/SFP+ Uplink Module

All models support Full PoE+

32 VN/VRF Supported with 31 User Configurable and 1 Default

Catalyst 9200 Series switching Partial POE+ Model

9200 (Modular Uplinks)

Partial POE+



48X1G Ports



48X1G Ports

4 x 1G, 4x 10G Modular Uplinks

9200L (Fixed Uplinks)

Partial POE+



48X1G Ports



48X1G Ports

4 x 1G, 4 x 10G Fixed Uplinks

All models support 370W PoE+ Power Budget

Modular Power Supplies available on all the SKUs

Cisco Catalyst 9200 Series

Next generation of entry-level access switches for intent-based networking



Security



Resiliency



Application
experience

Fixed Uplinks



48 ports Full POE+/Partial POE+/Data, 1G/10G Uplink



48 ports Full POE+, 12xmGig, 10G Uplink

48 ports Full POE+, 8xmGig, 25G Uplink



24 ports Full POE+/Data, 1G/10G Uplink



24 ports Full POE+, 8xmGig, 10G Uplink

24 ports Full POE+, 8xmGig, 25G Uplink

Modular Uplinks



Recommended for small scale SDA deployments



48 ports Full POE+/Partial PoE+/Data
48 port Full POE+ with 32 VN**



48 ports Full POE+, 8xmGig



24 ports Full POE+/Data
24 ports Full PoE+ with 32 VN**



24 ports Full POE+, 8xmGig

Modular
fans

Higher Efficiency AC FRU Power Supplies

Modular uplinks

FRU Fan



Silver
Rated



125W

Platinum
Rated



600W

Platinum
Rated



1000W

Platinum
Rated



715W DC

FRU Uplinks*



4x 1G



4x 10G



2x 25G



2x 40G

Cisco Catalyst 9200 Series highlights

UADP 2.0 mini

Cisco IOS XE Software

Limited-scale SD-Access

MACsec-128 link encryption

Trustworthy solutions

Perpetual/Fast PoE

Programmability

Cold patching

Full Flexible NetFlow
streaming telemetry



Cloud Monitoring

*C9200 1G skus support 1/10G uplinks while C9200 mGig will support 10/25/40G uplinks

**C9200 32 VN skus only support 1/10G uplinks and these skus cannot be stacked with other C9200 skus

Modular uplink options on Catalyst 9200 Series switches



- 4 x 1 Gig
- SFP Transceivers
- **Supported on all modular SKUs**



New

- 2 x 25 Gig
- SFP/SFP+ Transceivers
- 1/10/25G speed support
- **Supported on all mGig SKUs only**



- 4 x 10 Gig
- SFP/SFP + Transceivers
- **Supported on all modular SKUs**



New

- 2 x 40 Gig
- QSFP Transceivers
- **Supported on all mGig SKUs only**

All modular uplink modules are Field Replaceable Units
Modular uplinks supported on Catalyst 9200 Series modular SKUs

Resilient power supplies

Silver Rated (80% efficiency)



125WAC

Supported only on 1G Data SKUs

Platinum Rated (90% efficiency)



600WAC

Supported only on 24 Port
POE+ SKUs



1000WAC

Supported only on 48 Port
POE+ SKUs



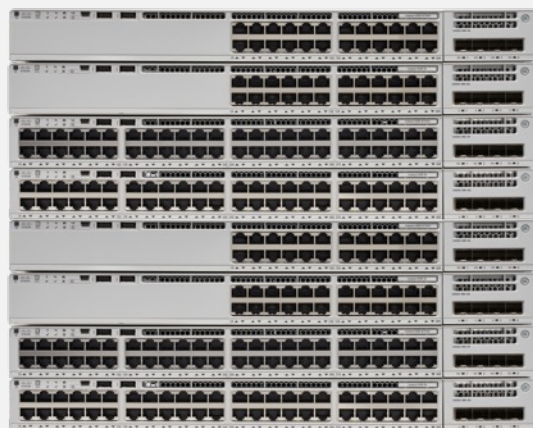
715W DC

Supported only on
all POE+ SKUs

Load sharing (1+1) mode supported for PoE+ SKUs

Power Supplies are Field Replaceable Units
Redundant Power Supply should be identical

StackWise-160/80 with SSO



Up to 8
member stack



- StackWise-160 supported on all modular Catalyst 9200 Series switching models
- StackWise-80 supported on all fixed Catalyst 9200 Series switching models
- Same Cisco IOS XE and license required on all members

Stacking Kit →



Stack Adapters



Stacking Cable

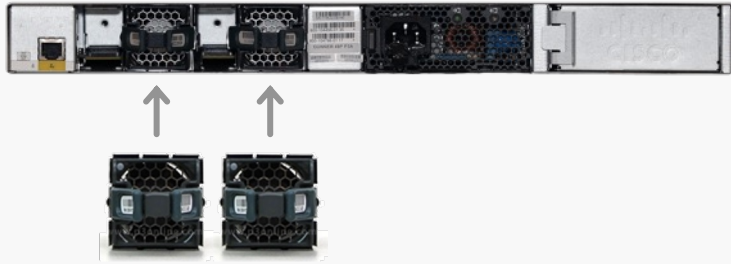
Ordered
Separately

**Stacking cable comes with three options:
50cm, 1m, 3m**

*Mix stacking not supported between StackWise-160 and StackWise-80

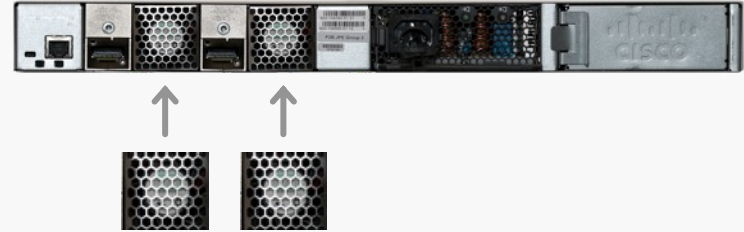
Resilient Fan Modules

Catalyst 9200 Series Modular models



FRU Fan Modules

Catalyst 9200 Series Fixed models



Fixed Fan Modules

Switch can operate on a single fan at ambient temperature

Catalyst 9200 Series Switching Architecture

Architectural simplicity with powerful innovations



Investment Protection
Flexible Pipeline



Enhanced Scale/Buffering
Multicore resource share



100GE
Bandwidth



6MB
Packet Buffer



1/2.5/5/10/40G
Supports Different Speeds



16K
Netflow Records



Flexible
Programmable Modules



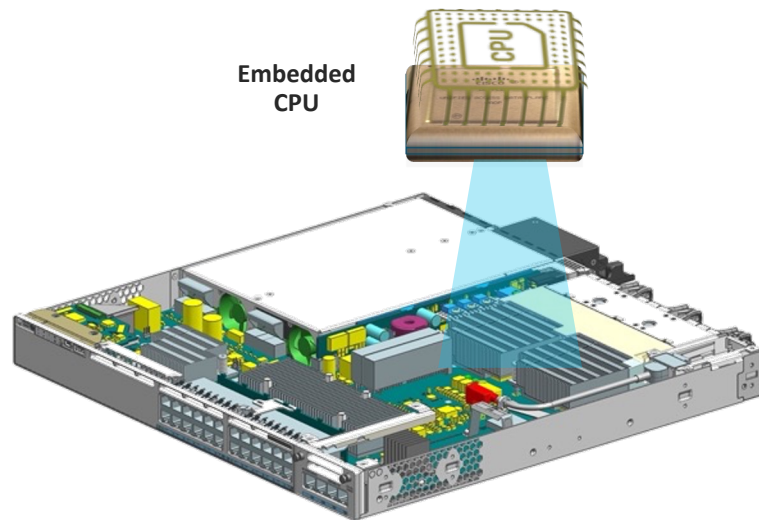
SDM Templates
Flexibility



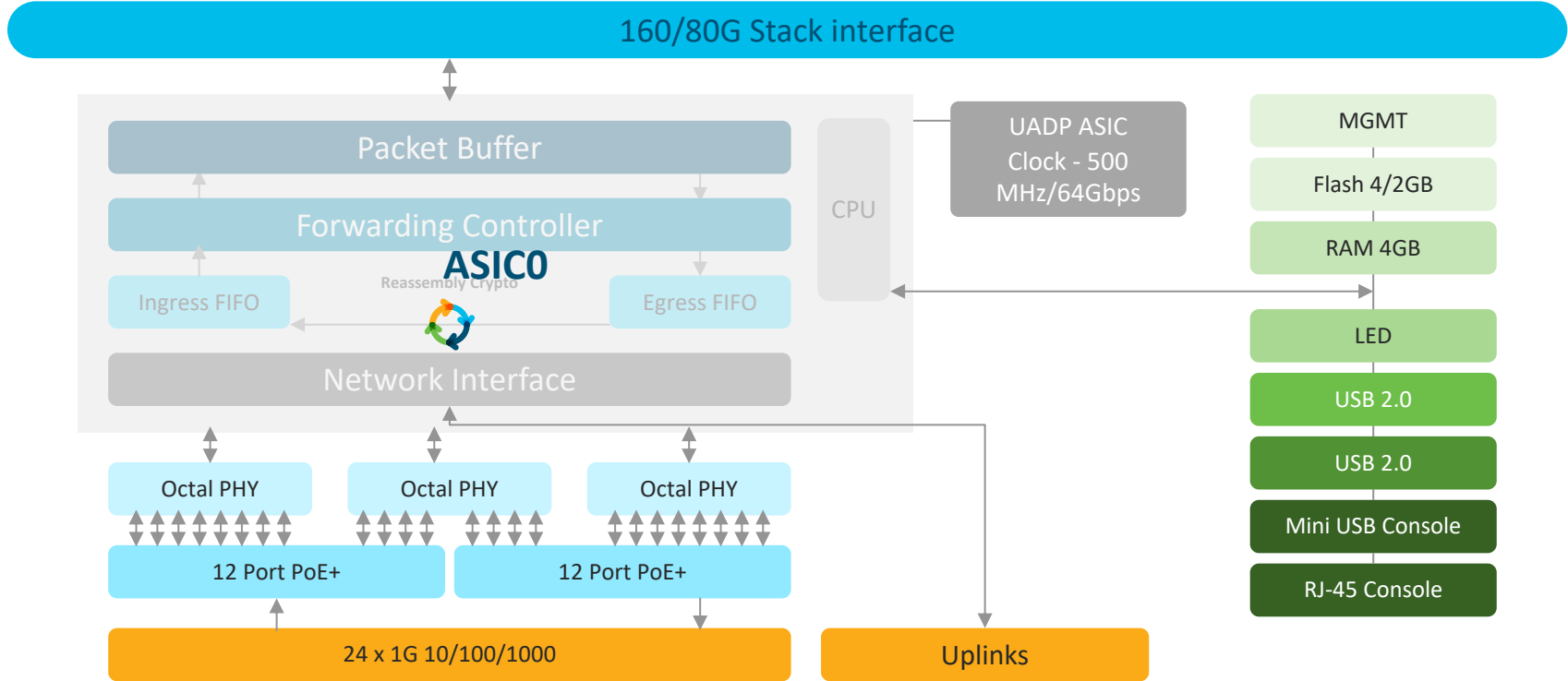
160/80G
Stacking Capacity



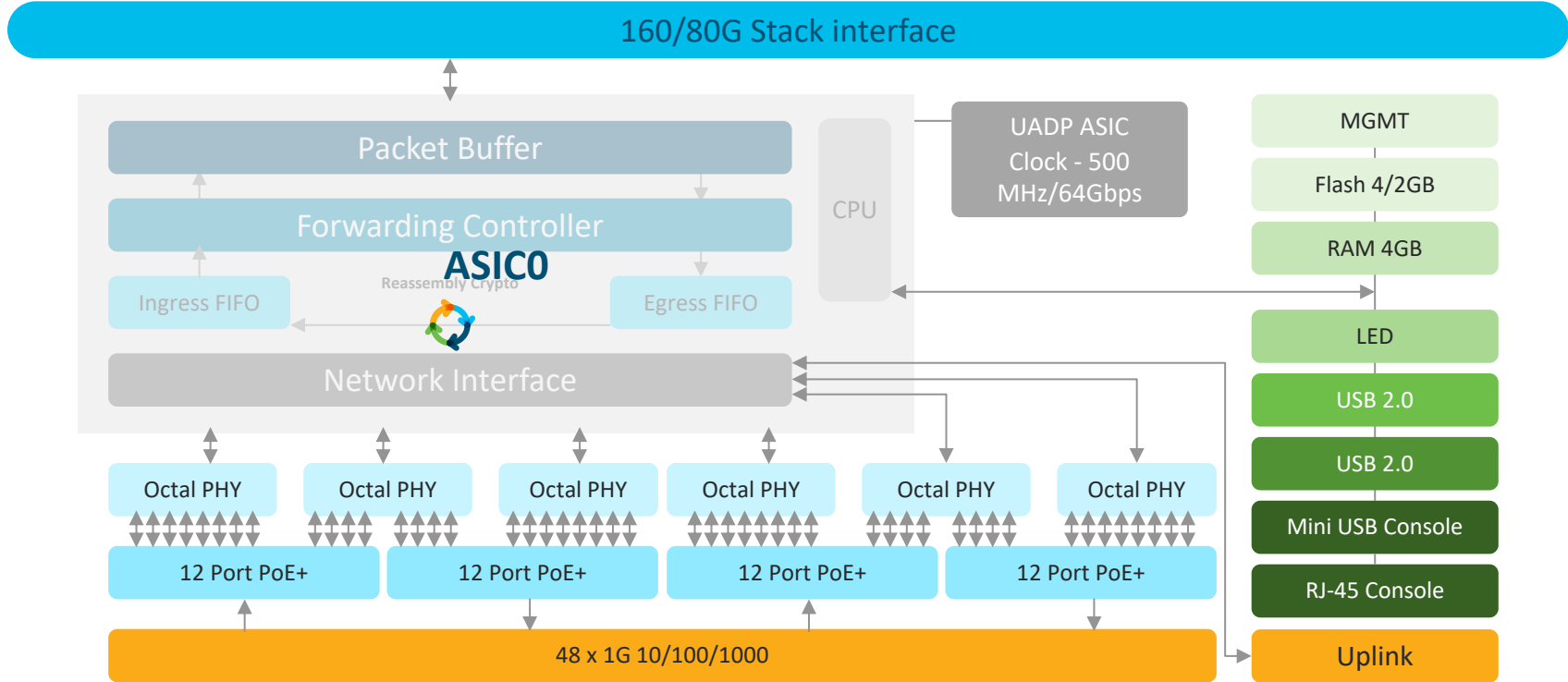
Up to 2X to 4X
forwarding + TCAM



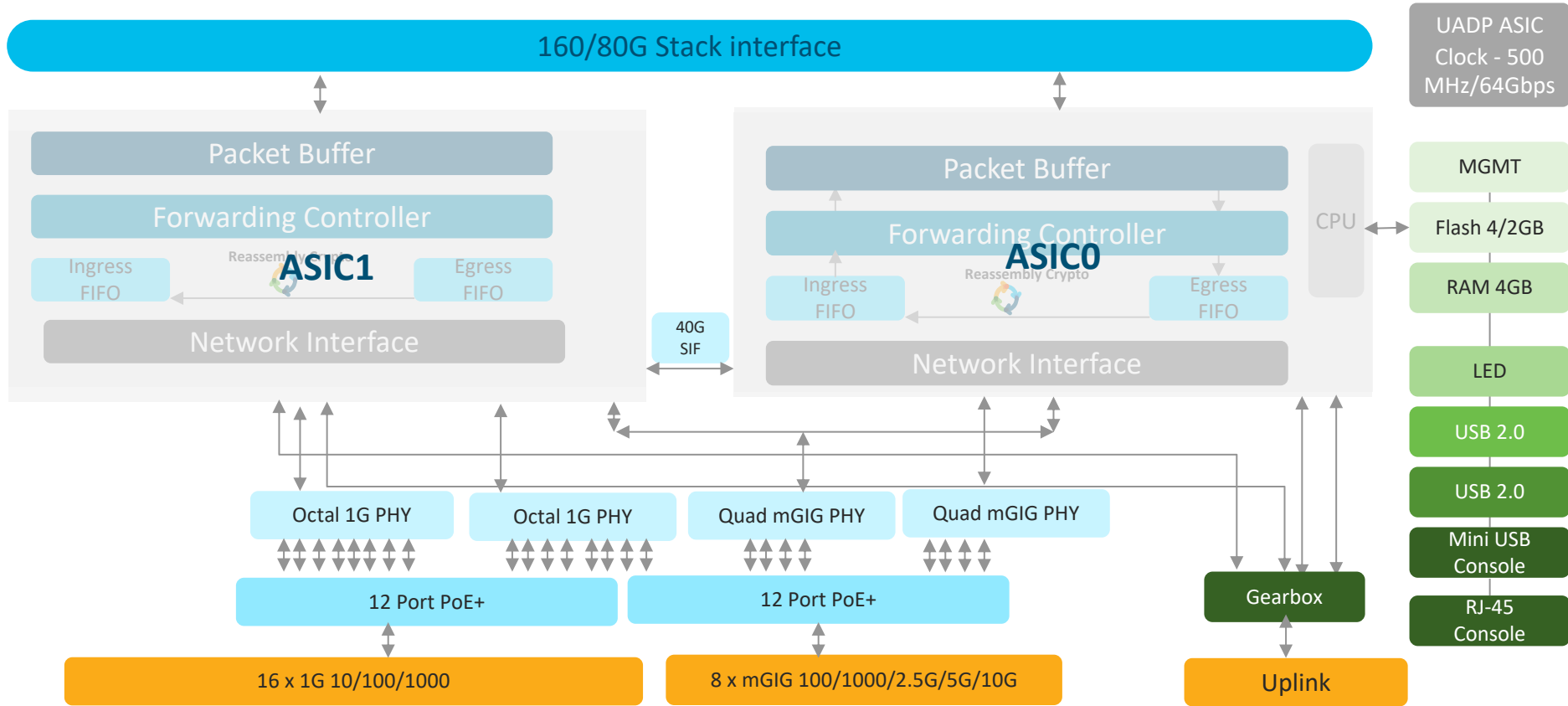
Catalyst 9200 Series switches - 24 Port Layout



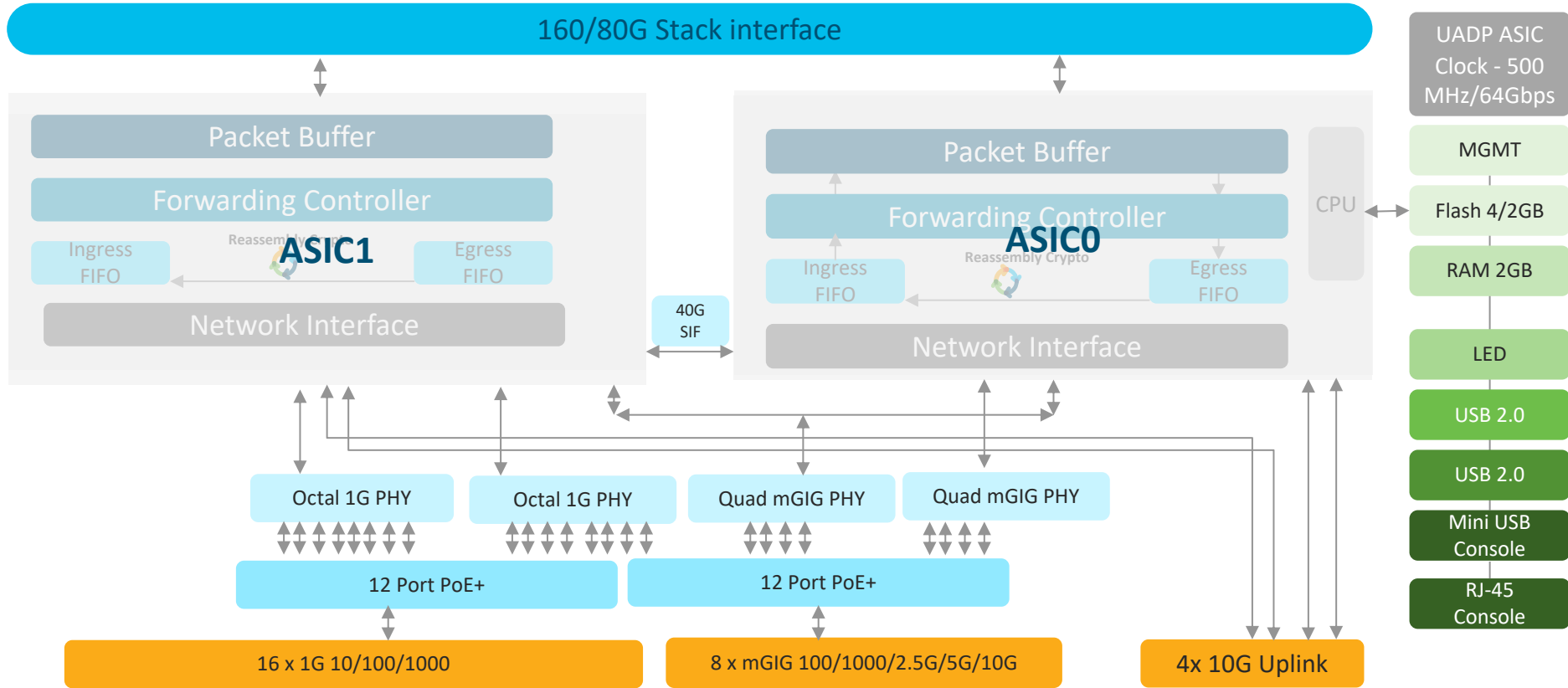
Catalyst 9200 Series switches – 48 Port Layout



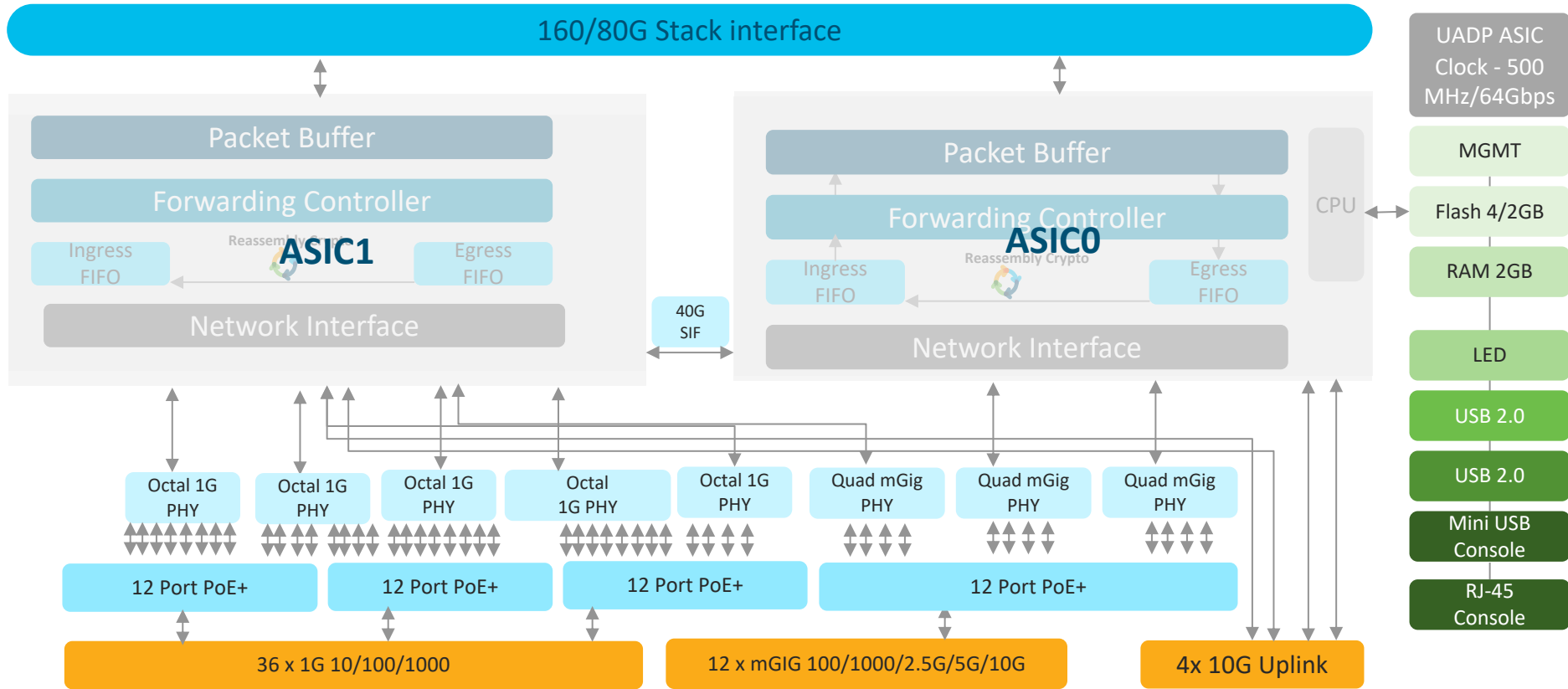
Catalyst 9200- C9200-24PXG



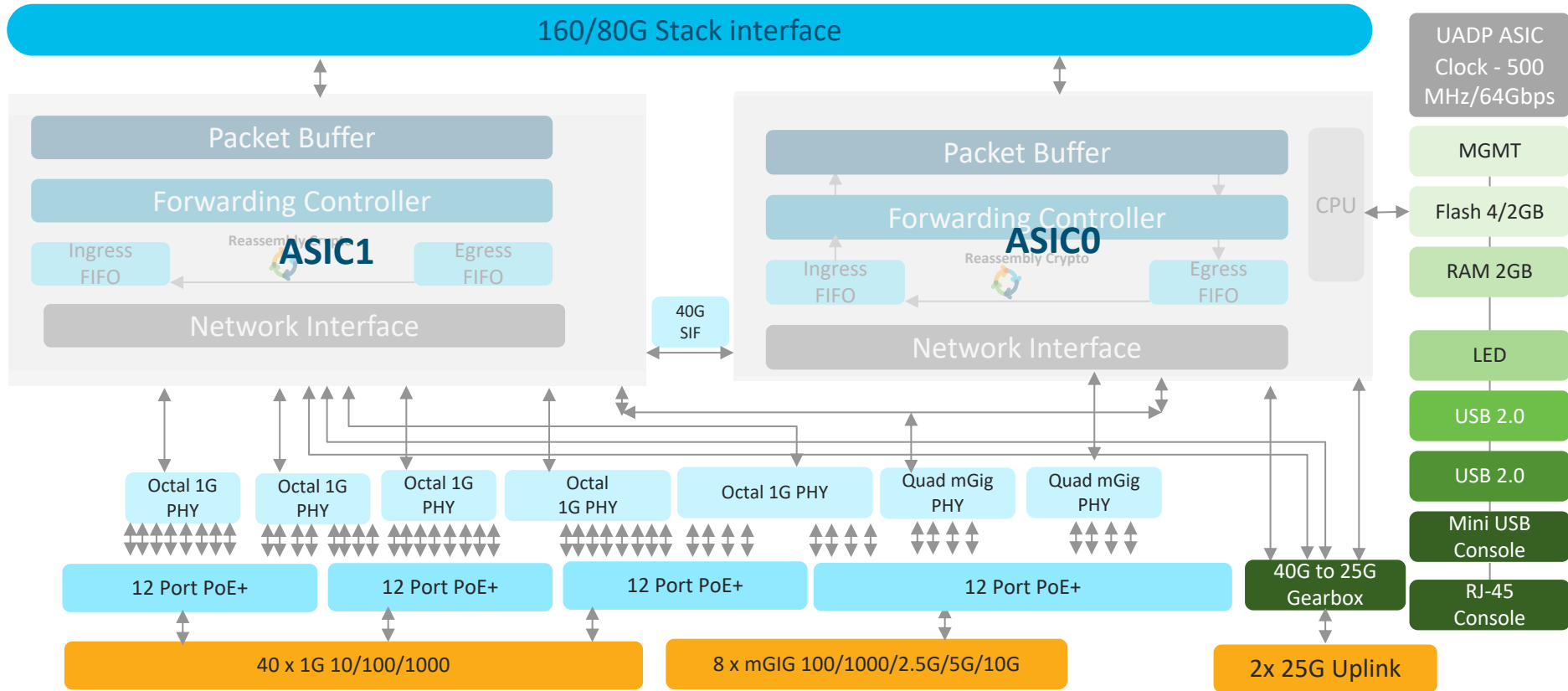
Catalyst 9200L- C9200L-24PXG-4X



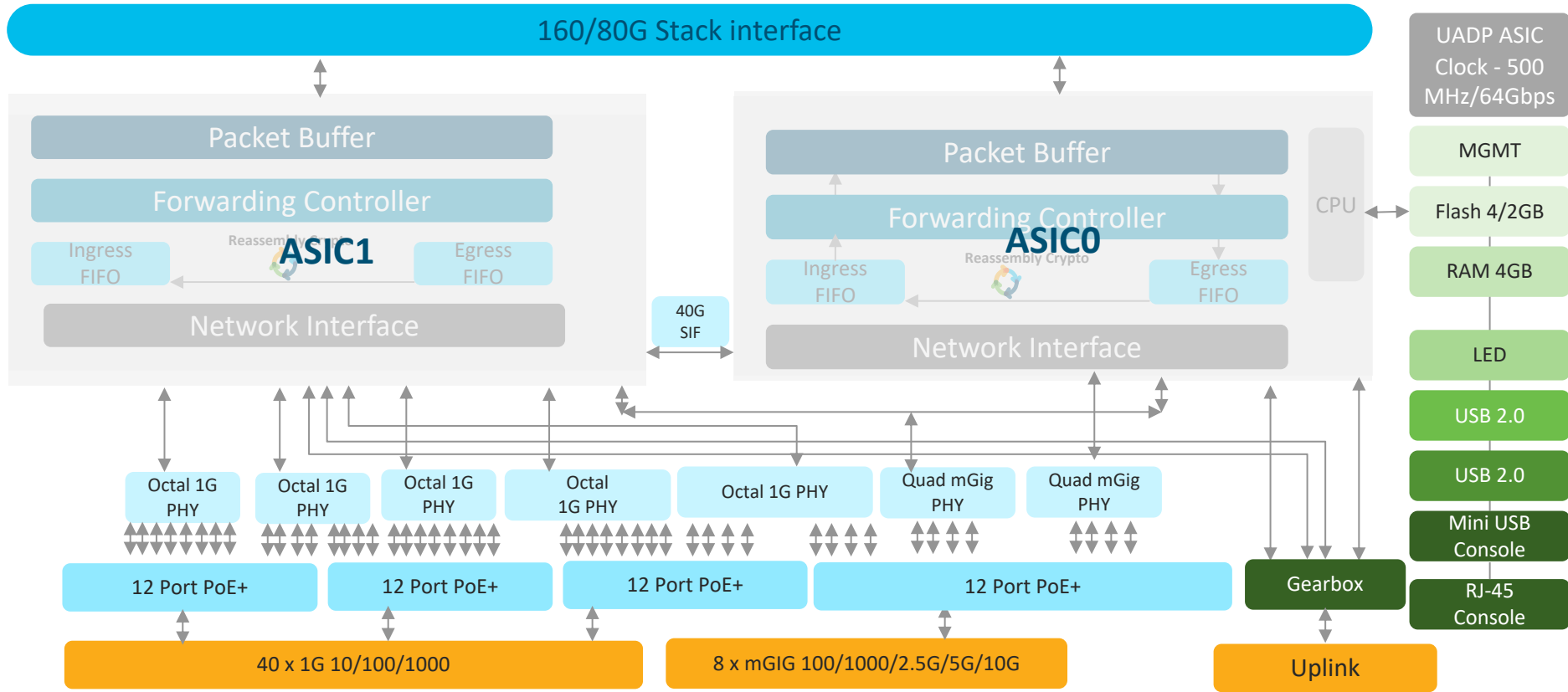
Catalyst 9200L- C9200L-48PXG-4X



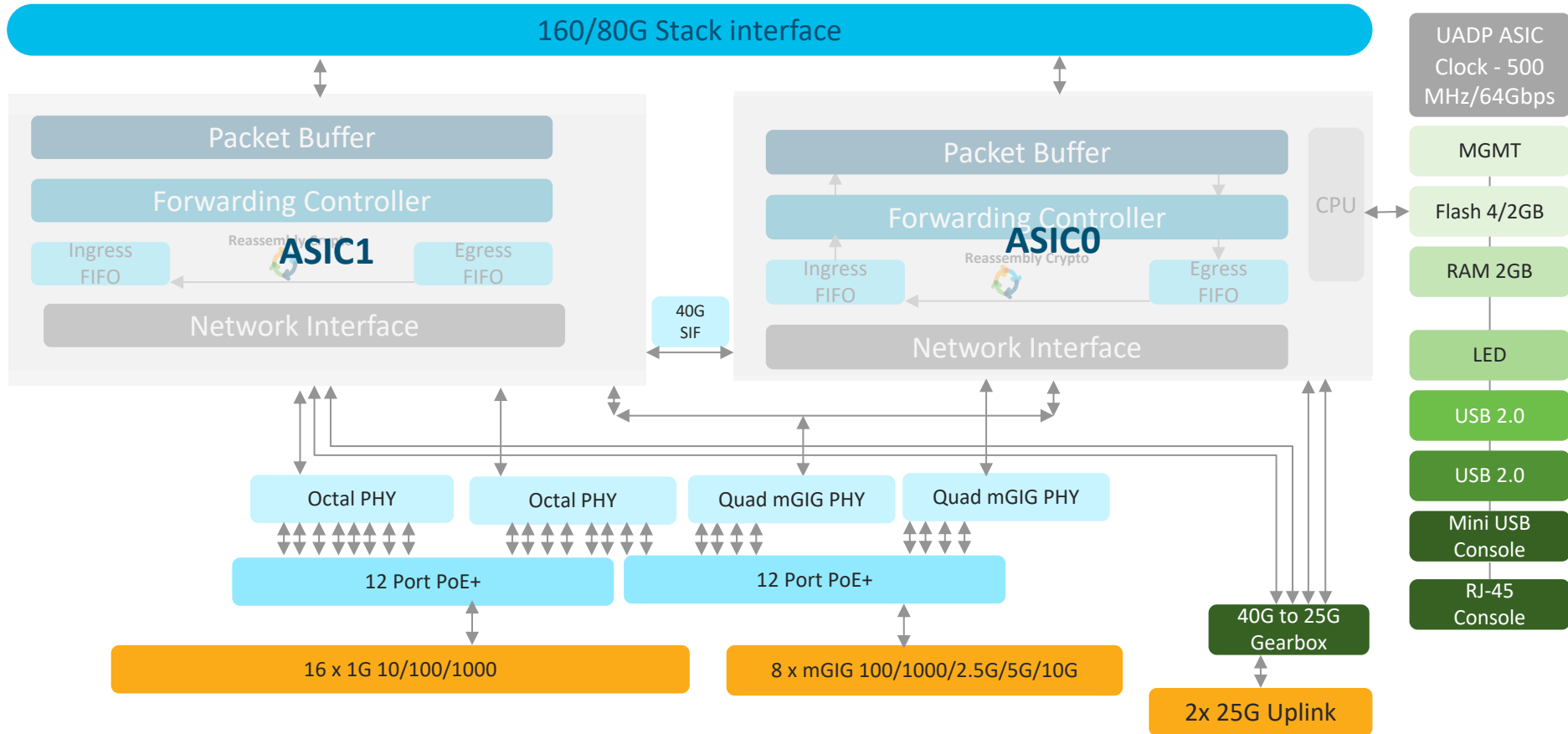
Catalyst 9200L- C9200L-48PXG-2Y



Catalyst 9200- C9200-48PQG



Catalyst 9200L- C9200L-24PXG-2Y



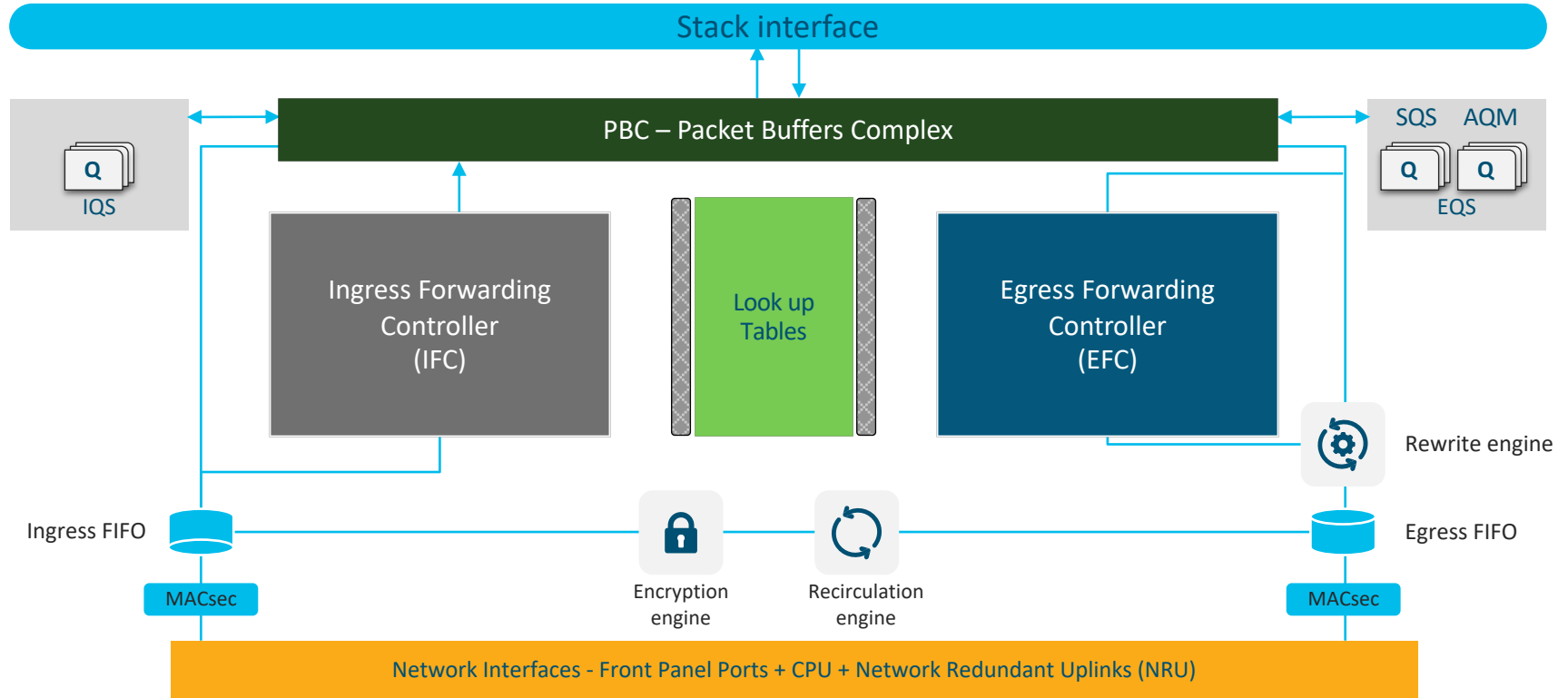
ASIC to port Mapping Catalyst 9200 Series – 24 Port

```
Switch#show platform software fed swi 1 ifm mappings
Interface          IF_ID      Inst asic Core Port SubPort Mac  Cntx LPN  GPN  Type Active
GigabitEthernet1/0/1  0x7        0    0  0   4    0    33   4    1    1    NIF  Y
GigabitEthernet1/0/2  0x8        0    0  0   5    0    7    5    2    2    NIF  Y
GigabitEthernet1/0/3  0x9        0    0  0   6    0    35   6    3    3    NIF  Y
GigabitEthernet1/0/4  0xa        0    0  0   7    0    34   7    4    4    NIF  Y
GigabitEthernet1/0/5  0xb        0    0  0   8    0    37   8    5    5    NIF  Y
GigabitEthernet1/0/6  0xc        0    0  0   9    0    36   9    6    6    NIF  Y
GigabitEthernet1/0/7  0xd        0    0  0  10    0    39  10    7    7    NIF  Y
GigabitEthernet1/0/8  0xe        0    0  0  11    0    38  11    8    8    NIF  Y
GigabitEthernet1/0/9  0xf        0    0  0  12    0    40  12    9    9    NIF  Y
GigabitEthernet1/0/10 0x10       0    0  0  13    0    8    13   10   10   NIF  Y
|
|
GigabitEthernet1/0/20 0x1a       0    0  0  23    0    48  23   20   20   NIF  Y
GigabitEthernet1/0/21 0x1b       0    0  0  24    0    51  24   21   21   NIF  Y
GigabitEthernet1/0/22 0x1c       0    0  0  25    0    50  25   22   22   NIF  Y
GigabitEthernet1/0/23 0x1d       0    0  0  26    0    53  26   23   23   NIF  Y
GigabitEthernet1/0/24 0x1e       0    0  0  27    0    52  27   24   24   NIF  Y
GigabitEthernet1/1/1  0x1f       0    0  0   0    0     0   0   25   25   NIF  N
GigabitEthernet1/1/2  0x20       0    0  0   1    0     1   1   26   26   NIF  N
GigabitEthernet1/1/3  0x21       0    0  0   2    0     2   2   27   27   NIF  N
GigabitEthernet1/1/4  0x22       0    0  0   3    0     3   3   28   28   NIF  N
TenGigabitEthernet1/1/1 0x23       0    0  0   0    0     0   0   29   29   NIF  Y
TenGigabitEthernet1/1/2 0x24       0    0  0   1    0     1   1   30   30   NIF  Y
TenGigabitEthernet1/1/3 0x25       0    0  0   2    0     2   2   31   31   NIF  Y
TenGigabitEthernet1/1/4 0x26       0    0  0   3    0     3   3   32   32   NIF  Y
```

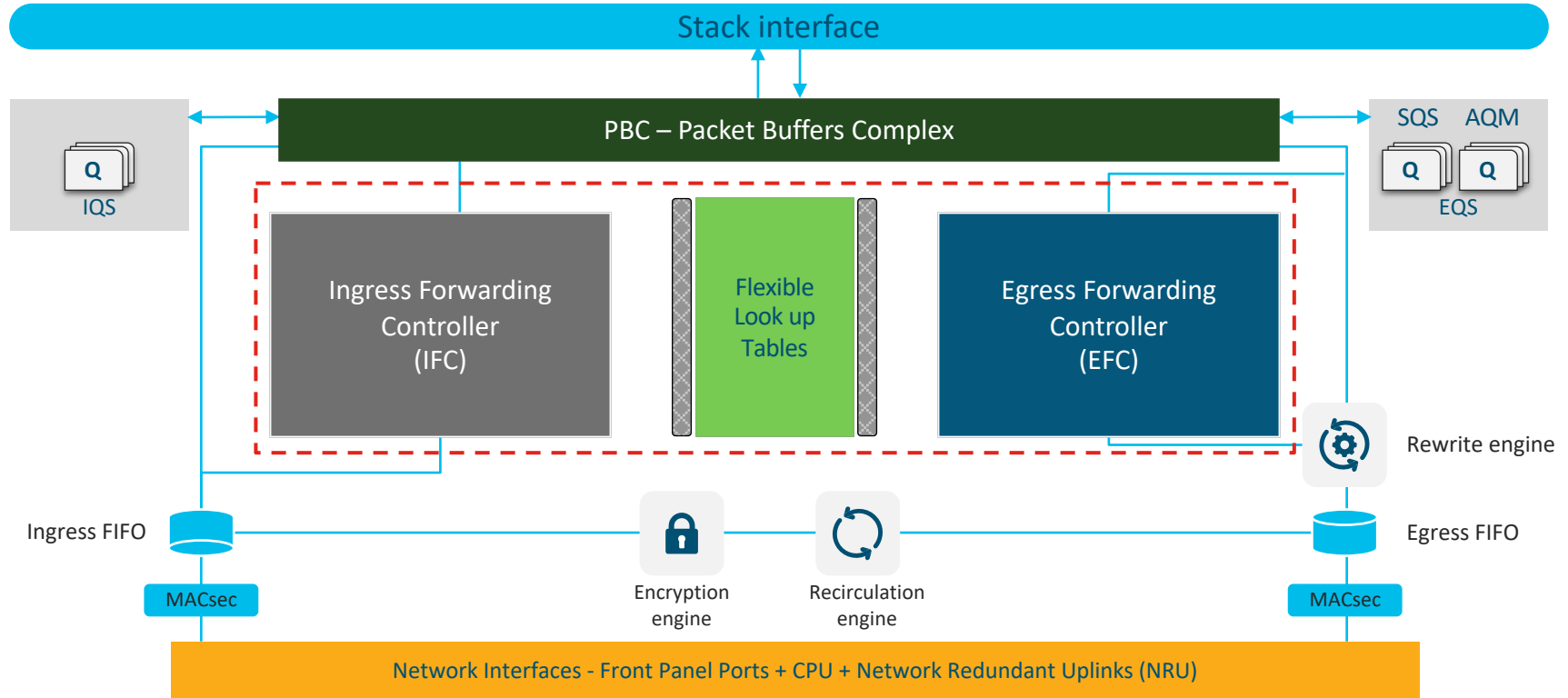
Catalyst 9200-24P

Switch	Ports	Model	SW Version	SW Image	Mode
*1	32	C9200-24P	16.10.1	CAT9K_LITE_IO-SXE	Bundle

UADP 2.0 mini – Core Architecture

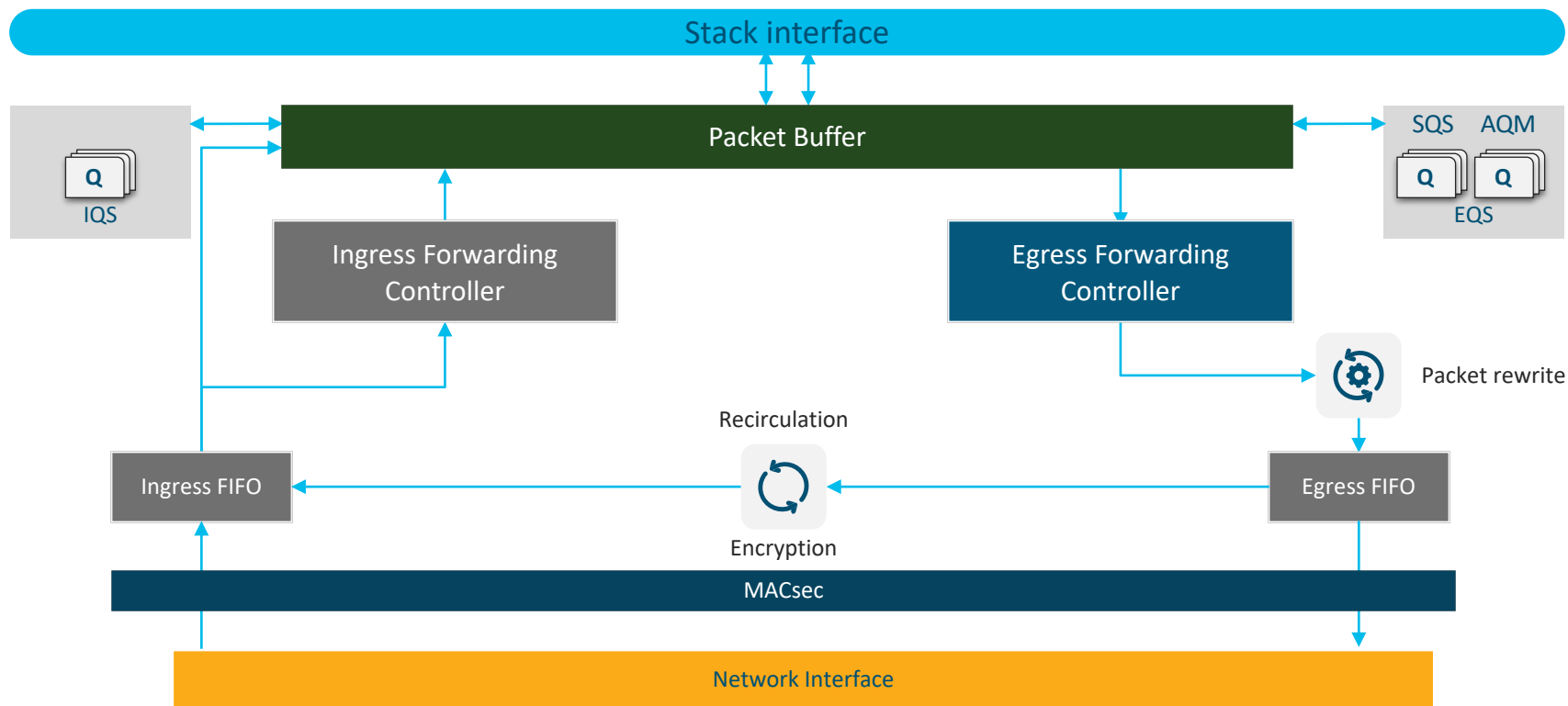


UADP 2.0 mini – Programmable Pipelines



Packet walks

UADP 2.0 mini block diagram



Abbreviations used

iFC

Ingress Forwarding Controller

PBC

Packet Buffer Complex

IQS

Ingress Queues

SIF

Stack Interface

EQS

Egress Queueing and scheduling

eFC

egress Forwarding Controller

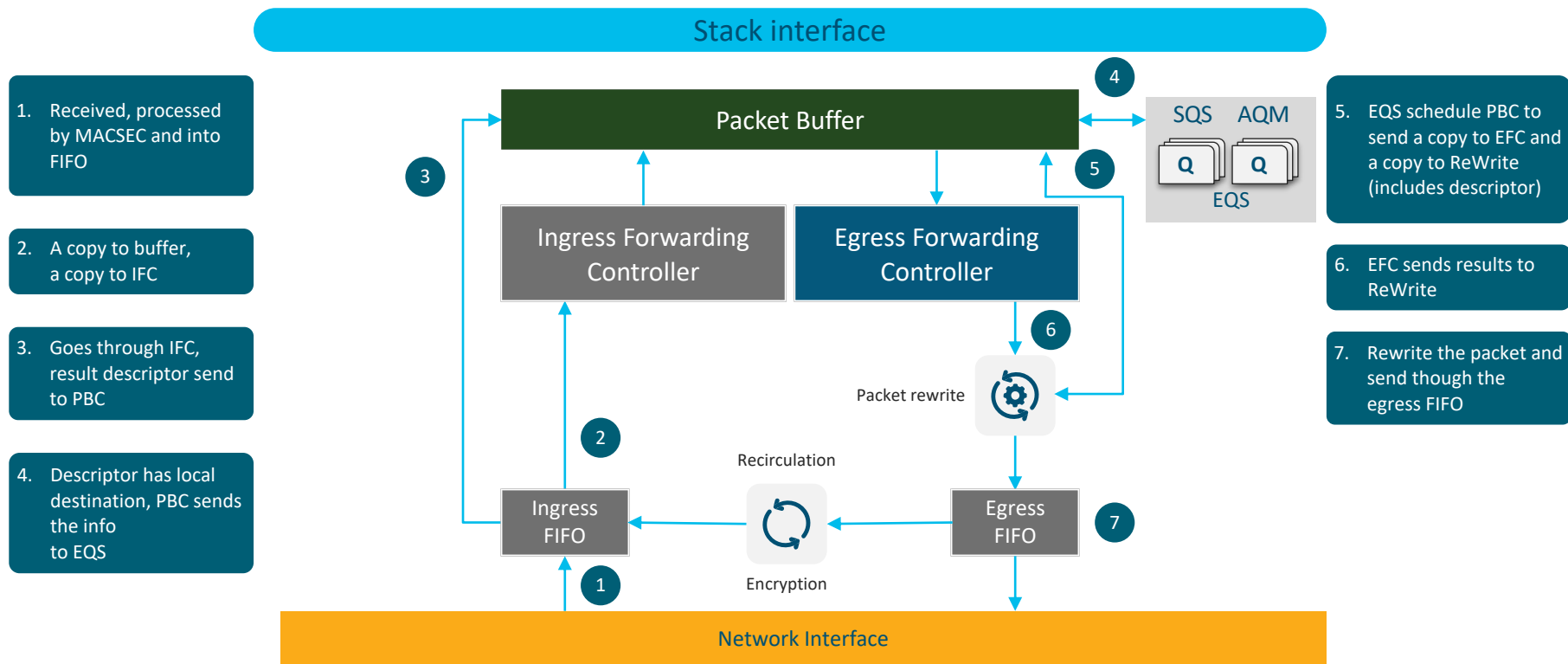
SQS

Stack Queueing and scheduling

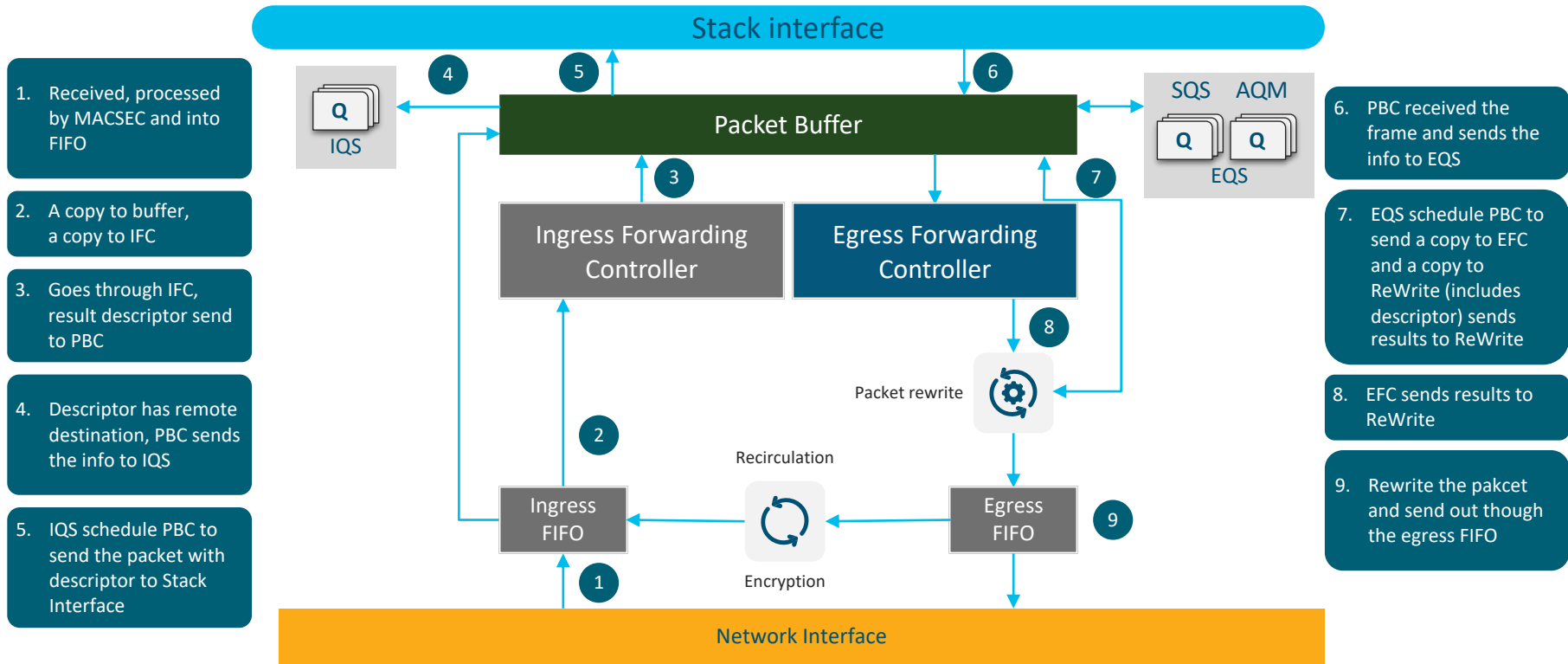
SPQ

Supervisor Packet Queueing

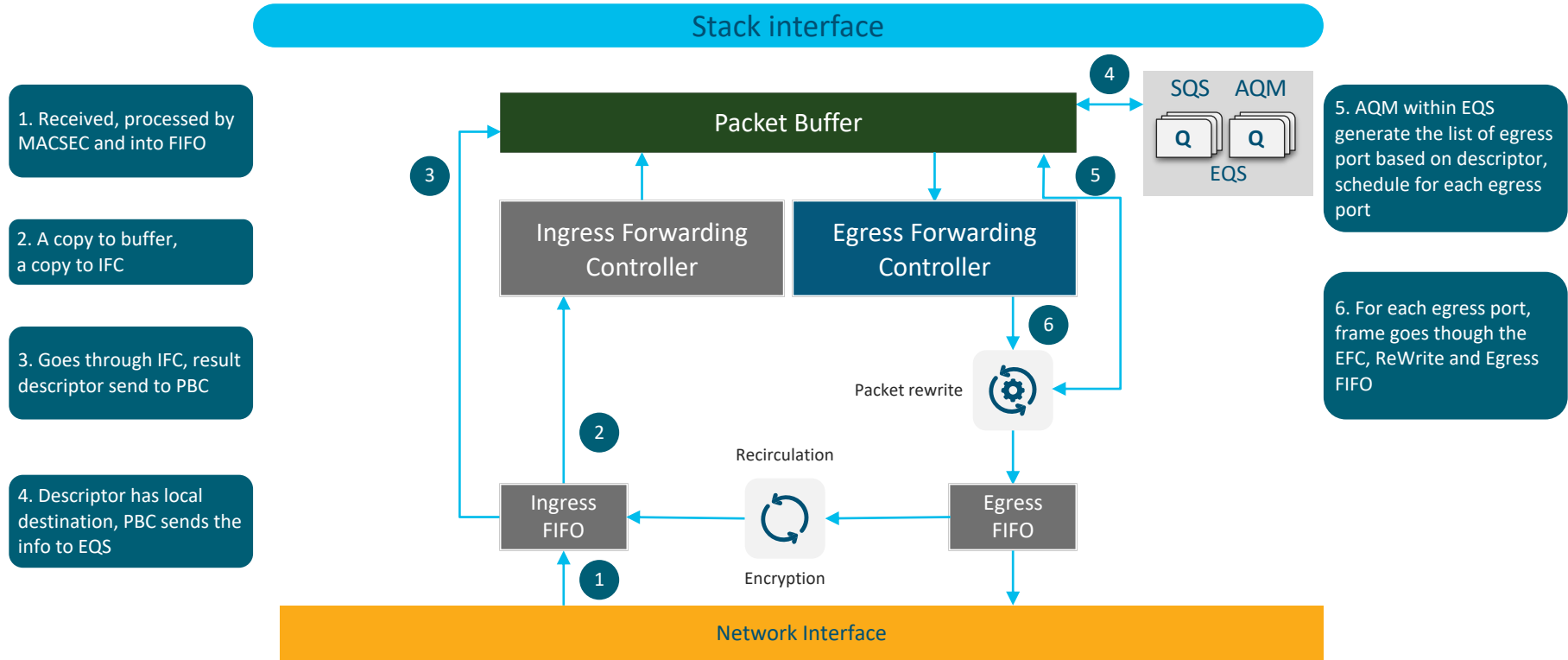
Local Switching: Within the ASIC



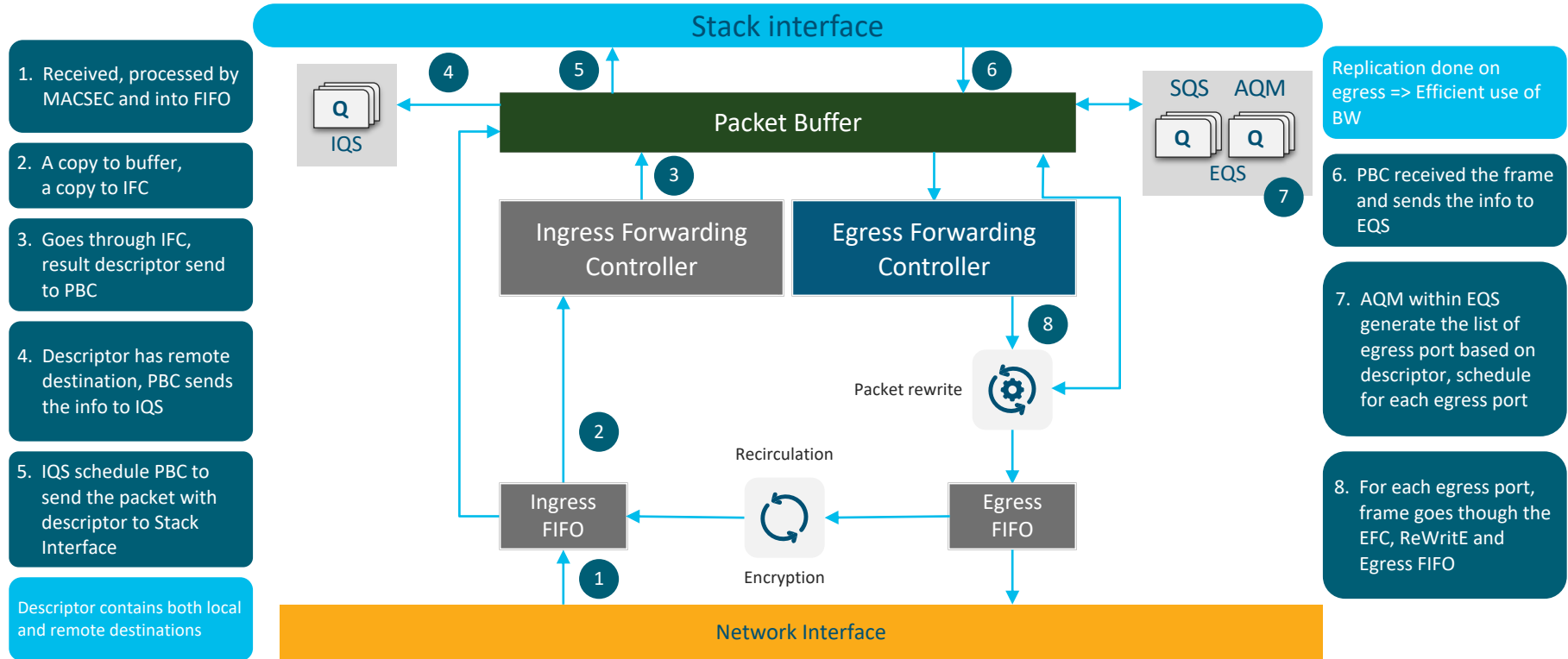
Remote switching: Across ASICs/stack members



Multicast: Egress local



Multicast: Egress remote



TCAMs, buffers and scale

Lookup tables

Forwarding Resources

	9200	9200L
MAC	32k	16k
Host Route	10k	8k
IGMP Groups	1k	1k
Indirect Route	4k	3k
Multicast Route	1k	1k
SGT	2k	2k

Feature Resources

	9200	9200L
Security ACL • PACL • VACL • RACL	1k	1k
QoS ACL	1k	1k
Netflow ACEs	128	128

Netflow

Netflow Entries: 16k per ASIC

Scale and TCAM partition

```
Switch#show platform hardware fed switch active fwd-asic resource tcam utilization 0
```

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

Table	Max Values	Used Values	
Unicast MAC addresses		16384/256	14/21
L3 Multicast entries		1024/256	0/7
L2 Multicast entries		1024	9
Directly or indirectly connected routes		10240/4096	2/19
QoS Access Control Entries		1024	40
Security Access Control Entries		1408	125
Ingress Netflow ACEs		128	8
Policy Based Routing ACEs		512	9
Egress Netflow ACEs		128	8
Flow SPAN ACEs		256	13
Control Plane Entries		512	213
Tunnels	128		17
Lisp Instance Mapping Entries		128	3
SGT_DGT	2048/256	0/1	
CLIENT_LE	2048/64	0/0	
INPUT_GROUP_LE		1024	0
OUTPUT_GROUP_LE		1024	0
Macsec SPD		128	2

Packet buffers

Ingress Buffers

For ingress queues and scheduler (IQS) (dedicated and shared)

Egress Stack Buffers

For egress Stack Queues and Scheduler (SQS) (dedicated and shared)

Egress Port Buffers

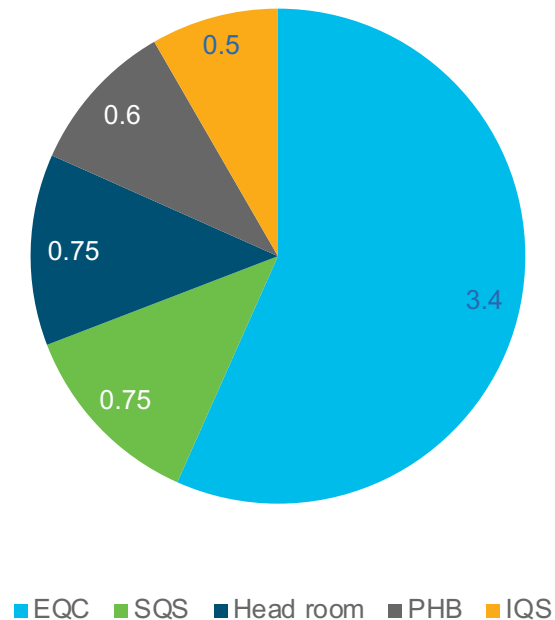
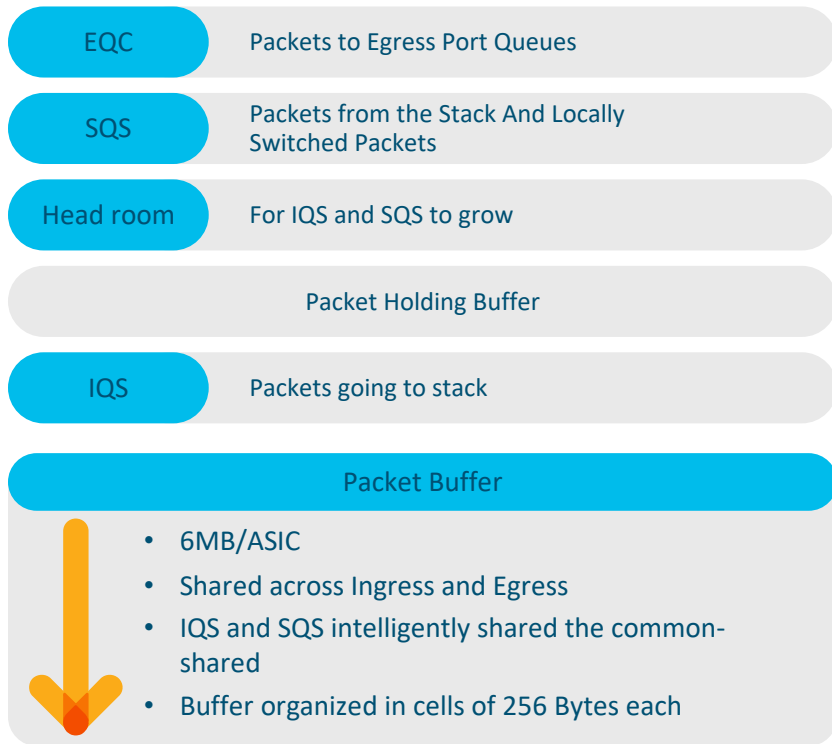
For egress port queues (AQM)

Temporary Buffers

For packet from the Stack or CPU

Allocation: Dedicated buffers are used first

6MB packet buffer per ASIC

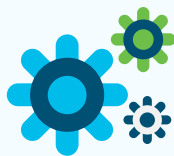


QoS scalability

QoS Scale Numbers	
Class-maps (Ingress)	1,024
Class-maps (egress)	512
Table-maps (ingress)	16
Table-maps (egress)	16
Aggregate Policers	1k
Wired Queues/port	8 queues
Buffer/ASIC	6 MB

Cisco IOS XE Lite

Cisco IOS XE



Single Release

Feature Consistency
Run Any Feature Anywhere
(RAFA)



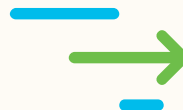
Simplicity

Plug-n-Play
Enhanced Web UI
Simplified Lifecycle
Management



Operational Efficiency

Faster Troubleshooting
Modularized Upgrades
Support Install and Bundle
Modes for bootup



Cisco IOS XE

Same Cisco IOS XE code base as
Catalyst
9000 family

Cisco IOS XE Lite: Powering the Catalyst 9200 Series switches

Optimized for Catalyst 9200 Series switches



Same image across all Catalyst 9200 Series switches



Consistent

- Same code base of Cisco IOS XE



Optimized

- Removed unused libraries
- IOSd optimizations
- Bash Optimizations



Light

- Optimized for lower memory on Catalyst 9200 Series switches
- Reduced image size by 50%



Modern

- Model-driven programmability
- Streaming telemetry
- Network monitoring

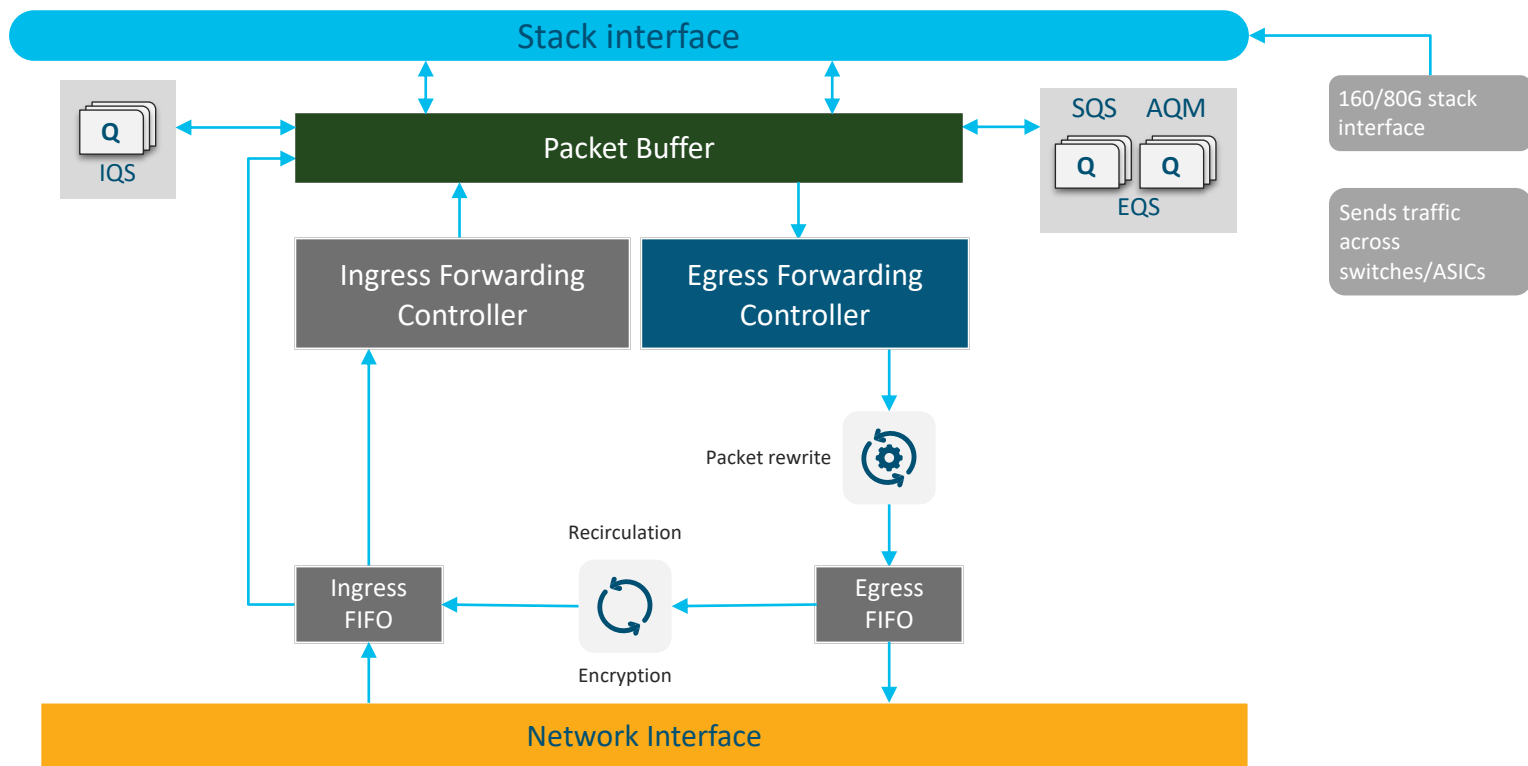


Highly available

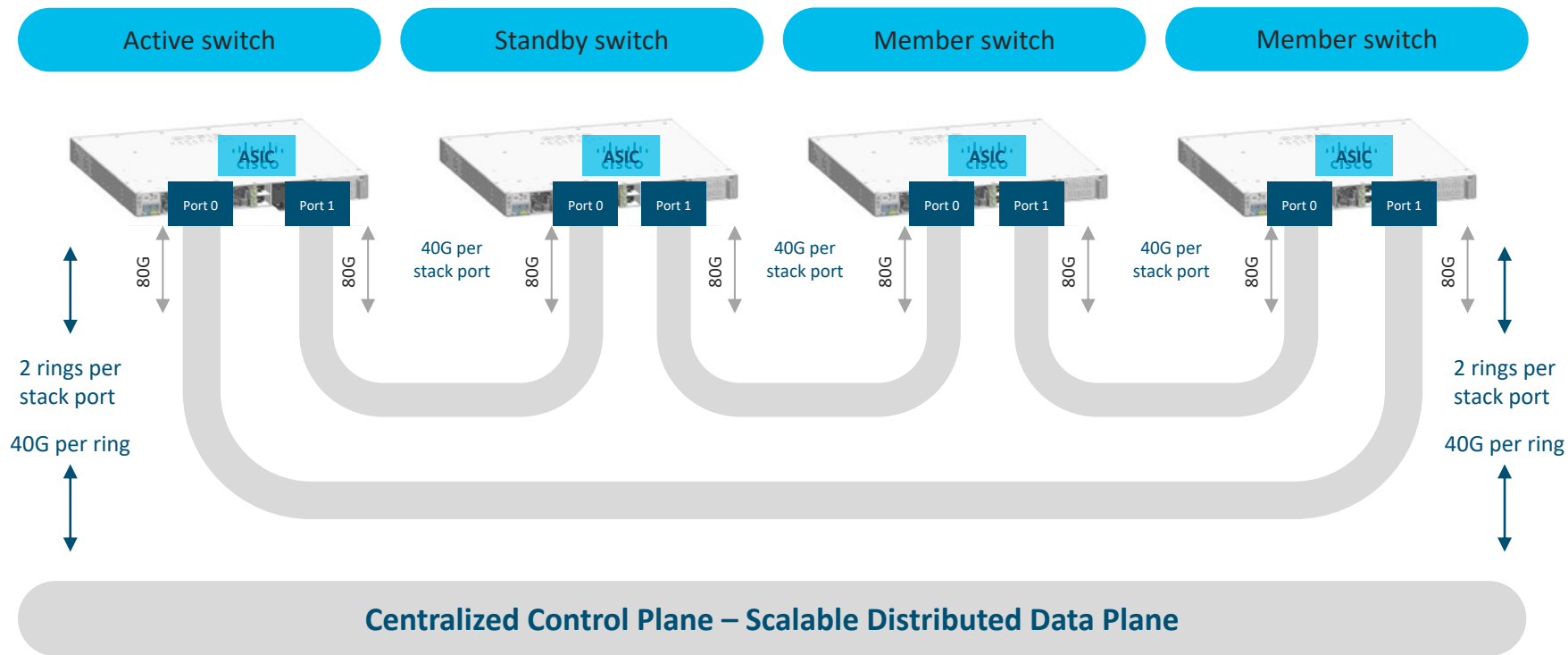
- Modularized feature block
- Status Recovery
- Failure Isolation

High availability

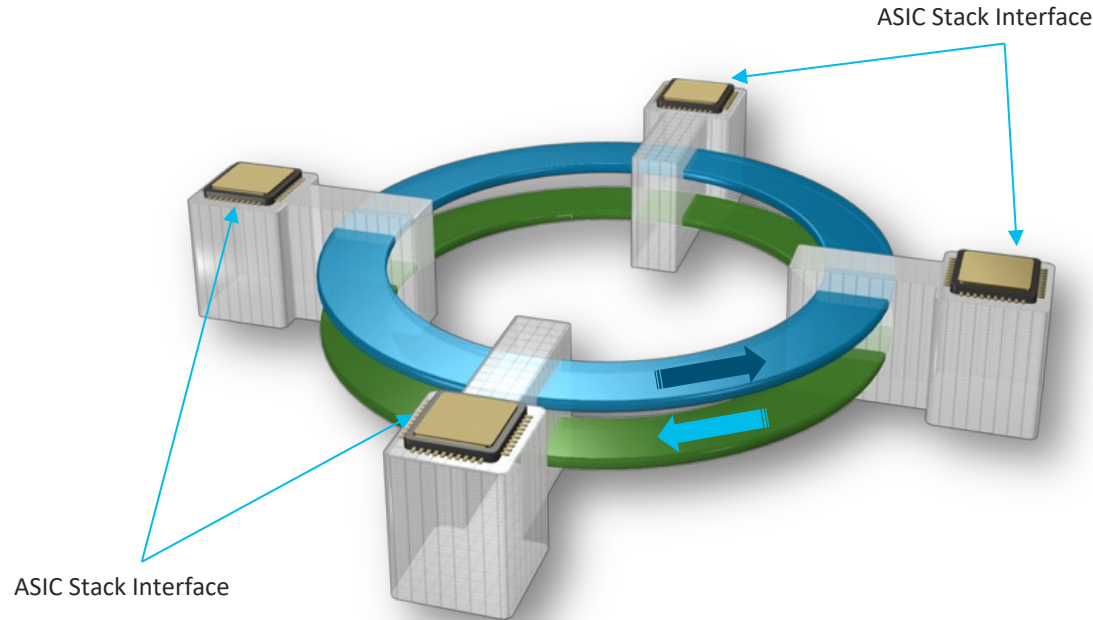
Stacking Architecture



StackWise-160



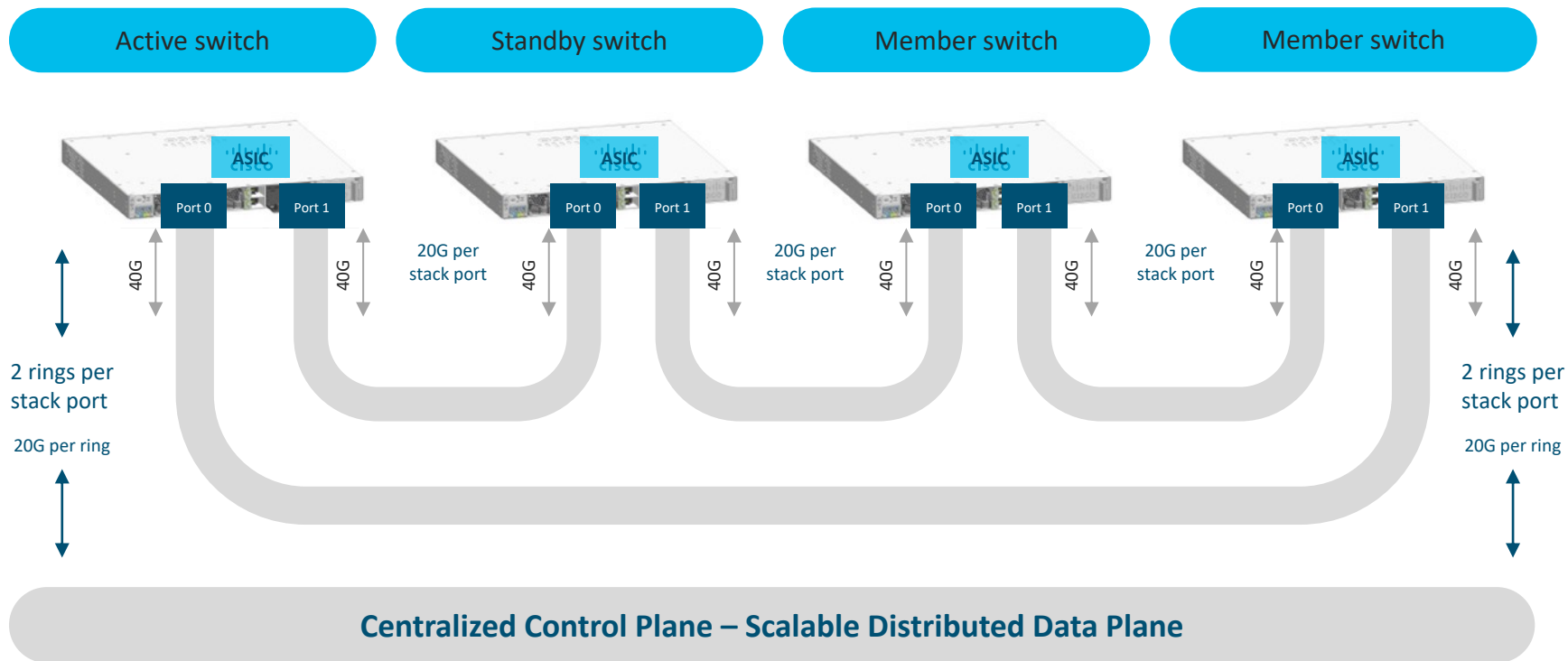
The stack ring – StackWise 160



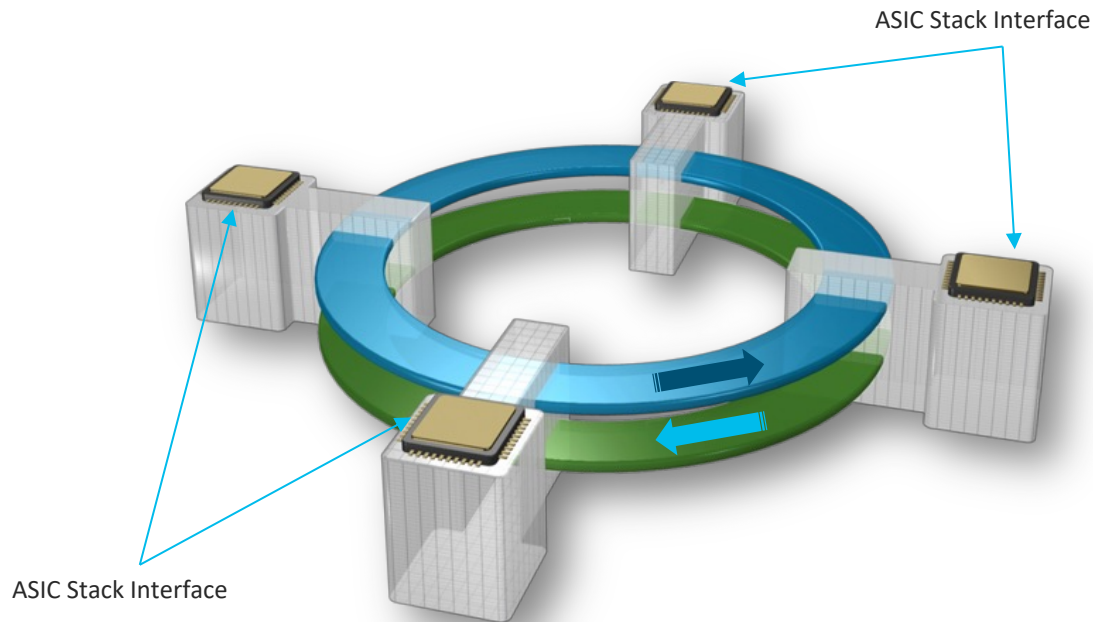
- 2 rings in total
- 1 ring goes East
- 1 ring goes West
- Each ring is 40 Gbps
- 80 Gbps bi-direction
- Spatial Reuse= 160 Gbps

Assuming 4 x 24-port Catalyst 9200 Series modular switches

StackWise-80



The stack ring – StackWise-80



- 2 rings in total
- 1 ring goes East
- 1 ring goes West
- Each ring is 20 Gbps
- 40 Gbps bi-direction
- Spatial Reuse= 80 Gbps

Assuming 4 x 24-port Catalyst 9200 Series fixed switches

Stateful switchover in StackWise



Hardware Redundancy

Ability to stack multiple switches through stack cables

Stackwise-160 and Stackwise-80

Use stateful switchover to provide resiliency within the stack

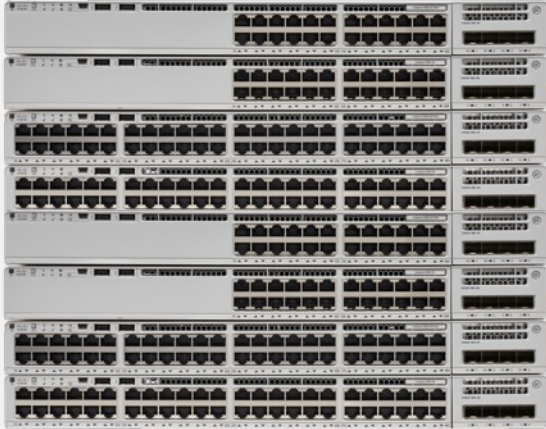
How?

The active switch creates and updates all the switching, routing information and constantly synchronizes that information with the standby switch

Stateful Switchover

If the active switch fails, the standby switch assumes the role of the active switch and continues to keep the stack operational

How many can I stack together?



Up to 8 switches can be stacked using back stacking cables



All Catalyst 9200 Series switching models support stacking however mixed stacking not supported, including Catalyst 2960X/XR and Catalyst 9300 Series

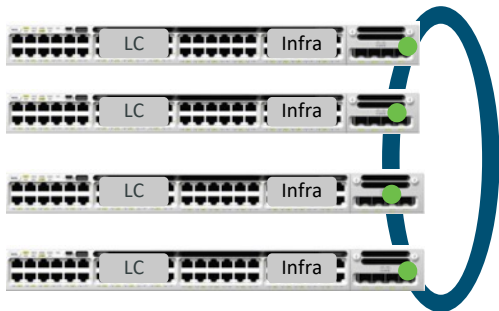


Same Cisco IOS XE and license required on all members

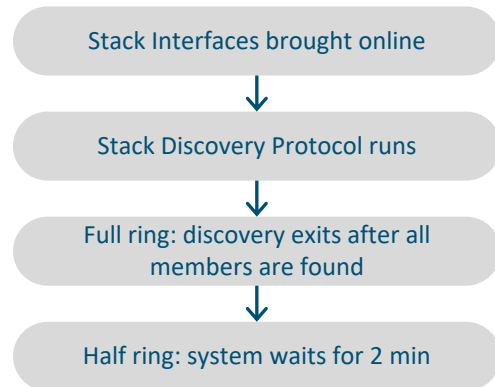
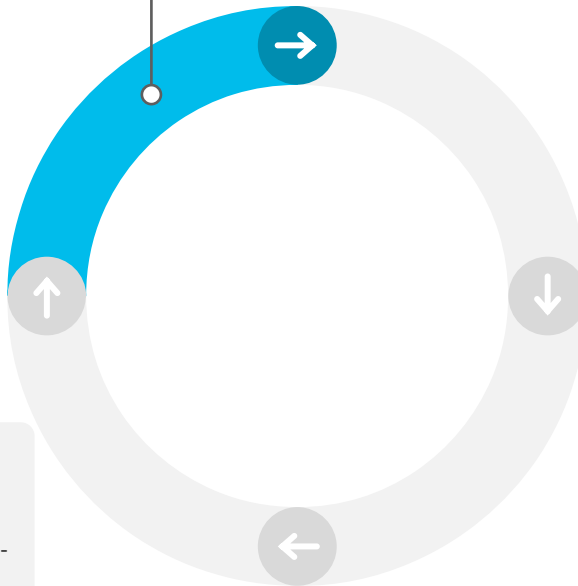
Stacking process – Stack discovery

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

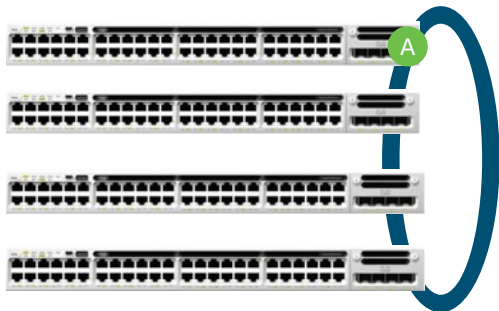


Switch number is 3
%IOSXE-1-PLATFORM: process stack-mgr:
%STACKMGR-1-DISC_DONE: **Switch 3 has finished stack discovery.**
%IOSXE-1-PLATFORM: process stack-mgr:
%STACKMGR-1-SWITCH_ADDED: **Switch 3 has been added to the stack.**

Stacking process – Stack active election

Stack Discovery

- Broadcast, followed by neighborcast



Stack Active Election

- Lowest MAC address



The switch which has the highest user configurable priority 1–15

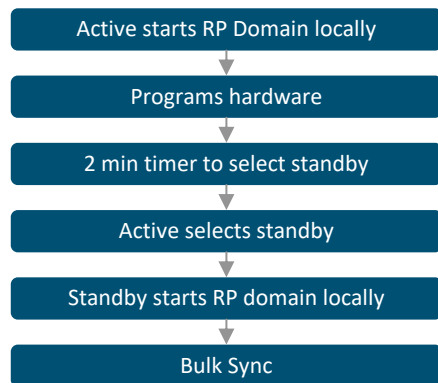
The stack whose member has the lowest MAC address

```
%IOSXE-1-PLATFORM: process stack-mgr: %STACKMGR-1-ACTIVE_ELECTED: Switch 3 has been elected ACTIVE.
```

Stacking process – Stack initialization

Stack Discovery

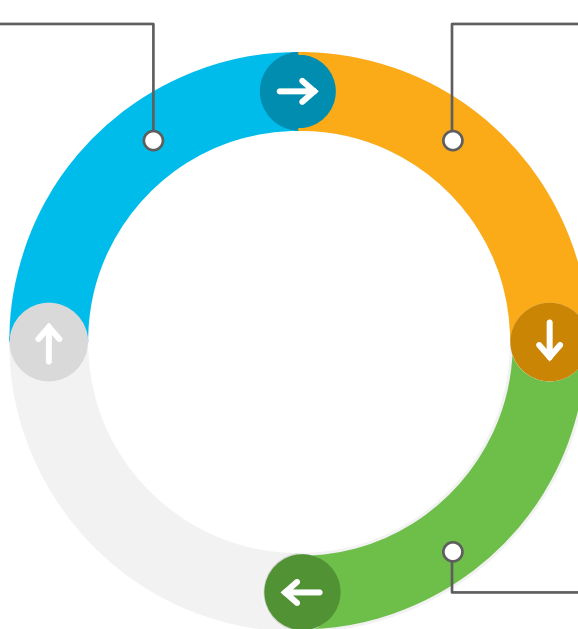
- Broadcast, followed by neighborcast



GUIDELINE#show switch
Switch/Stack Mac Address: 2037.0652.a580 - Local Mac Address
Mac persistency wait time: Indefinite
H/W Current

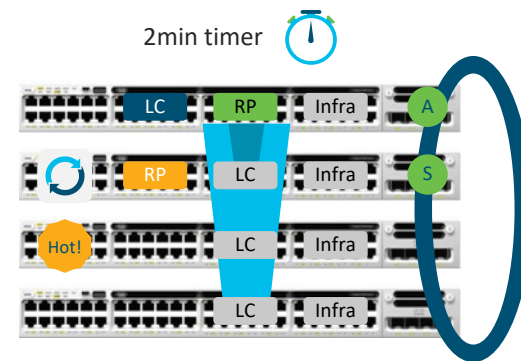
Switch# Role Mac Address Priority Version State

1	Member	2037.0653.ca80	5	P6A	Ready
2	Standby	2037.0653.db00	10	P6A	Ready
*3	Active	2037.0652.a580	15	V01	Ready



Stack Active Election

- Lowest MAC address

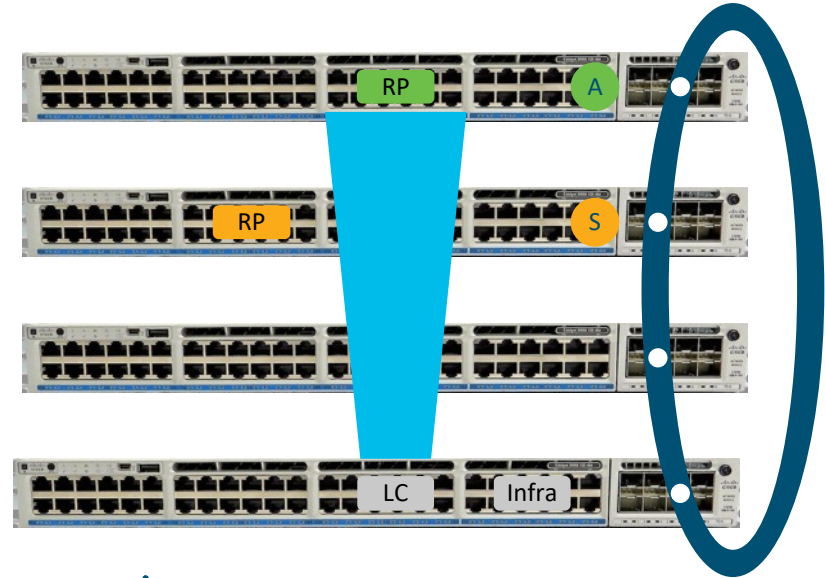


Stack initialization

- Active starts RP domain

Stack member addition – Software upgrade

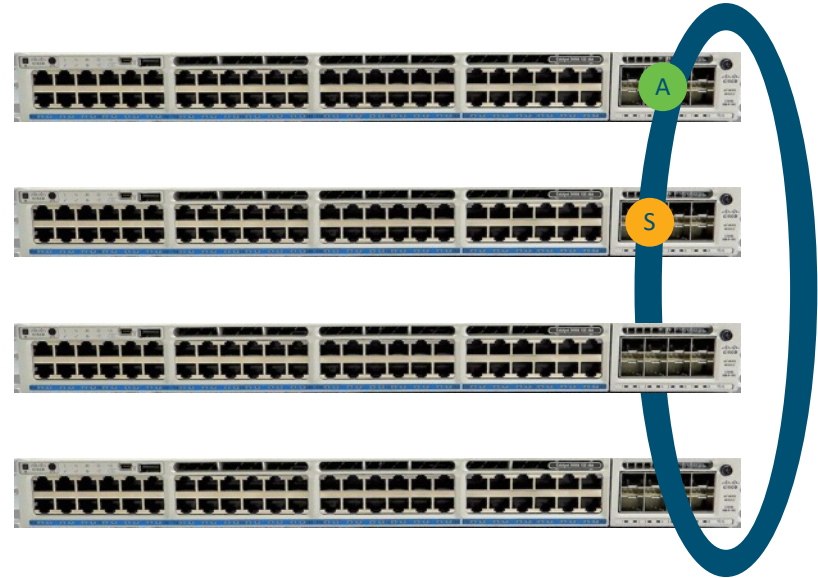
- Common Cisco IOS XE on all stack members
- Stack member with version mis-match with ACTIVE switch will fail to RPR mode
- Enable “software auto-upgrade enable”
- System must boot in install mode (default and recommended)



Auto Upgrade

Stack member deletion

- Stack discovery initiated and completed
- Active detects member removal – and Clean up process is initiated
- Clean-up involves removing TCAM entries referencing removed member, MAC addresses, CDP tables – more like all ports on the member are shutdown
- Configuration is moved to Pre-Provisioned state



Stacking process – Stack member addition

Stack Discovery

- Broadcast, followed by neighborcast

Stack discovery initiated



Complete full ring



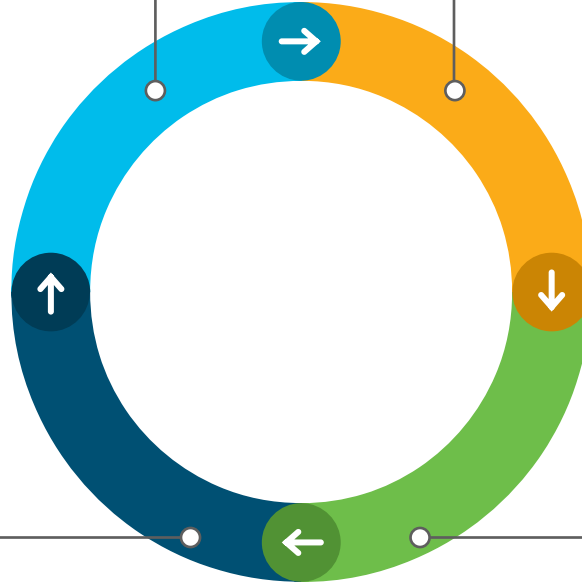
Active detects the new addition



Active is not pre-empted by High priority member

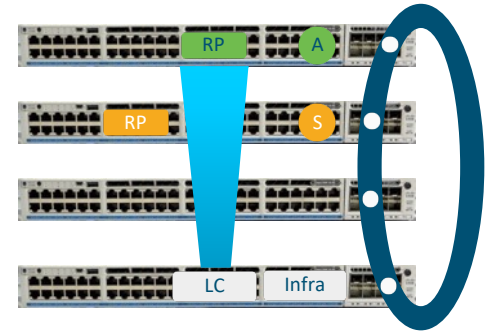
Stack member addition

- Stack discovery initiated



Stack Active Election

- Lowest MAC address



Stack Initialization

- Active starts RP domain

Fans in Redundant Mode



Thermal Sensors

Detect ambient temperature and adjust fan speeds

Can operate with individual fan failure

Up to 45 ° C ambient temperature, no need to RMA the box

Hot Swappable

Insert and Remove Fan on go

Front-to-back airflow

Irreversible flow

Redundant power supply

Field-replaceable power supplies for Resilient Switching and PoE



Non-stop power in 1 RU

Optional power
redundancy with dual
supplies

Hot Swappable

Insert and Remove PS
on go

Easy field replacement

of failed PSU

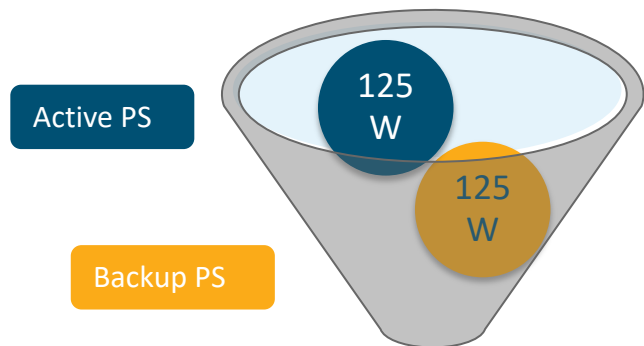
Redundancy in combined mode

PoE budget gets
doubled with second
PS

Power supply modes

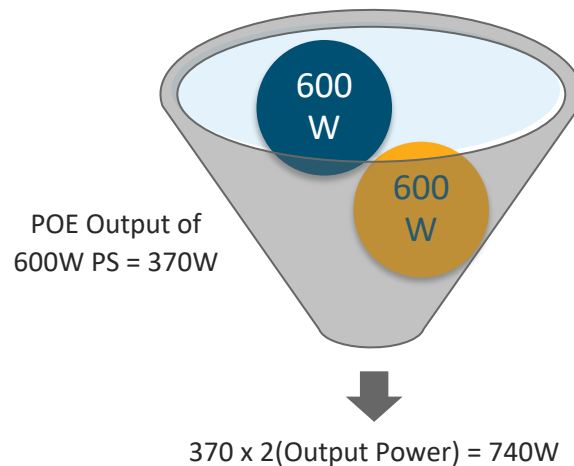
Non-POE SKUs

- First power supply is used for system power
- Second power supply is in redundant mode
- No Load sharing between the power supplies



POE+ SKUs

- Combined mode by default
- Both the power supplies will add to POE Budget
- System Power is redundant



Power priority

In case of power shortage

Higher priority ports get preference for power



Higher power priority ports

Whichever PD negotiates power faster

By default power priority is **low**

```
C9200-1(config)#int gi1/0/1
C9200-1(config-if)#power inline port prio
C9200-1(config-if)#power inline port priority?
    high high priority port
    low low priority port
C9200-1(config-if)#power inline port priority high
C9200-1(config-if)#
```

```
C9200-1#show power inline priority
Interface Admin Oper   Admin
           State State  Priority
-----
Gi1/0/1   auto  off   high
Gi1/0/2   auto  off   low
```

POE Budget of all Catalyst 9200 Series switching SKUs

PID	Power Supply	Available PoE Budget with One PS	Available PoE Budget with Two PS
C9200-24P	600W	370W	740W
C9200-24PXG	600W	370W	740W
C9200-24PB	600W	370W	740W
C9200-48P	1000W	740W	1440W
C9200-48PXG	1000W	740W	1440W
C9200-48PB	1000W	740W	1440W
C9200L-24PXG-2Y	600W	370W	740W
C9200L-24PXG-4X	600W	370W	740W
C9200L-24P-4G	600W	370W	740W
C9200L-24P-4X	600W	370W	740W
C9200L-48PXG-2Y	1000W	740W	1440W
C9200L-48PXG-4X	1000W	740W	1440W
C9200L-48P-4G	1000W	740W	1440W
C9200L-48P-4X	1000W	740W	1440W

Redundant Power Supply should be identical

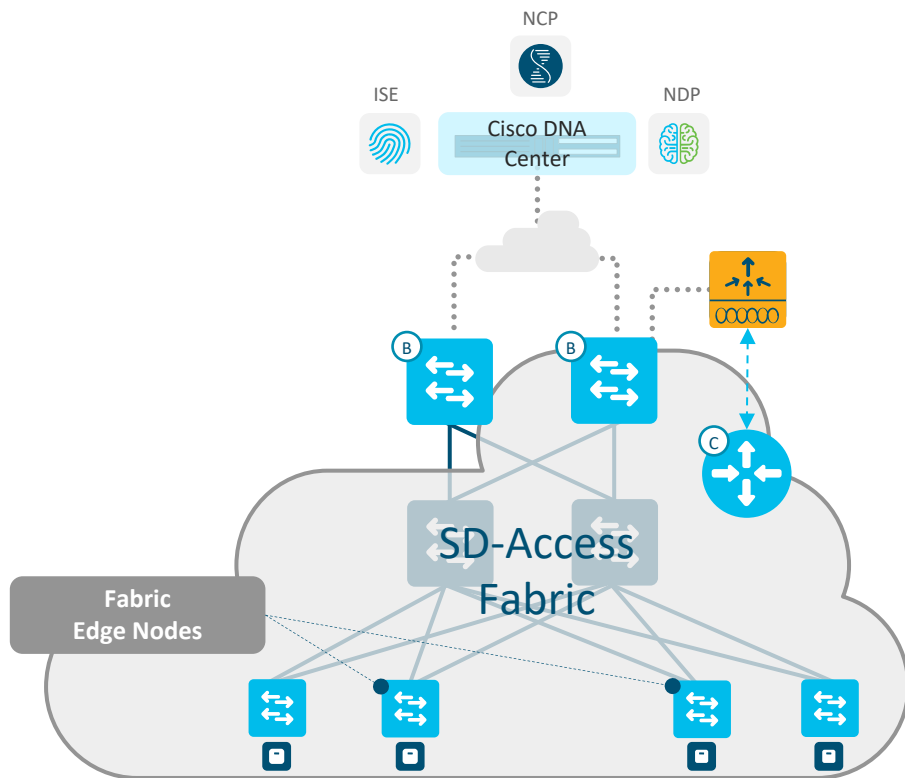
POE Budget of all Catalyst 9200 Series switching SKUs - 715WDC

PID	Power Supply	Available PoE Budget with One PS	Available PoE Budget with Two PS
C9200-24P	715W DC	485W	740W
C9200-24PXG	715W DC	485W	740W
C9200-24PB	715W DC	485W	740W
C9200-48P	7715W DC	485W	970W
C9200-48PXG	715W DC	485W	970W
C9200-48PB	715W DC	485W	970W
C9200L-24PXG-2Y	715W DC	485W	740W
C9200L-24PXG-4X	715W DC	485W	740W
C9200L-24P-4G	715W DC	485W	740W
C9200L-24P-4X	715W DC	485W	740W
C9200L-48PXG-2Y	715W DC	485W	970W
C9200L-48PXG-4X	715W DC	485W	970W
C9200L-48P-4G	715W DC	485W	970W
C9200L-48P-4X	715W DC	485W	970W

Redundant Power Supply should be identical

Intent-based networking

Fabric Edge Node for SD-Access



Fabric Edge Nodes – A fabric device that connects wired endpoints to the SD-Access Fabric

Provides first-hop services for Users/Devices connected to a fabric

Supports:

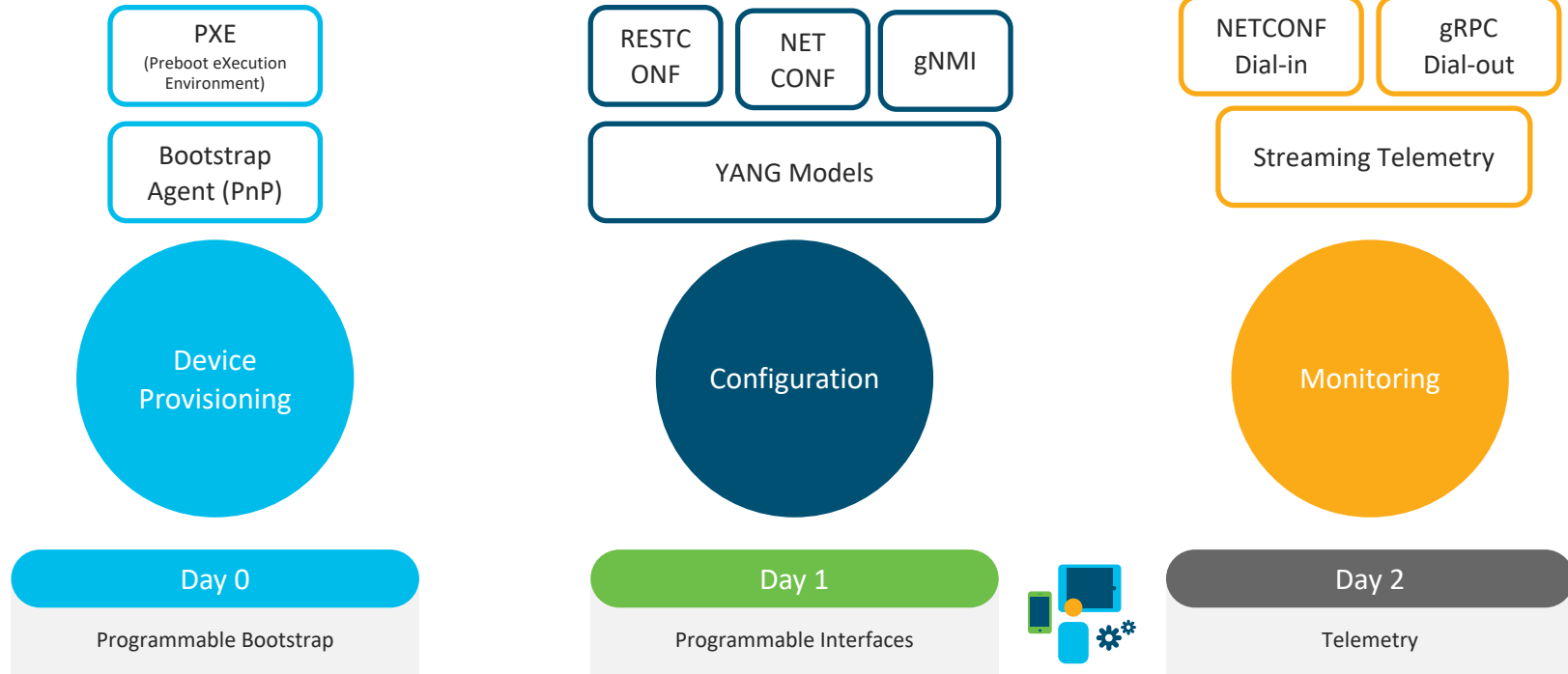
- LISP
- VxLAN

Scale:



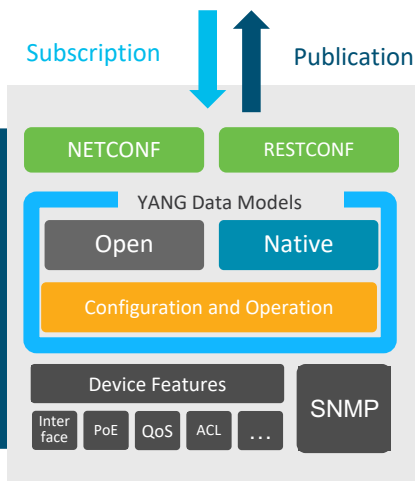
	9200-PB SKUs	9200 SKUs	9200-L SKUs
Number of User VRFs	32	4	1

Programmability and automation



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

Patching

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 a SMU will require a system reload in the first release. It is traffic impacting.



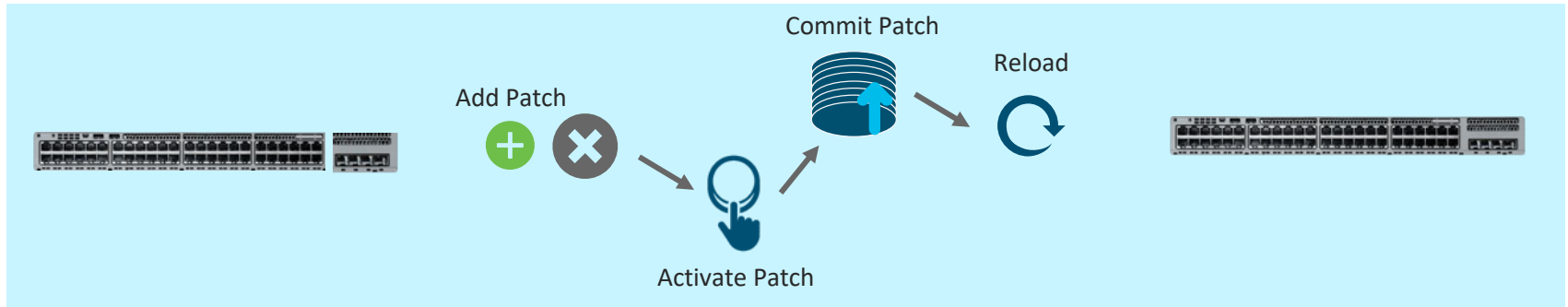
Install Add



Install Activate



Install Commit



QoS

Key differences – Catalyst 9200 Series switches vs Catalyst 2960X/XR Series switches

Catalyst 9200 Series switches



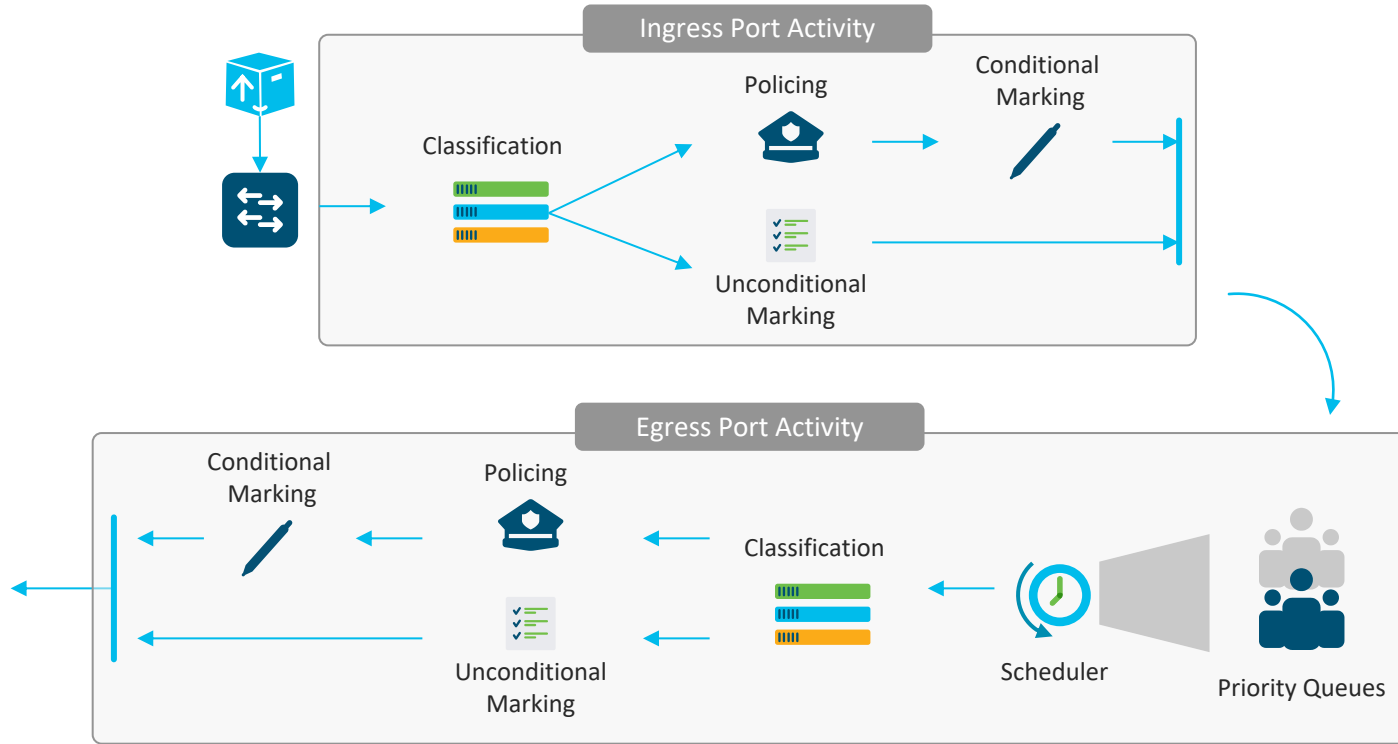
- MQC
- Trust by Default
- 8 Queues per Port
- 6 MB Buffer per ASIC
- HQoS – 2 Level Hierarchical Policy

Catalyst 2960X/XR Series switches

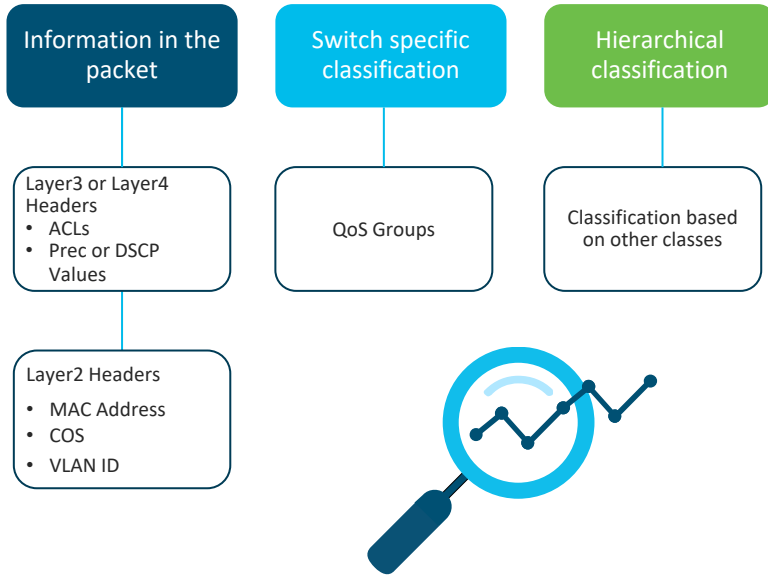


- MLS QoS
- Untrust by Default
- 4 Queues per Port
- 4 MB Buffer per ASIC
- No HQoS

QoS Activities on Ingress and Egress



Packet classification



A class-map can be defined as a logical OR only, i.e. “match-any” “match-all” is also supported on Catalyst 9000 switches (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



Conditional
Policer
based marking



Unconditional
Explicit marking



Table Map
based marking

Marking with 'set'
Marking with Table Maps

Catalyst9200-L(config-pmap-c)#set ?

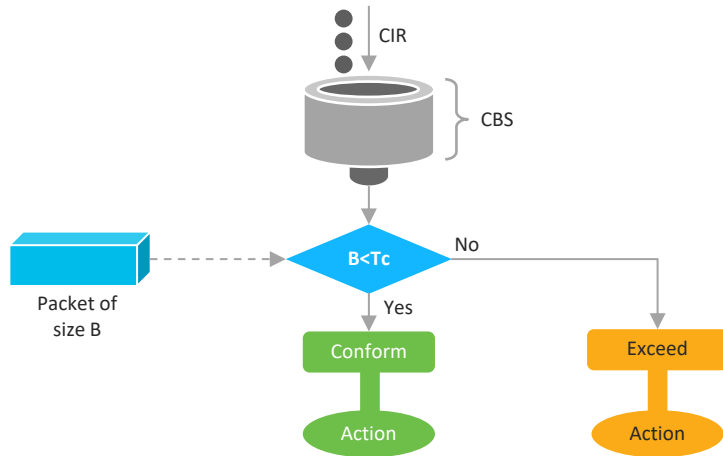
cos Set IEEE 802.1Q/ISL class of service/user priority
dscp Set DSCP in IP(v4) and IPv6 packets
ip Set IP specific values
precedence Set precedence in IP(v4) and IPv6 packets
qos-group Set QoS Group
wlan Set WLAN

```
[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
```

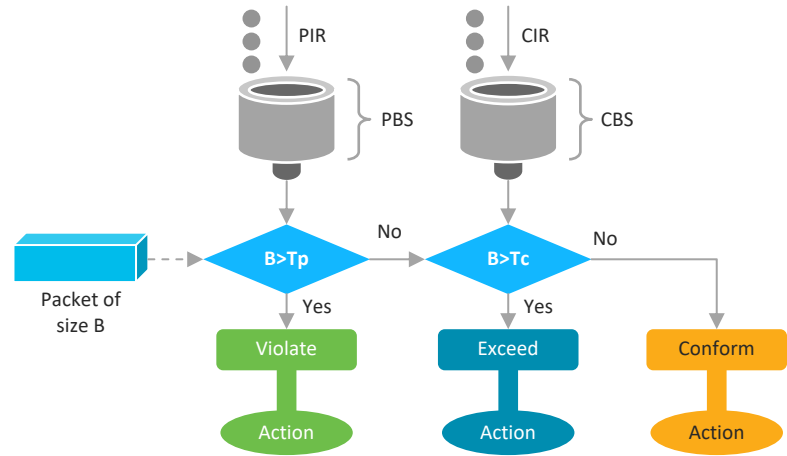
```
table-map COS2DSCP
map from 5 to 46
default copy
```

Policing

1 rate 2 color



2 rate 3 color



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

```
police cir percent 10 pir percent 50 conform-action transmit exceed-  
action set-dscp-transmit af11 violate-action drop
```

Security

**Security Features
on Catalyst 9200
Series switches**



- **IEEE 802.1x**
- **MACsec-128**
- **Trustworthy solutions**
- **IPV6 First hop security**

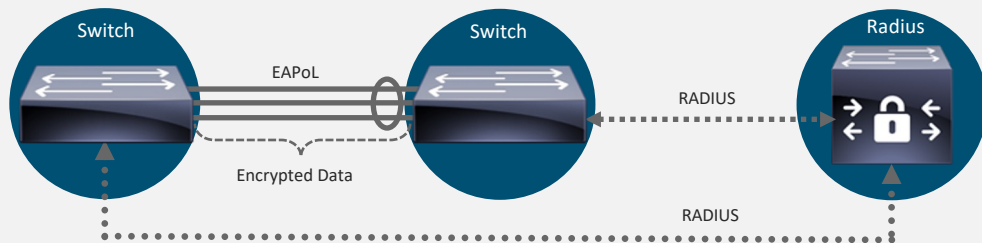
MACsec-128

Securing the network via link encryption

MACsec encryption performed at hardware

Switch to Switch (can be any front panel port or Network Module ports) but usually uses the network module uplink ports

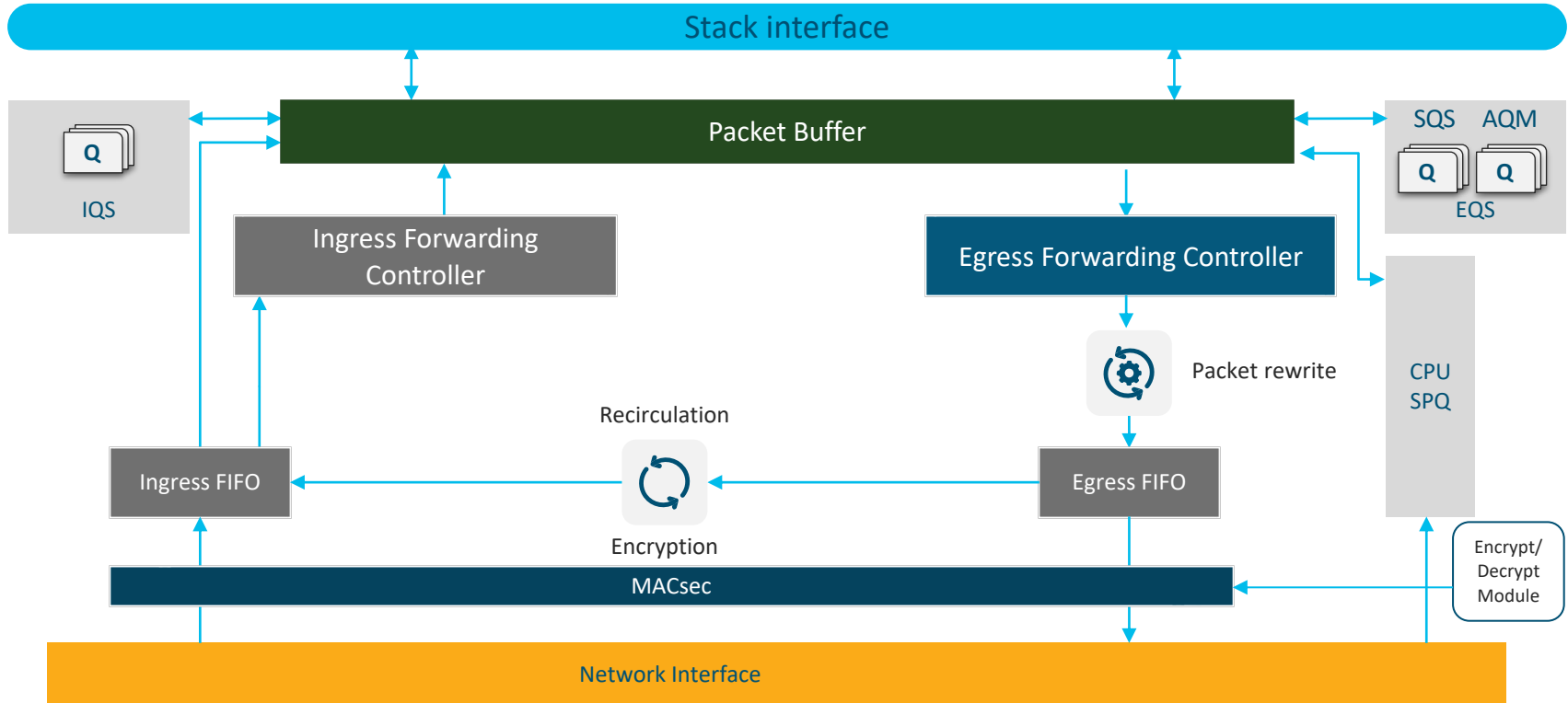
MACsec is not supported on the Port-channel Logical Link but it can be enabled on the port-members individually (MKA Mode only)



	MACSEC	Catalyst 9200 modular SKU		Catalyst 9200 fixed SKUs	
		SW	License	SW	License
Switch to Switch	128 Bits SAP	16.10.1	NE	16.9.2	NE
	128 Bits MKA	16.10.1	NE	16.9.2	NE
Host to Switch	128 Bits MKA	16.10.1	NE	16.10.1	NE

NE: Network Essentials

Where is MACsec performed in Hardware?



Trustworthy solution

Catalyst 9200 Series switches provides strong resistance against today's threats

HW Anchored Secure Boot

Image Signing and Secure Boot work together to ensure that authentic Cisco SW boots up on a Cisco Platform

Secure Unique Device Identification

Tamperproof ID for the device

Trust Anchor Module

HW Authenticity Check



IPv6 First-Hop Security (FHS)

Securing Enterprise IPv6 Networks



IPv6 First-Hop Security

RA Guard



Protection:

- Rogue or malicious RA
- MiM attacks

DHCPv6 Guard



Protection:

- Invalid DHCP offers
- DoS attacks
- MiM attacks

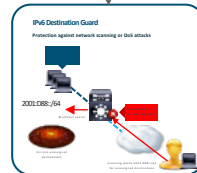
Source/Prefix Guard



Protection:

- Invalid source address
- Invalid prefix
- Source address spoofing

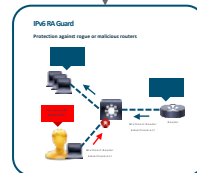
Destination Guard



Protection:

- DoS attacks
- Scanning
- Invalid destination address

ND Multicast Suppress



Reduces:

- Control traffic necessary for proper link operations to improve performance

Core Features

Advance Features

Scalability and Performance

Robust Security for Emerging BYOD Trends

PoE innovations

Cisco innovations in PoE deliver a robust low voltage infrastructure

2-event classification

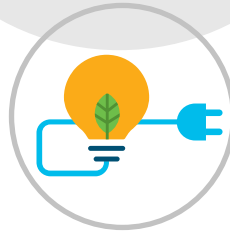
- Fast power negotiation without LLDP
- Physical layer negotiation < 1s

Perpetual PoE

- Uninterrupted PoE power during control plane reboot

Fast PoE

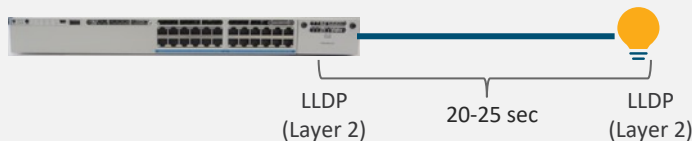
- Bypasses IOS control plane boot
- Restores power to PD within 30 sec of power resumption



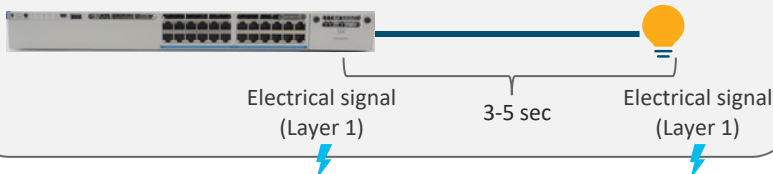


2-Event classification

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

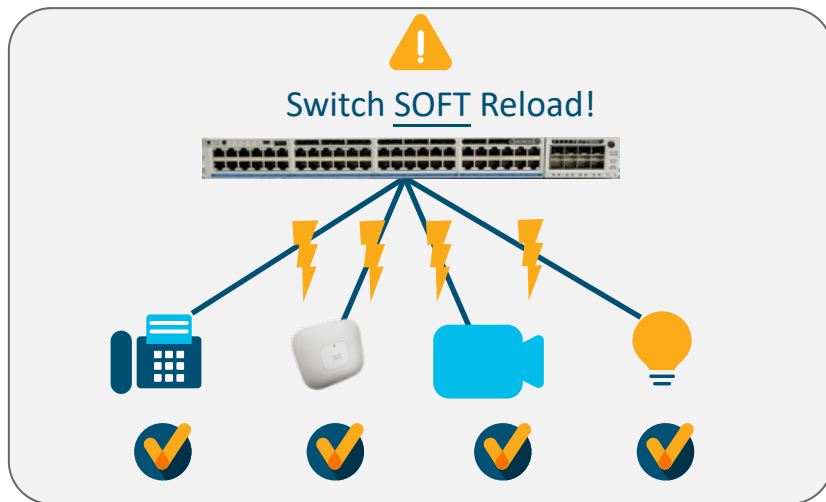
Switch(config-if)# end

- Class 4 PD gets 30W even before the link comes up, otherwise 15.4W
- Type-2 PSE sends classification voltage (2nd Handshake) pulse to Class 4 PD (PoE+, 12.96-25.5 W) 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
- No waiting for CDP/LLDP exchange for PoE+ power levels



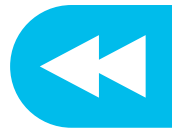
Perpetual PoE

PoE devices connected to switch stay powered even on Switch Reload!

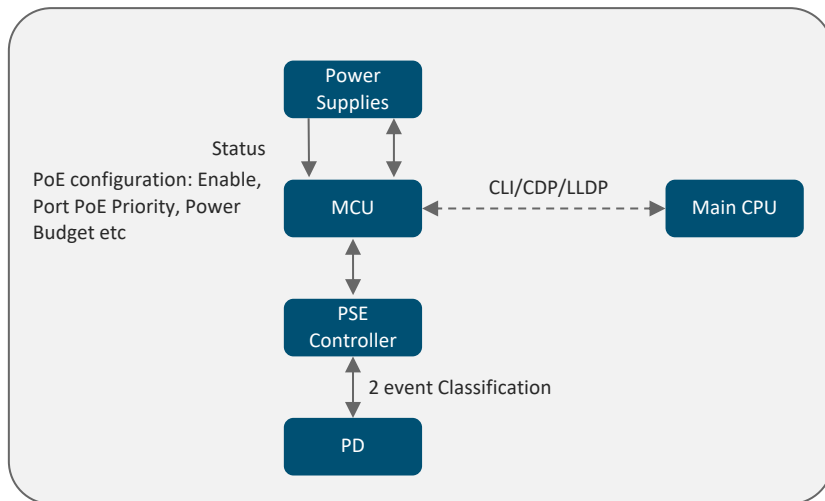


```
Switch> enable
Switch# configure terminal
Switch(config)# interface gigabitethernet2/0/1
Switch(config-if)#
power inline port perpetual-poe-ha
Switch(config-if)# end
```

- 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/FEP 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 in less than 30 seconds post restoration of power
- Works even before IOS comes up
- Allocates last power (stored in NVRAM) drawn from PDs
- Works in Stacking deployments

Application visibility and control

Full flexible netflow

Key Differences – Catalyst 9200 Series switches vs Catalyst 2960X/XR Series switches

Catalyst 9200 Series switches



- Both ingress and egress
- 16K Flows/ASIC
- Match on Layer2 VLAN header as well

Layer 2, IPv4 and IPv6 capable

4 banks in ASIC, 2 ingress, 2 egress

Ipv4 flows: 8k per direction

Layer 2 and Ipv6 flows: 4k per direction

Ingress and Egress FnF supported on all ports, VLANs

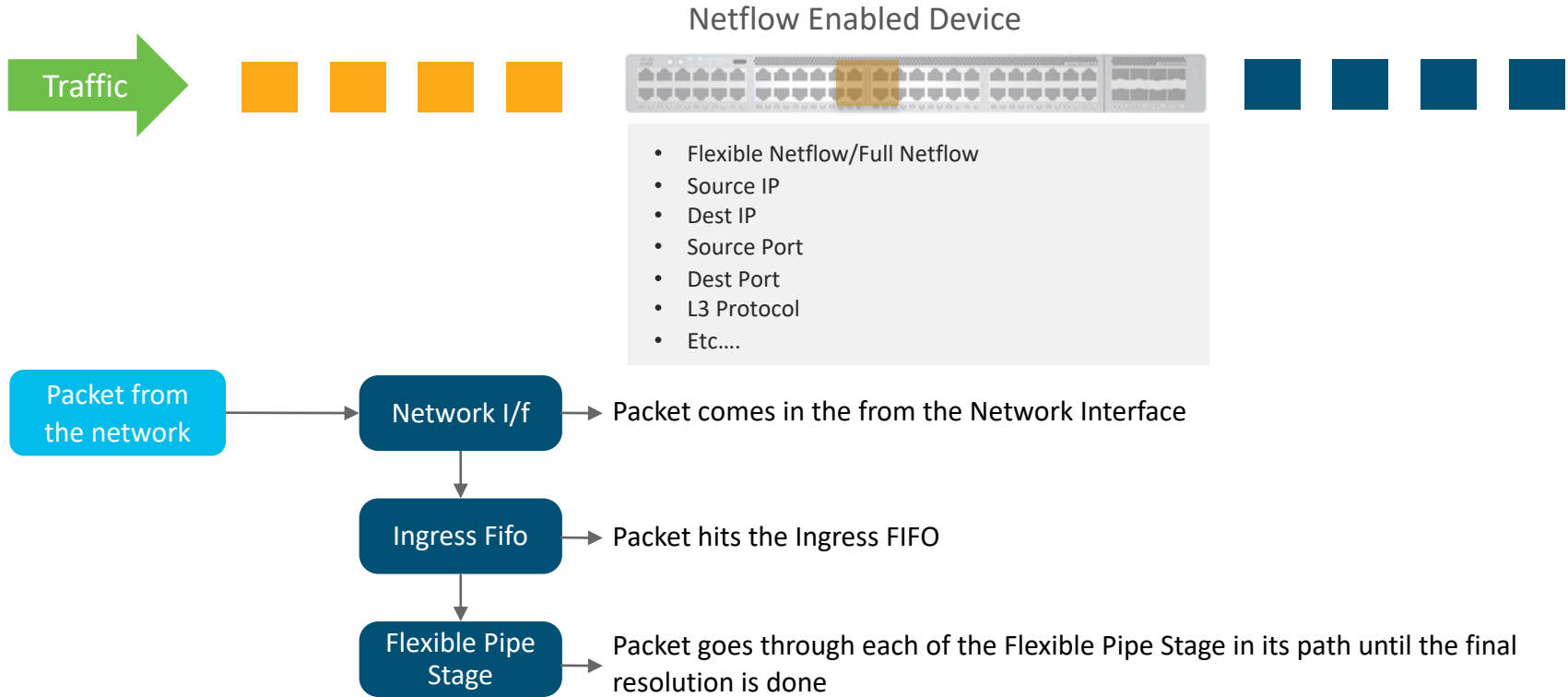
Catalyst 2960X/XR Series switches



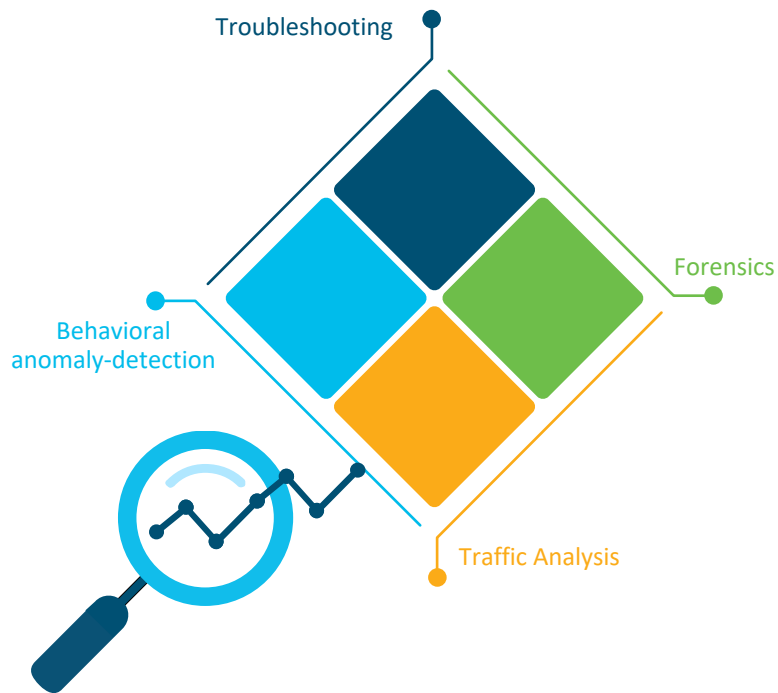
- Only ingress
- 8K Flow/ASIC
- No match on Layer2 VLAN Header

Full flexible netflow

Packet processing



Benefits of full flexible netflow



Multiple monitors per interface



Configuration

- Traffic type support
- Ipv4
- Ipv6
- datalink



Interface type

- Switchport
- Non switchport (routed port)
- Vlan configure
- Port-channel member interface

Multiple monitors for different traffic types per interface per direction

Application Visibility and Control

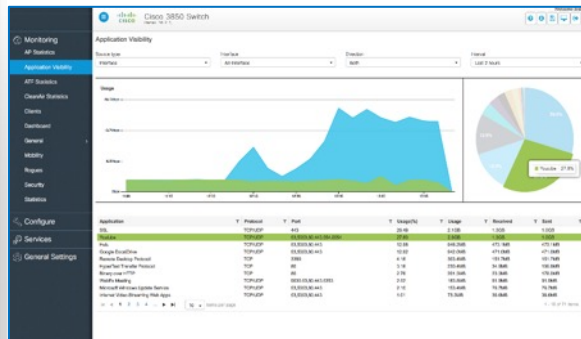
Granular Detection, Advanced Monitoring & Business Logic Based Policies

Know Your Applications



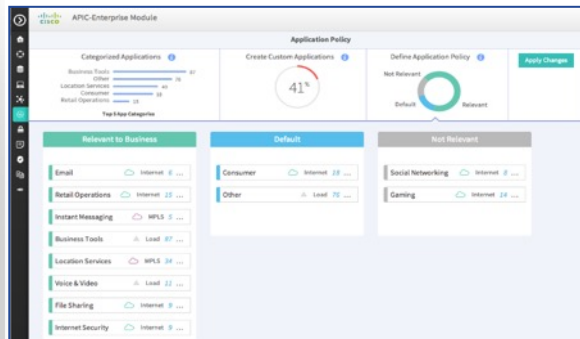
Granular App Detection
Encrypted Application

Monitor Your Applications



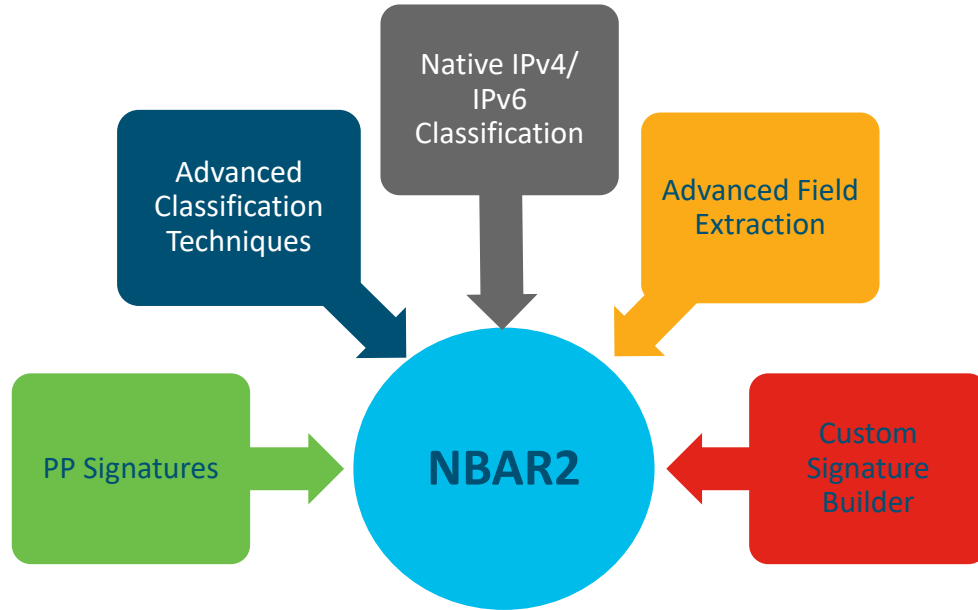
Fault Isolation, Troubleshooting
Performance Assessment

Control Your Applications



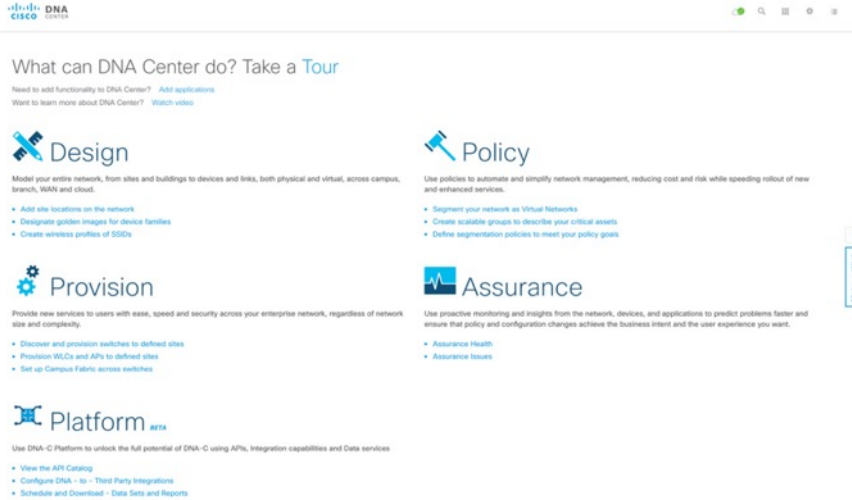
Prioritized Applications,
Bandwidth Management

Network Based Application Recognition



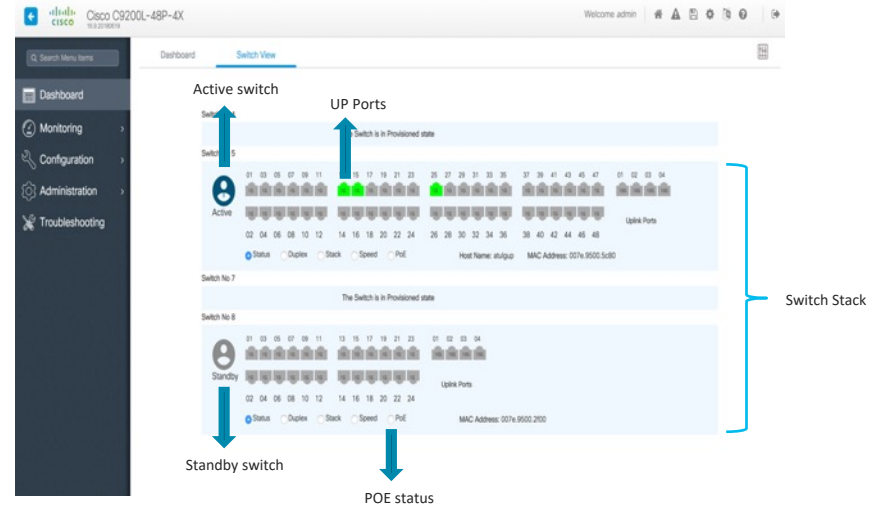
- Optimize the Application experience in the network
- Hitless Protocol Pack update allows adding more applications.

Manageability



DNAC

Part of the Larger Network



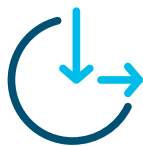
WebUI

Small Branch - CPC Migration

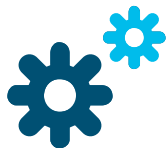
Catalyst 9200 can be Managed multiple ways

Embedded WebUI

Ease of Access



Build configurations



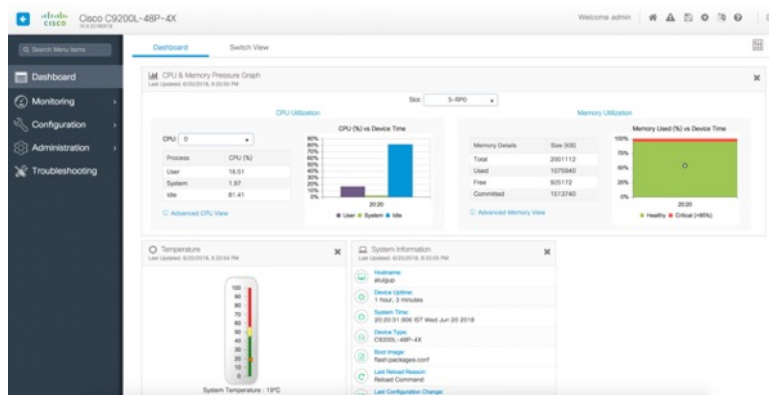
Intuitive Interface



Switch View



Troubleshooting
made fun



Switch view

The screenshot displays the Layer23-Switch management interface for a Cisco C9200L-48P-4X switch. The interface is divided into a sidebar and a main content area.

Sidebar:

- Search Menu Items
- Dashboard
- Monitoring
- Configuration
- Administration
- Troubleshooting

Main Content Area:

The main content area shows a "Switch View" for a switch stack. It lists three switches:

- Switch No 4:** Active. Status: Active. Host Name: atulgup. MAC Address: 007e.9500.5c80. It has 48 ports, with ports 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, and 48. Ports 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, and 48 are all in the "UP" state.
- Switch No 5:** UP Ports. Status: UP Ports. Host Name: atulgup. MAC Address: 007e.9500.5c80. It has 48 ports, with ports 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, and 48. Ports 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, and 48 are all in the "UP" state.
- Switch No 7:** Standby. Status: Standby. Host Name: atulgup. MAC Address: 007e.9500.2f00. It has 48 ports, with ports 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, and 48. Ports 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, and 48 are all in the "UP" state.

Annotations on the screenshot:

- Active switch:** Points to Switch No 4.
- UP Ports:** Points to the "UP Ports" status of Switch No 5.
- Standby switch:** Points to Switch No 7.
- POE status:** Points to the "PoE" status of Switch No 7.
- Switch Stack:** A bracket on the right side of the interface indicates the stack of switches.

Troubleshooting made fun !!

Check the Core files

The screenshot shows the Cisco C9200L-48P-4X Troubleshooting interface. The left sidebar contains a search bar and a menu with items: Dashboard, Monitoring, Configuration, Administration, and Troubleshooting (which is highlighted). The main content area is titled 'Troubleshooting' and displays seven tiles: Audit Support, Core Dump, Debug Bundle, Packet Capture, Ping and Trace Route, Syslog, and Web Server log. Annotations include a blue arrow pointing from the 'Core Dump' tile to the text 'Check the Core files' above it, and two blue arrows pointing from the 'Ping and Trace Route' and 'Syslog' tiles to the text 'Ping and traceroute' and 'View Syslogs' below them, respectively.

Dashboard

Monitoring

Configuration

Administration

Troubleshooting

Troubleshooting

Audit Support
Check security, hardening, and the best practices aspect of the device config. Needs internet access

Core Dump
View the list of core files captured in the device

Debug Bundle
Capture require info like CLI outputs, logs as a single bundle for error reporting and debugging

Packet Capture
Capture packets with different filter options to feed into Wireshark for debugging

Ping and Trace Route
Check Ping-ability and Trace route info of a target destination through different sources

Syslog
Configure and View Syslog

Web Server log
View and Download Access and Error info of Web User Interface Logs

Ping and traceroute

View Syslogs

References

Catalyst 9200 Series switching H/W characteristics

	Catalyst 9200 Series modular switches	Catalyst 9200 Series fixed switches	Catalyst 2960-XR Series switches	Catalyst 2960-X Series switches
CPU	4 Core @ 1.4Ghz Embedded ARM	4 Core @1.4Ghz Embedded ARM	Dual Core CPU@600MHz	Dual Core CPU@600MHz
DRAM (DDR3)	4GB	2GB	512MB	512MB
Flash On board	4GB	4GB	256MB	128MB
Buffer	6MB/ASIC	6MB/ASIC	4MB/ASIC	4MB/ASIC
Stacking (module)	Stackwise-160	Stackwise-80	FlexStack-Plus/ Extended module	FlexStack-Plus/ Extended module
# of Stack Members	8	8	8	8
Stack Bandwidth	160Gbps	80Gbps	80Gbps	80Gbps
Power Supply	2 FRUable PS	2 FRUable PS	2 FRUable PS	Single Fixed
Max PoE Budget	1440W	1440W	740W	740W
Modular Uplinks	Yes	No	No	No
Modular Fans	Yes	No	No	No
Max Depth	13.8"	11.3"(13.8" for mGIG)	16"	14.5"





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

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