

Catalyst 9000 Switch Family Architecture

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Cisco Webex App

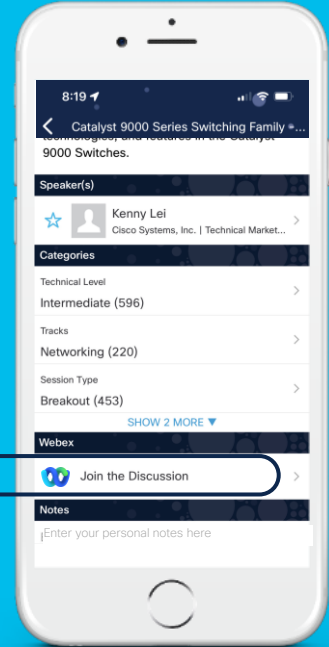
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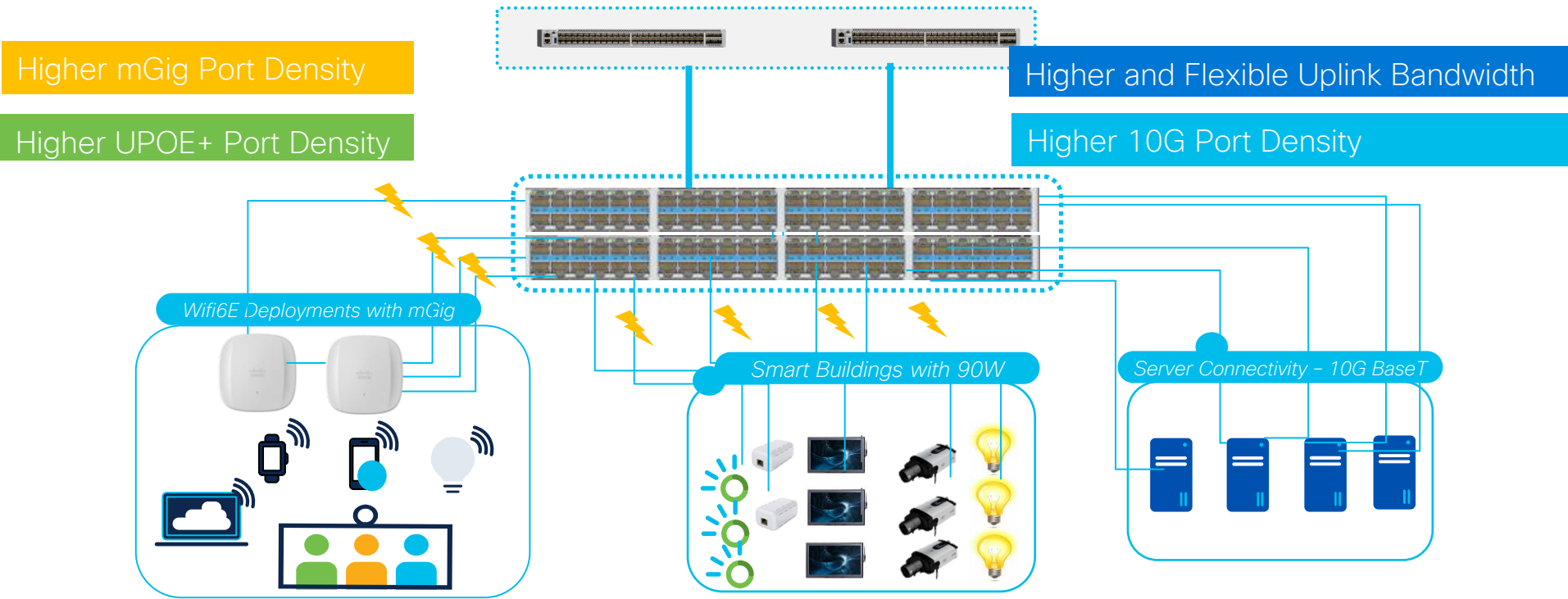




Agenda

- Digital trends
- Cisco ASICs
- Access Switching
 - Catalyst 9300 (C9300X, C9300, C9300L/LM)
 - Catalyst 9200 (C9200CX, 9200, C9200L)
 - Catalyst 9400 (C9400X, C9400)
- Core and Distribution Switching
 - Catalyst 9500 (C9500X, C9500)
 - Catalyst 9600 (C9600X, C9600)
- Summary

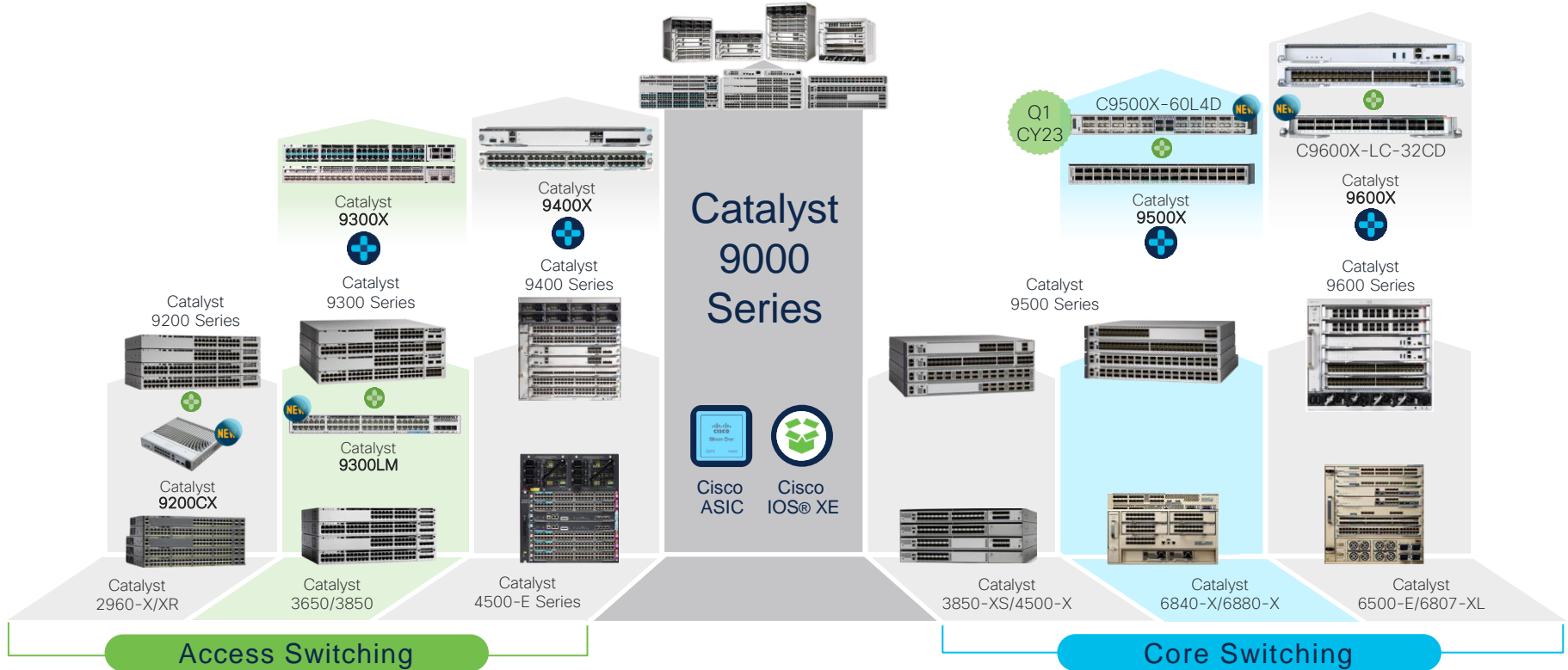
Enterprise Access Trends



New Access requirements for Future Campus

Cisco Catalyst 9000 Switching Portfolio

One Family from Access to Core – Common Hardware & Software



Cisco ASICs

Cisco UADPs and Silicon One



Catalyst 9000 Series – Common Building Blocks



Programmable x86
Multi-Core CPU

Application Hosting
Secure Containers



Open IOS XE[®]
Polaris

Model-Driven APIs
Modular Patching



Cisco ASICs
UADPs and Q200

Programmable Pipeline
Flexible Tables

Same binary image for both UADP and Silicon One C9K platforms*

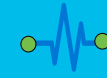
Custom ASICs – Programmable Silicon



Unified Access Data-Plane



Cisco Silicon One™



Flexible Pipelines

Investment Protection



Adaptable Tables

Universal Deployment



Scalable Resources

Enhanced Scale and Buffering

Flexible & Programmable ASICs – Adapt to New Technologies

Cisco Unified Access Data-Plane (UADP®)

Common ASIC Architecture for Switching Access, Distribution & Core



UADP 2.0m

120 Gbps

16nm FinFET
1.3B Transistors
1 Core + ARM CPU

UADP 2.0/XL

240 Gbps

28nm FinFET
7.6B Transistors
2 Core

UADP 2.0sec

480 Gbps

16nm FinFET
7.6B Transistors
1 Core² + SEC

UADP 3.0

1.6 Tbps

16nm FinFET
19.2B Transistors
2 Core

UADP 3.0sec

1.6 Tbps

16nm FinFET
19.2B Transistors
2 Core + SEC

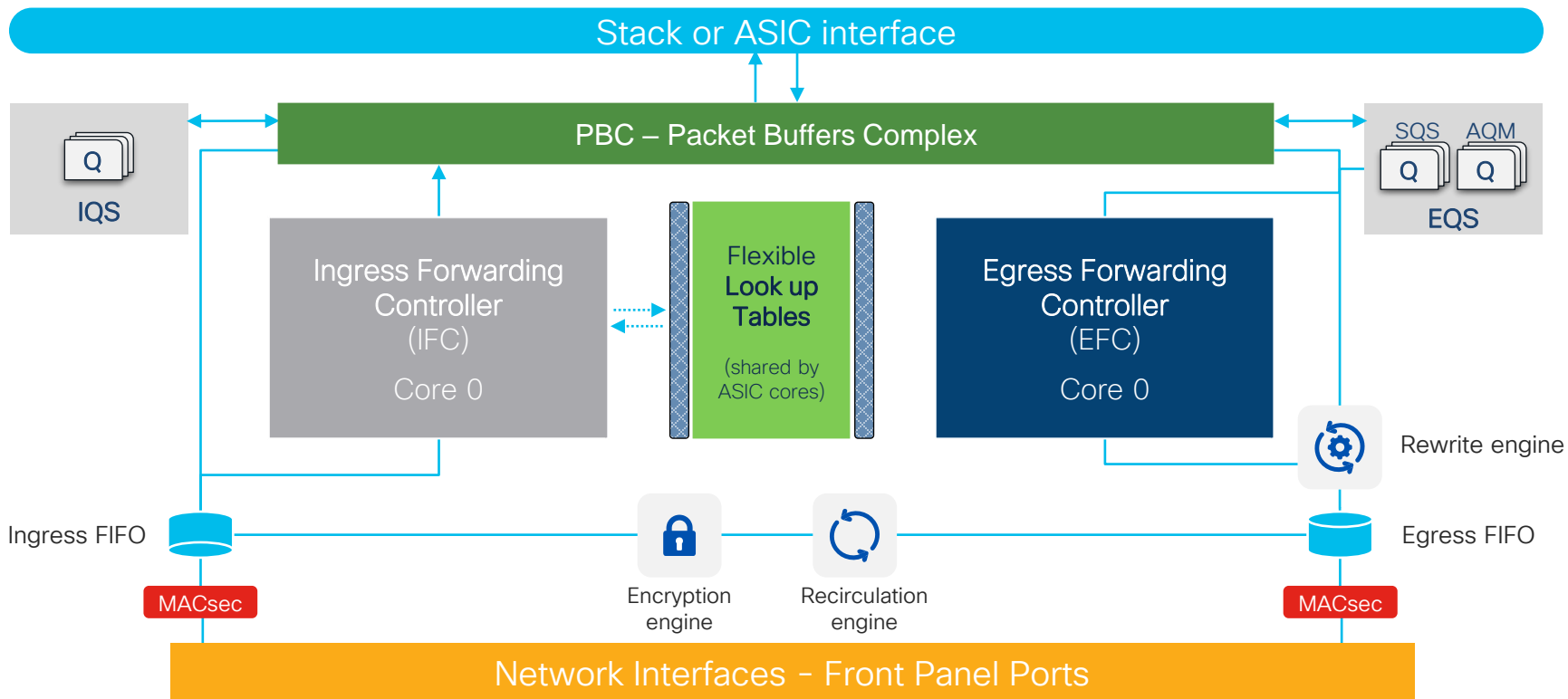
- Multiple generations and formats, same architecture
- Rich flexible forwarding & services memories
- First fully programmable microcode network silicon

- **Multiple functions:** system-on-chip or line-card
- **Multiple form factors:** fixed or modular
- **Multiple places:** Access, Distribution and Core

Cisco UADP ASICs

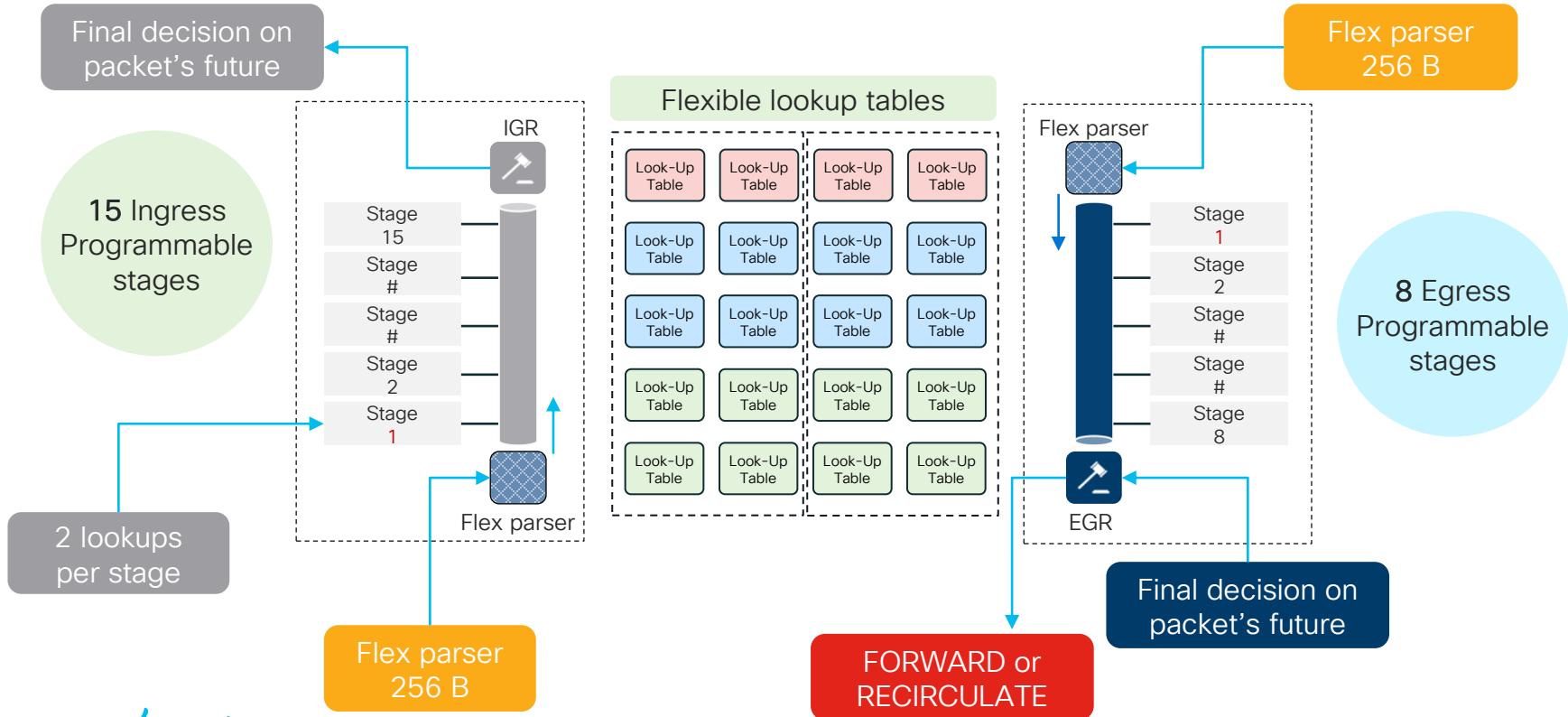
ASIC Architecture & Block Diagram

up to 1 BILLION
times per second!



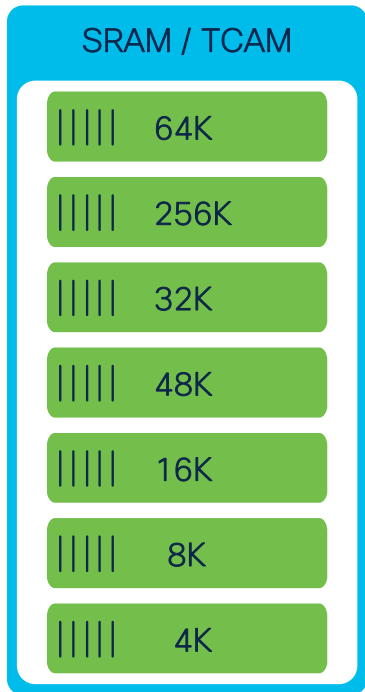
Cisco UADP – Flexible Lookups

Programmable Ingress and Egress Processing Stages



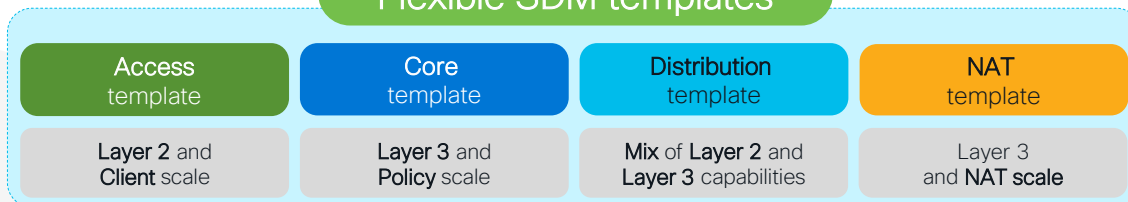
Cisco UADP - Flexible Tables

Customizable ASIC tables for universal deployment flexibility



- MAC
- IPv4/v6
- Unicast
- Multicast
- NetFlow
- ACL
- SGACL
- QoS
- NAT
- SPAN

Flexible SDM templates



Customize table sizes for each function – based on the Place in Network

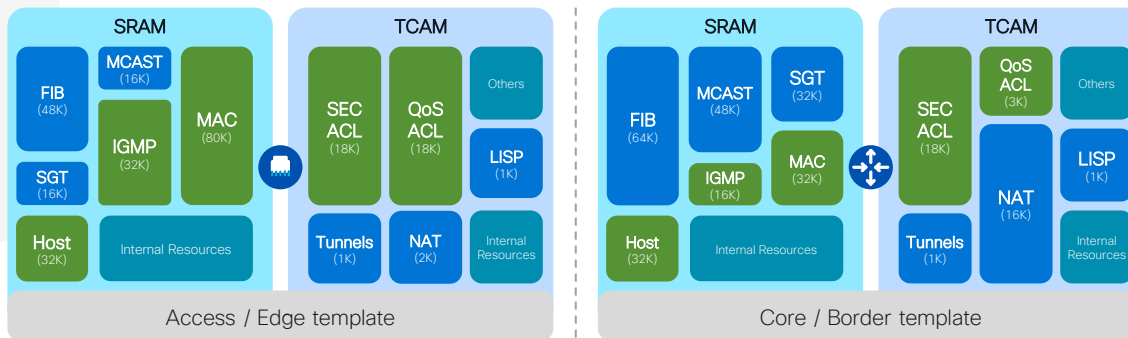


Table sizes can be tailored to support multiple templates

Cisco Silicon One™ Q200

Industry leading Switching and Routing Silicon



12.8T BW



8.1 Bpps



8G HBM for
deep buffers



2M IPv4
or 1M IPv6
route scale



Fully P4
Programmable
Pipeline



50G PAM4
Serdes

Cisco Silicon ONE Q200
Industry Leading
12.8T System on Chip



First 7nm ASIC providing
lowest watts/GE power
consumption



Fully P4 programmable enabling
feature velocity



Multi slice architecture for
flexibility and scale

Routing Capabilities with Switching Power and Performance

Cisco Silicon One™ Q200

ASIC Architecture & Block Diagram



Packet Processing Slices (6):

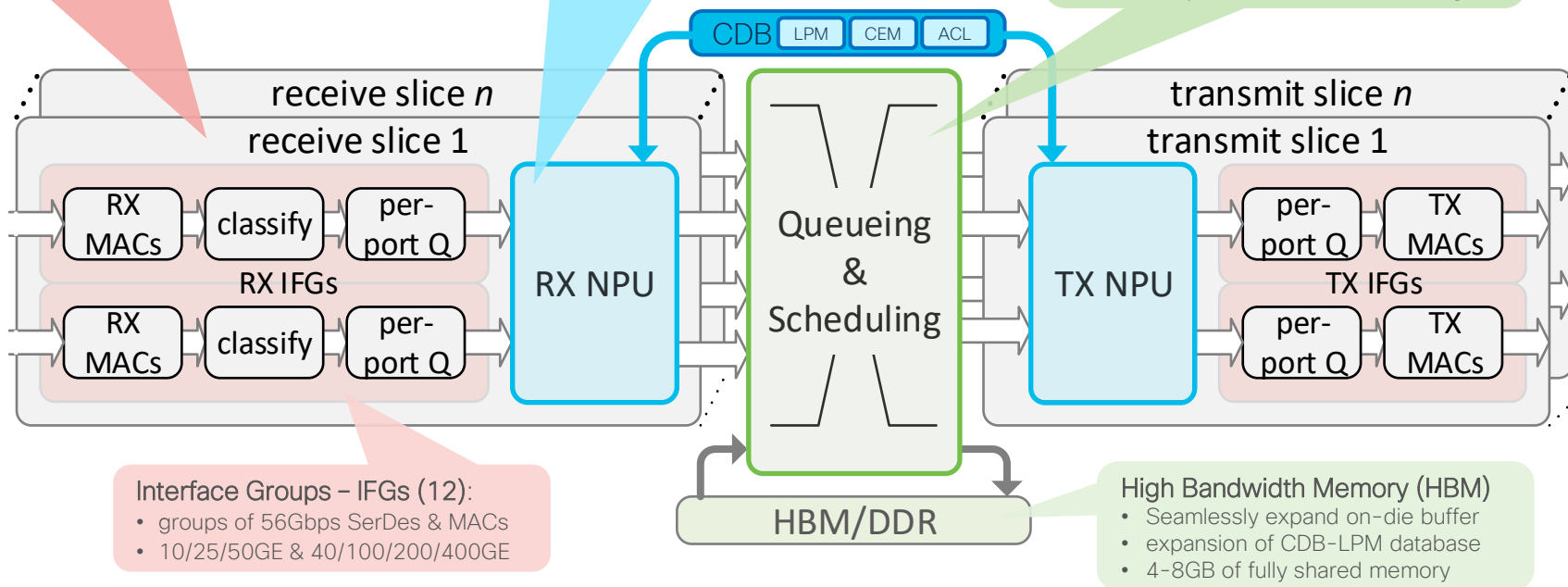
- 1 packet per clock (@ 1.35GHz)
- Slice = 2x IFGs + 1 RX & TX NPU

RX & TX NPU (per slice):

- P4 programmable Run-to-Complete
- Large Central Database (CDB) Tables
- Expandable LPM in external HBM

Traffic Manager (TM)

- Large fully-shared memory switch
- Congestion Management
- Pool of queues & flexible scheduling



Interface Groups – IFGs (12):

- groups of 56Gbps SerDes & MACs
- 10/25/50GE & 40/100/200/400GE

High Bandwidth Memory (HBM)

- Seamlessly expand on-die buffer
- expansion of CDB-LPM database
- 4-8GB of fully shared memory

Cisco Silicon One™ Q200 – Central Databases

Onboard LPM, CEM & ACL memory



Q200 CDB includes the Central L2/L3 Forwarding and ACL databases:

LPM – SRAM database for IP/mask routing implemented by **Longest Prefix Match** algorithm

- Primarily used by IPv4 and IPv6 unicast routing
- Up to* 2M IPv4 route entries, or 1M IPv6 route entries
- LPM can be extended (from CDB) to HBM

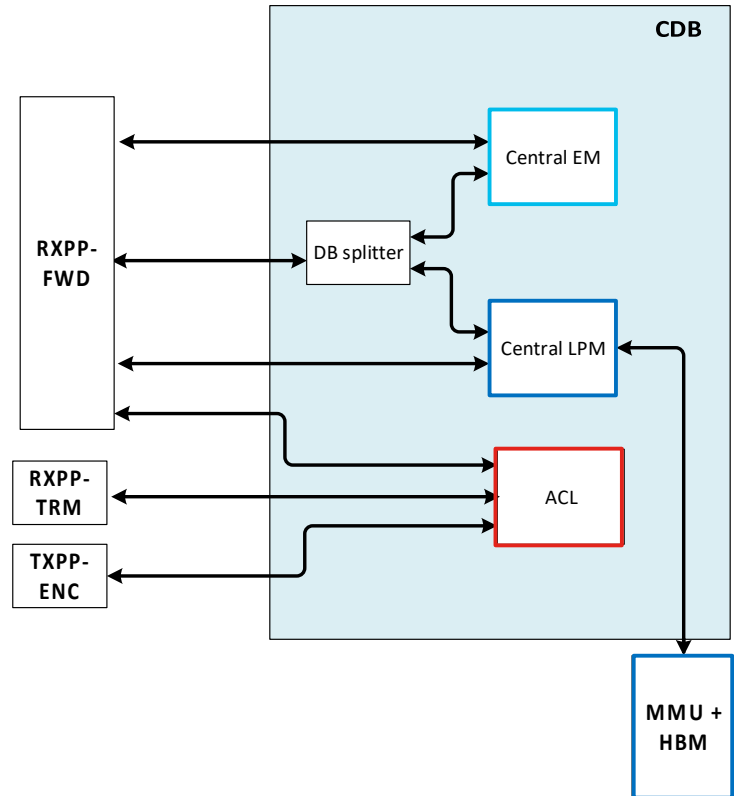
CEM – SRAM database for MAC & Host (/48, /32 or /128), Multicast & Labels implemented by **Exact Match** algorithm

- For features using an exact match (every bit, no mask)
- Up to 608K IPv4 entries, or 304K IPv6 entries
- CEM can be flexibly reallocated for different tables

ACL – TCAM classification database, contains Security, QoS and Services **Access Control List** entries

- For features that use (match criteria + action) policies
- Up to 8K IPv4 ACL entries, or 4K IPv6 ACL entries
- OG/SGACLs use CEM, with only action ACEs in TCAM

* Exact scale depends on IP/mask distribution (contiguous vs. random) and hash efficiency. Sample tests with IPv4 GRT is ~1.85M



Cisco Catalyst 9500X & 9600X with Q200

SDM templates and scale numbers

Features (CEM)	Customizable	DEFAULT (core + edge)	Custom (min to max @ step)	
MAC addresses	☐	128,000	32,000 to 256,000	@ 1000 step
Host routes (ARP/NDP)	☐	128,000 / 64,000	32,000 to 256,000	@ 1000 step
Layer 2 multicast entries (IGMP/MLD)	FCS+	16,000 / 8000	0 to 64,000	@ 1000 step
Layer 3 multicast routes (IPv4/IPv6)	FCS+	32,000 / 16,000	0 to 64,000	@ 1000 step
ACL compression (SGT, DGT, OGID/v6)	☐	32,000 / 16,000	0 to 64,000	@ 1000 step
MPLS labels	☐	256,000	0 to 512,000	@ 1000 step
Reserved (PBR/NAT)	FCS+	16,000 / 8,000	0 to 256,000	@ 1000 step
	CEM	608,000 <small>(288,000 for LPM)</small>		

L3 Routes (LPM)	FCS+	2 million / 1 million	1 million to 2 million	@ 1 million step
------------------------	-------------	------------------------------	-------------------------------	-------------------------

Features (TCAM)	Customizable	DEFAULT (core + edge)	Custom (min to max @ step)	
Security ACL (IPv4/IPv6)	FCS+	8000 / 4000 shared*	0 to 11,000/5000	@ 1 step
Quality of service (IPv4/IPv6)	FCS+	8000 / 4000 shared*	0 to 11,000/5000	@ 1 step
Policy-based routing (IPv4/IPv6)	FCS+	8000 / 4000 shared*	0 to 11,000/5000	@ 1 step
Lawful intercept (IPv4/IPv6)	FCS+	1000 (2x 512) reserved	1000 to 5000/2500	@ 1 tap (2 ACE)
LPTS, EPC, FSPAN, NFL (IPv4/IPv6)	FCS+	1000 (2x 512) reserved	1000	@ 1 step
	TCAM	10,000 <small>(2000 for LPM)</small>		

* Shared is an unreserved space, first come, first served per feature.

Access Switching



Catalyst 9000 Family PID decoder

Product ID: C9300LM-48UX-4Y

Product Family
C9200
C9300
C9400 (C9404, C9407, C9410)
C9500
C9600 (C9606)

Product sub-family
L - Fixed uplink
C - Compact
X - Expansion
M - Mini (Shallow Depth)
R - Modular Chassis with Redundant Supervisor

# of ports and port type	
Copper (RJ45)	Fiber
T - Data only	S - 1Gbps (SFP)
P - PoE (30W)	X - 10Gbps (SFP+)
U - UPoE (60W)	Y - 25Gbps (SFP28)
H - UPoE+ (90W)	Q - 40G (QSFP)
G - 1Gbps	L - 50G (SFP56)
X - 10Gbps	C - 100G (QSFP28)
N - mGIG (up to 5Gbps)	DD - 400G (QSFP-DD)
M - mGIG	

Catalyst 9300

C9300X – Expansion

C9300 – Modular Uplinks

C9300L – Fixed uplinks

C9300LM – Mini version with Fixed uplinks

Cisco Catalyst 9300 Series

Extended Catalyst 9300 Series with Catalyst 9300X models

Catalyst® 9300 models with modular uplinks (C9300)

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



48/24 ports Data 1G



48/24 ports PoE+ 1G



48/24 ports UPOE+ and UPOE 1G

2x
Buffers

2-4x
Scale



48/24 ports UPOE 1G - 9300B

Multigigabit models with UPOE



48/24 ports Multigigabit

1G fiber



48/24 ports SFP 1G

9300 Uplinks



4x
Multigigabit



4x 1G SFP



8x 1/10G SFP/
SFP+



2x 40G QSFP



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

Catalyst 9300 models with Fixed uplinks (C9300L)

1G Copper Data & PoE



48/24 ports data 1G



48/24 ports PoE+ 1G

Multigigabit models with UPOE



48/24 ports mGig + UPOE

4x1G or 4x10G
fixed
Uplinks

4x1G or 4x10G
fixed
Uplinks

4x10G or
2x40G
Uplinks

StackWise® and StackPower
cables



50CM-1M-3M



30CM-150CM

Optional StackKit



Stack Adapters



50CM-1M-3M

Platinum-rated power supplies

Common
components



315W AC



715W AC/DC



1100W AC



1900W AC

Modular fans



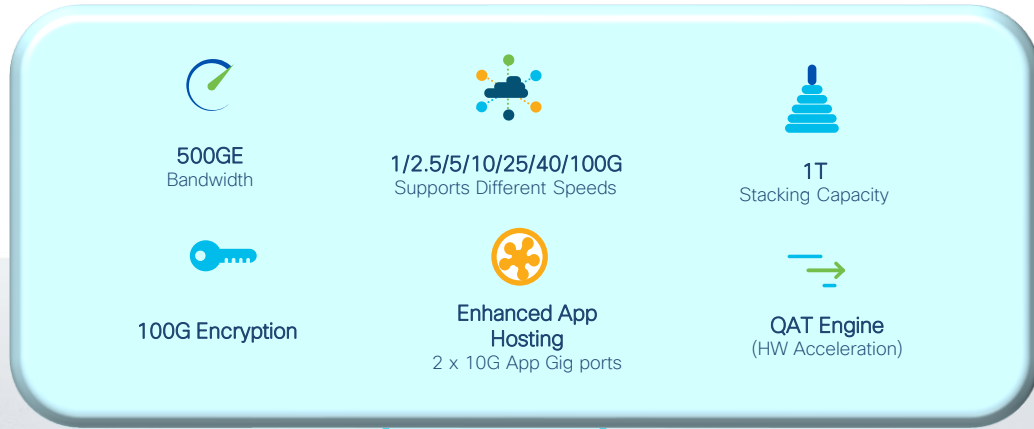
BRKARC-2035

External Storage



USB 3.0
120/240GB

Catalyst 9300X – New High Performance Access Switch



- 500GE Bandwidth
- 1/2.5/5/10/25/40/100G Supports Different Speeds
- 1T Stacking Capacity
- 100G Encryption
- Enhanced App Hosting
2 x 10G App Gig ports
- QAT Engine (HW Acceleration)



48 x mGig-10G + 90W UPOE+

Flexible Uplink Options

Investment protection with Catalyst 9300X

External storage
(240-GB SSD)

Redundant fans

Redundant power



Data stack cables
1T Stacking BW

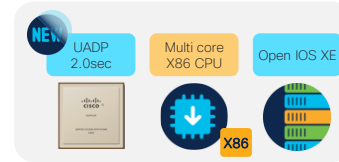
StackPower cables

Optional power
supplies (AC+DC)

Common components and stacking backward compatible with Catalyst®
9300 Series

Introducing the Catalyst 9300X models

Stacking up the industry firsts



Industry first **Terabit stacking**

Stacks with Catalyst® 9300 Series switches

Mixed 25/10G fiber stacking with copper

Transitions Catalyst 3850-XS fiber switches

100G uplinks on stackable

Densest uplinks: 2x 100/40G, 8x 25/10G, 8x 10G/Multigigabit

Fiber



Catalyst 9300X-24Y



Catalyst 9300X-12Y

Copper



Catalyst 9300X-48HX



Catalyst 9300X-48TX



Catalyst 9300X-48HXN



Catalyst 9300X-24HX

Industry first **100G Layer 3 encryption**

IPsec,
* WAN MACsec,
* CloudSec*

Industry first **StackPower+**

Enabled through StackPower+ and power supply enhancements

Industry first **App hosting with crypto acceleration**

QAT and ~2x capacity (memory, CPU, 2x 10G KR)

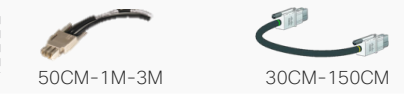
Extending Catalyst leadership ...

- Line-rate non-blocking
- Removable storage (240 GB)
- 256-bit MACsec
- Hot patching
- Extended FSU
- NBAR2
- IEEE 1588 and AVB

...while seamlessly integrating with Catalyst 9300

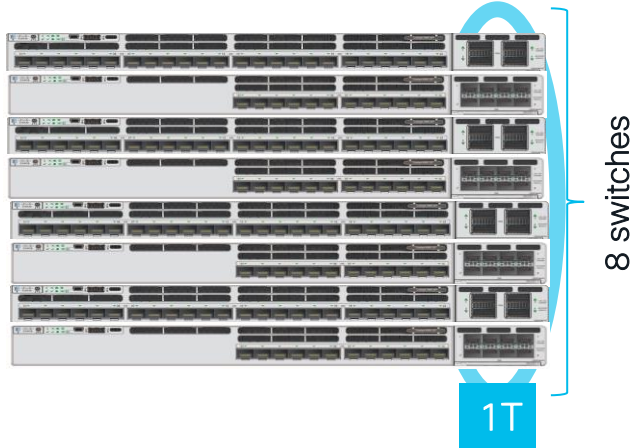
- Same optics
- Common stacking
- Common power stacking
- Common power supplies, fans, cables

Modular uplinks **StackWise® and StackPower cables** **Platinum-rated power supplies** **Modular fan**

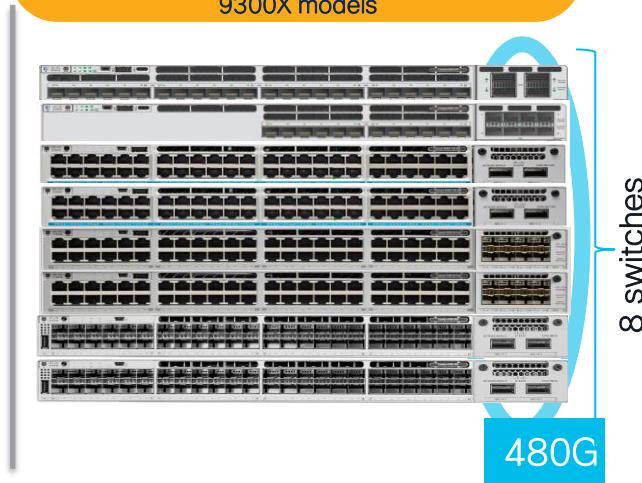


Catalyst 9300 Stacking Support

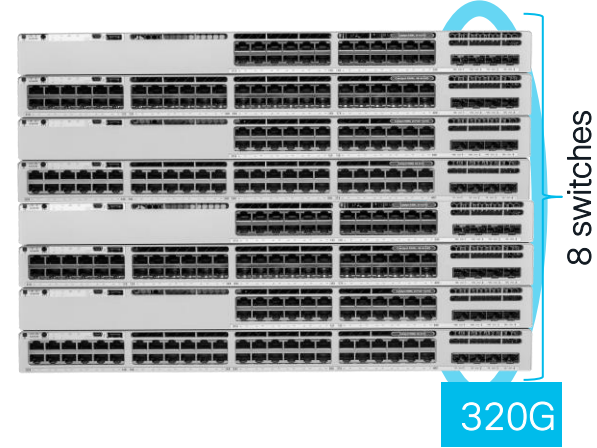
Modular Uplink
Catalyst 9300X models (10/25G Fiber)



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



Fixed Uplink
Catalyst 9300L/LM models

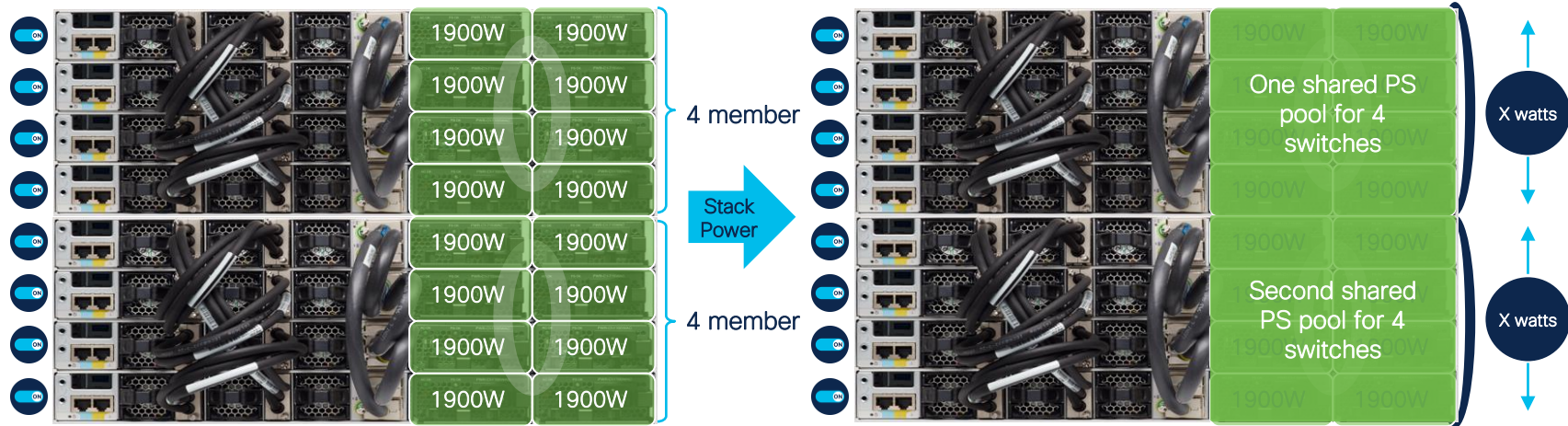


Stacking supported among Catalyst 9300X models and mixed stacking between Catalyst 9300 and Catalyst 9300X models

Stacking supported among Catalyst 9300L/LM models only

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

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

Cisco Catalyst 9300LM Series

Fixed Uplink replacement for Catalyst 3650-mini

Fixed Uplinks (C9300LM Models)

Multigigabit/UPOE model



4 x10/25G Uplinks

C9300LM-48UX-4Y 40 x 1 G +8 x 100/1/2.5/5/10G UPOE Ports

UPOE models



4 x10/25G Uplinks

C9300LM-24U-4Y 24 x 1G UPOE Ports

1G Data model



4 x10/25G Uplinks

C9300LM-48T-4Y 48 x 1G Ports



4 x10/25G Uplinks

C9300LM-48U-4Y 48 x 1G UPOE Ports



Modular Stacking



Newer Higher-Efficiency C9300LM only Power supplies

Modular Fans*



Stack Adapters



Stack Cables



600W AC



715W DC



1000W AC



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

Cisco Catalyst 9300 Series

Extended Catalyst 9300 Series with Catalyst 9300X and 9300LM 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

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

4x1G or 4x10G fixed Uplinks

48/24 ports PoE+/data 1G

4x1G or 4x10G fixed Uplinks

48/24 ports PoE+ 1G

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

1G Copper Data & PoE

Multigigabit models with UPOE

Catalyst® 9300LM models with Fixed uplinks NEW

Platinum-rated power supplies

Common components

315W AC 715W AC/DC 1100W AC 1900W AC

Modular fans

External Storage

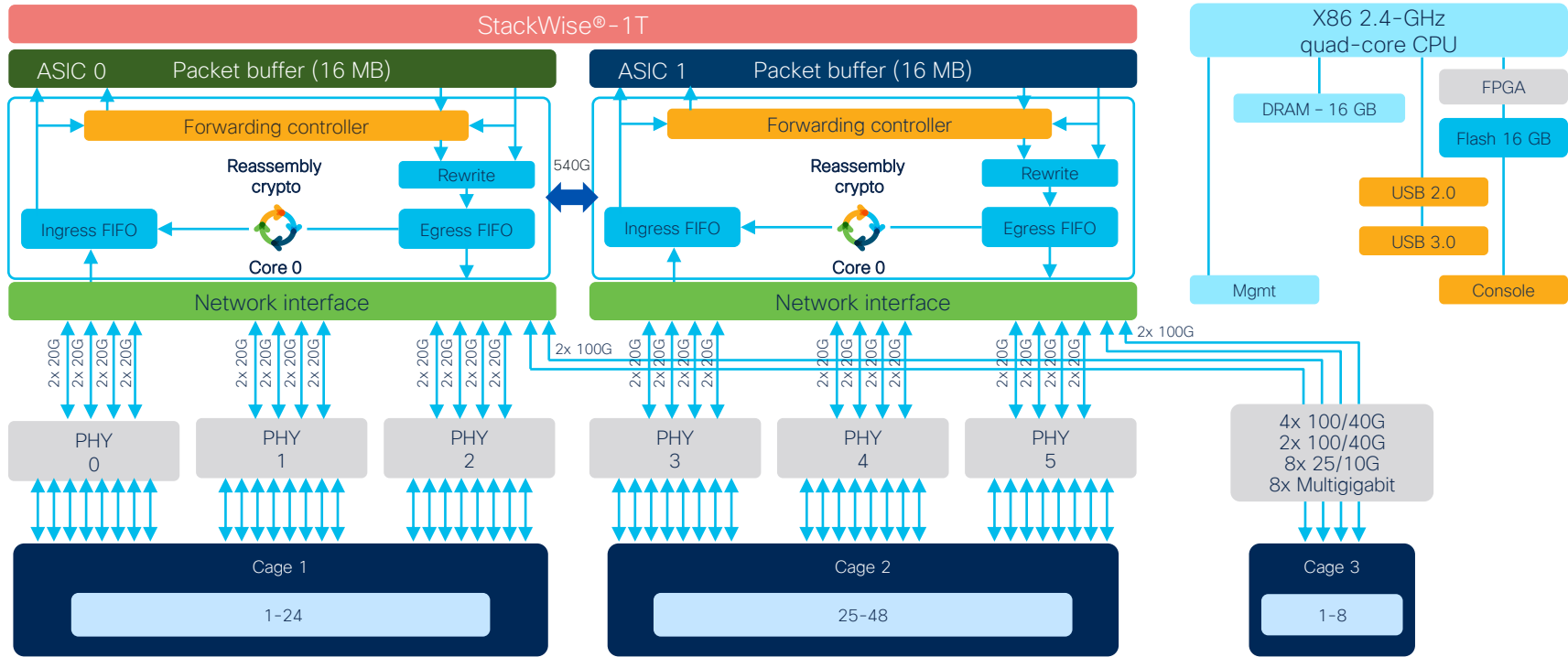
USB 3.0
120/240GB



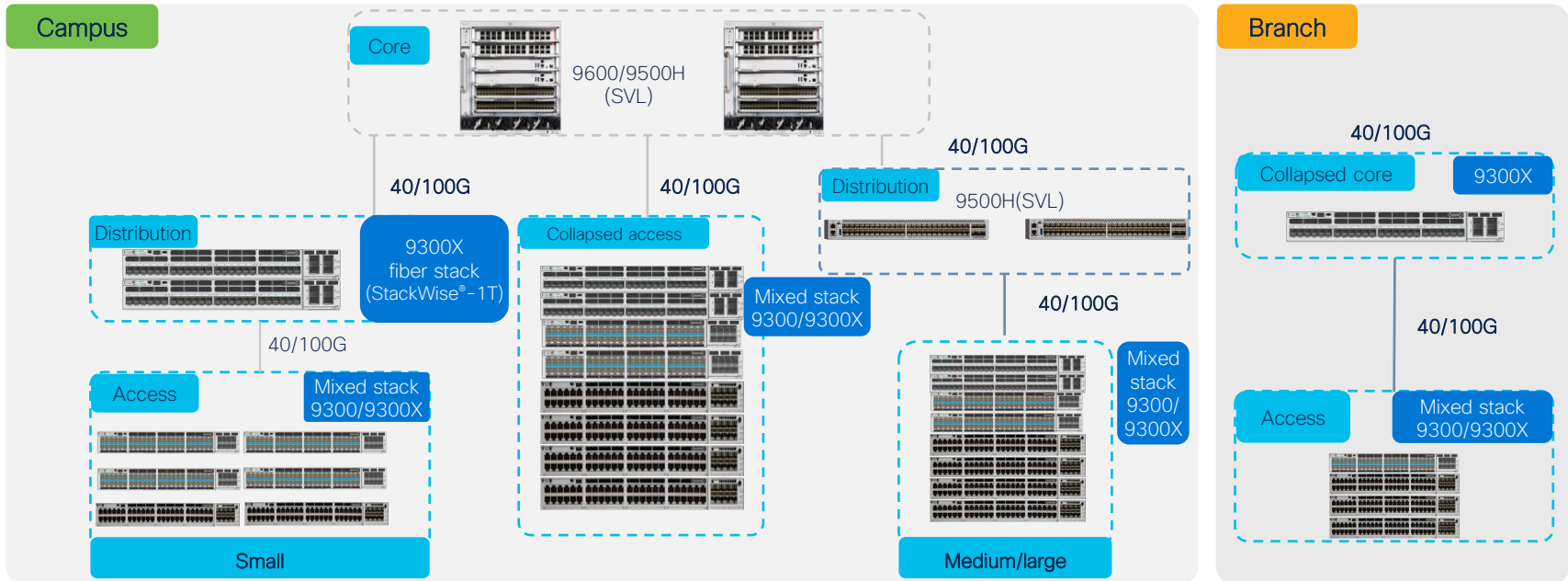
* Supported on 48HX and 24Y
** Last two ports disabled with 48HXN

Cisco Catalyst 9300X models

C9300X-48HX - 48 port 1/2.5/5/10G copper



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



Bringing 10/25/40/100G with StackWise-1 Terabit to access (C9300X)

Catalyst 9200

C9200 – Modular Uplinks

C9200L – Fixed Uplinks

C9200CX – Compact

Catalyst 9200 Series



UADP 2.0 Mini



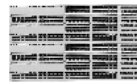
Cisco IOS-XE Lite



6MB
Packet Buffer



Up to 100GE
Bandwidth



Cisco
StackWise
160/80



Enhanced Security
MACsec 128



Smart building ready
Green builds, 802.3bt PoE

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

Right Sized Switching for simple Branch Deployments

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

FRU Fan



125W

Silver Rated



FRU PSU

Platinum Rated



600W

Platinum Rated



1000W

Modular uplinks

FRU Uplinks*



4x 1G



4x 10G



2x 25G



2x 40G

Cisco Catalyst 9200 Series highlights

UADP 2.0 mini

Cisco IOS XE Software (lite)

Limited-scale SD-Access

MACsec-128 link encryption

Trustworthy solutions

Perpetual/Fast PoE

Programmability

Cold patching

Full Flexible NetFlow streaming telemetry

*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

Cisco Catalyst 9200CX Series

Data and PoE+ Models

1G Downlink and 1G/10G Uplink Models (Fanless)

Data SKU



C9200CX-12T-2X2G

12x1G Downlinks + (3x1G + 2x10G SPP+ Uplinks)

- External power adapter (80W)
- UPOE+ powered (70W)



Power adapter
80W AC External
Power Adapter

Powering Option	Available Power (W)
Auxiliary Input	80W
1 UPOE+ Uplink	71W
1 Class 6 802.3bt (60W)	51W

PoE+ SKUs



C9200CX 12 Port PoE+

12x1G Downlinks + (2x1G + 2x10G SPP+ Uplinks)



C9200CX 8 Port PoE+

8x1G Downlinks + (2x1G + 2x10G SPP+ Uplinks)

- 310W Internal AC power supply
- 240W PoE power budget

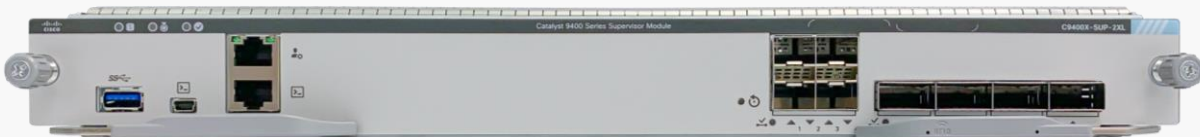
Catalyst 9400X/9400

Modular Access delivering ever-increasing value

- ✓ No oversubscription per slot on any chassis (w/ Sup 2XL)
- ✓ Higher non-oversubscribed port density
- ✓ Higher Access Point (AP) Density
- ✓ Perpetual and Fast PoE hardware capable



- ✓ 100 Gbps ports on Supervisors
- ✓ More Active Ports on Supervisors
- ✓ Higher TCAM scale
- ✓ Proven 25 Gbps value



Catalyst 9400 SUP 2XL

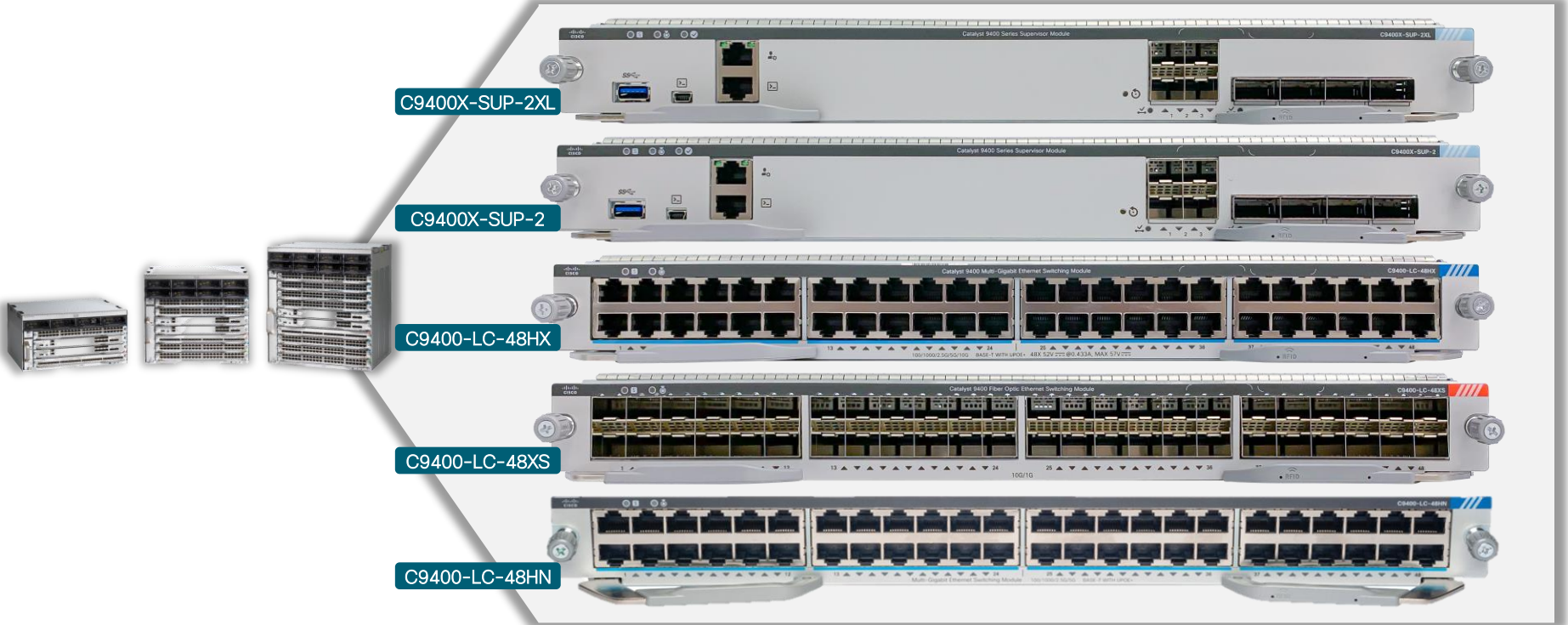


Catalyst 9400 SUP 2



Catalyst 9400 SUP 1/1XL

Same Chassis with New Supervisors and Line cards



NOTE: Same Supervisor model required in Dual SUP/SSO configuration

C9400X-SUP-2 / 2XL

Gen2 Supervisor Modules with UADP 3.0sec

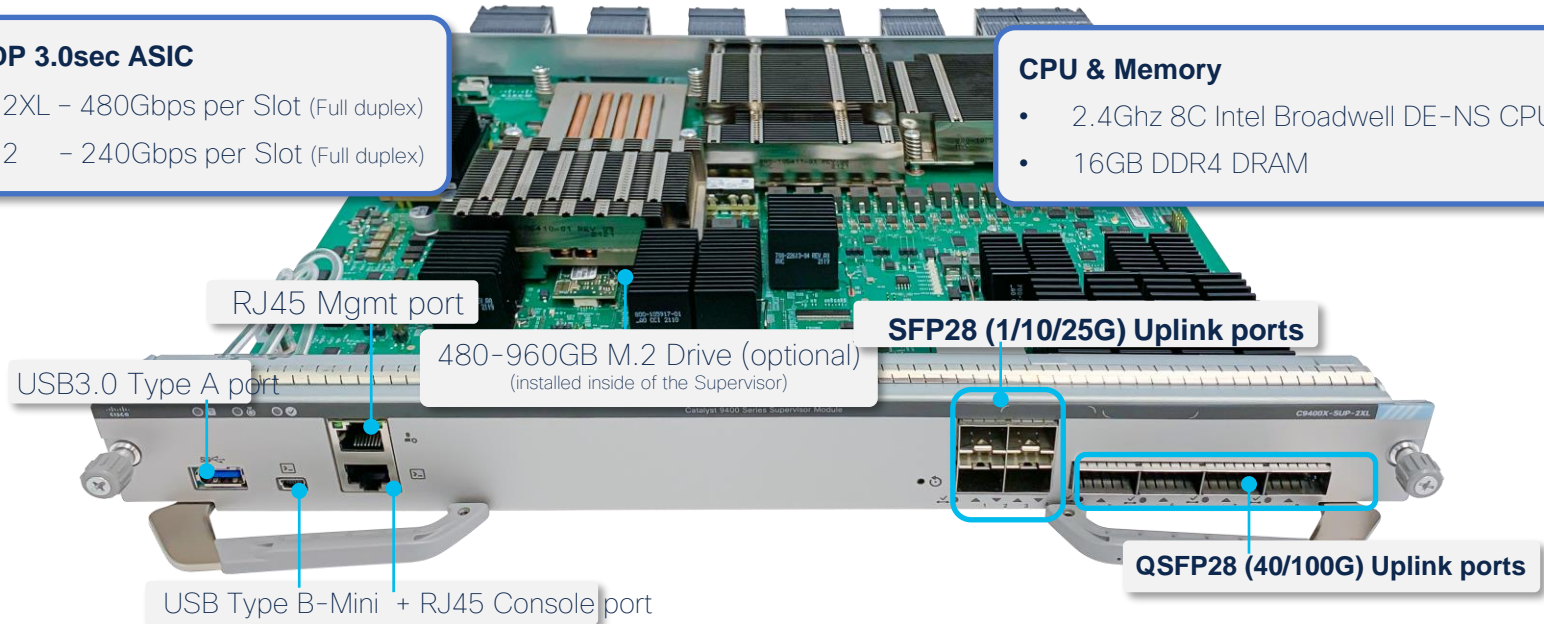
4.8 Tbps
With 2XL

3x UADP 3.0sec ASIC

- Sup 2XL – 480Gbps per Slot (Full duplex)
- Sup 2 – 240Gbps per Slot (Full duplex)

CPU & Memory

- 2.4Ghz 8C Intel Broadwell DE-NS CPU
- 16GB DDR4 DRAM



RJ45 Mgmt port

USB3.0 Type A port

USB Type B-Mini + RJ45 Console port

480-960GB M.2 Drive (optional)
(installed inside of the Supervisor)

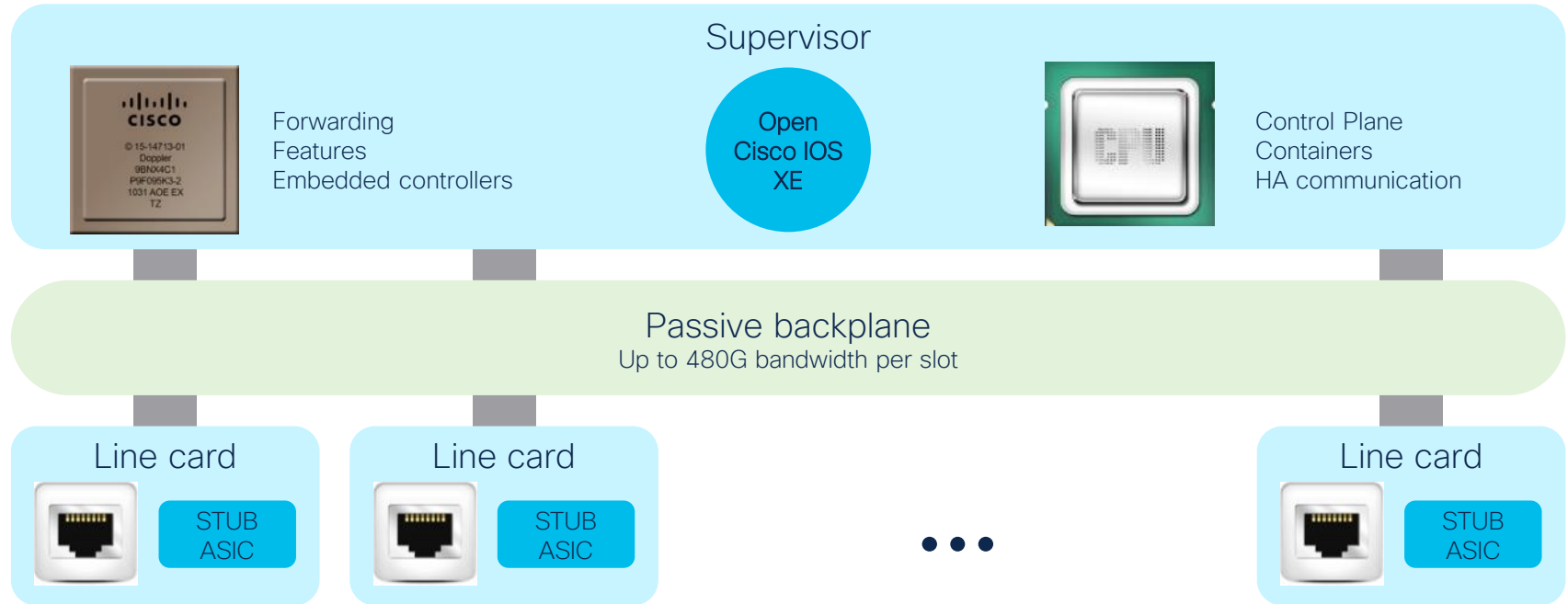
SFP28 (1/10/25G) Uplink ports

QSFP28 (40/100G) Uplink ports

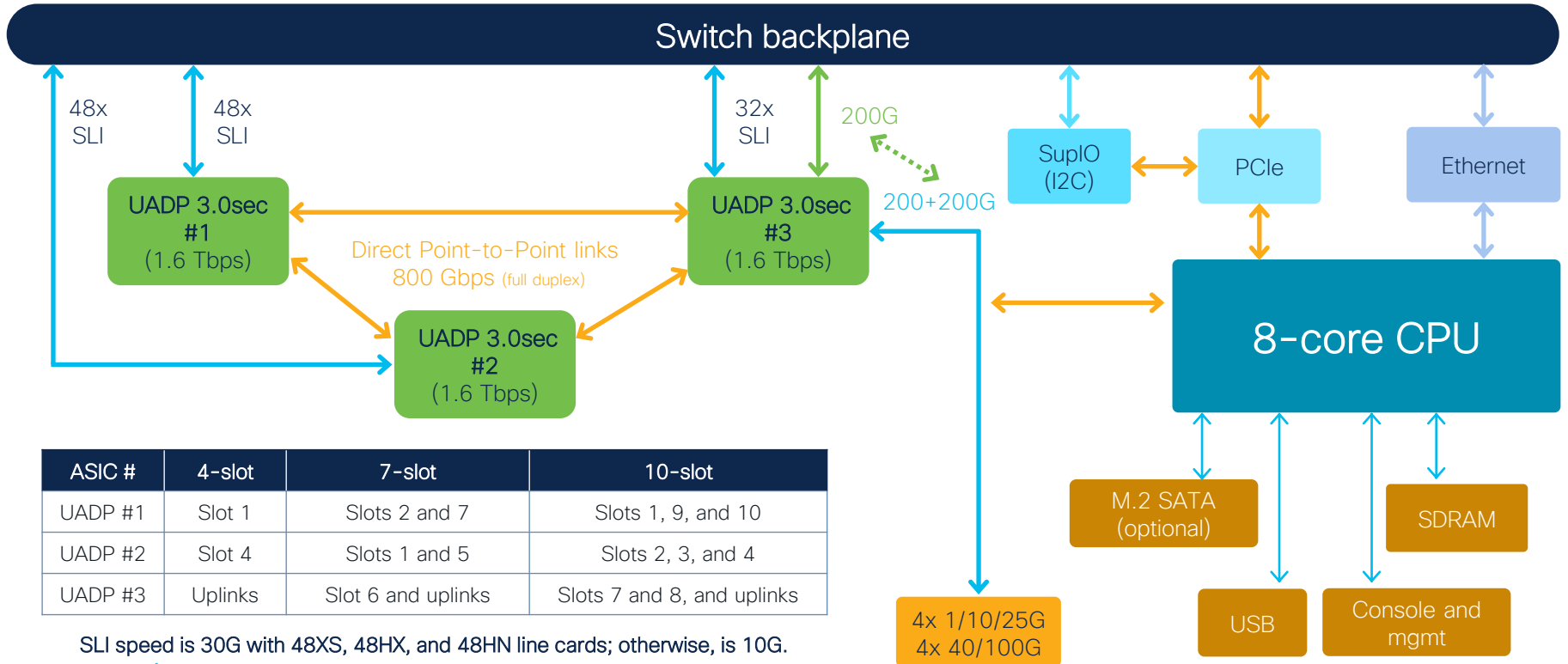
Cisco Catalyst 9400 Series

Centralized Modular Architecture

Centralized architecture



Catalyst 9400 SUP-2/2XL block diagram



ASIC #	4-slot	7-slot	10-slot
UADP #1	Slot 1	Slots 2 and 7	Slots 1, 9, and 10
UADP #2	Slot 4	Slots 1 and 5	Slots 2, 3, and 4
UADP #3	Uplinks	Slot 6 and uplinks	Slots 7 and 8, and uplinks

SLI speed is 30G with 48XS, 48HX, and 48HN line cards; otherwise, is 10G.

Line cards - RJ-45 (TrustSec and MACsec-256)

DATA



C9400-LC-48T

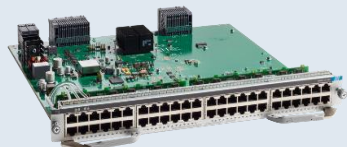
48x 10/100/1000M

POE+/UPOE



C9400-LC-48P

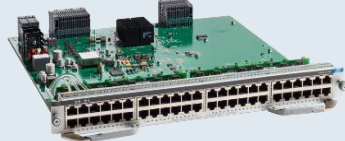
48x 10/100/1000M PoE+



C9400-LC-48U

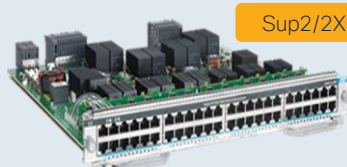
48x 10/100/1000M UPOE®

UPOE +



C9400-LC-48H

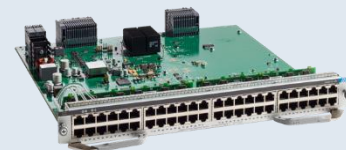
48x 10/100/1000M
UPOE+/802.3bt



C9400-LC-48HX

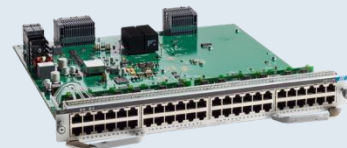
48x 10GbBaseT, 2.5/5G mGig,
100/1000M
UPOE+/802.3bt

MultiGigabit



C9400-LC-48UX

24x MultiGigabit + 24 10/100/1000



C9400-LC-48HN

48x 100M/1G/2.5G/5G/10G
PoE+/UPOE+
up to 90W

Line cards – SFP/SFP+ (TrustSec and MACsec-256)

1/10Gb SFP/SFP+



C9400-LC-48XS

48x 1/10Gb SFP/SFP+



C9400-LC-24XS

24x1/10Gb SFP/SFP+

1 Gb SFP



C9400-LC-24S

24x1Gb SFP



C9400-LC-48S

48x1Gb SFP

Bandwidth Boost with Gen2 Supervisors



Cisco C9400 SUP 1/1XL

Cisco C9400X
SUP2

Cisco C9400X
SUP2XL

	Type	C9404R	C9407R	C9410R	C9404R/C9407R/C9410R	C9404R/C9407R/C9410R
C9400-LC-48HX	UPOE+	-	-	-	240	480
C9400-LC-48XS	Fiber	-	-	-	240	480
C9400-LC-48UX	UPOE	80 / 240	80 / 120	80	240	240
C9400-LC-24XS	Fiber	80 / 240	80 / 120	80	240	240
C9400-LC-48HN	UPOE+	80 / 120	80 / 120	80	240	240



Not Supported

Bandwidth in Gbps

3x Bandwidth Uplift for Gen1 LCs (80G -> 240G) on 10 Slot Chassis w/ SUP2XL

2x Bandwidth Uplift for Gen1 LCs (120G -> 240G) on 7 Slot Chassis w/ SUP2XL

Concurrent POE Port Density with C9400-LC-48HX

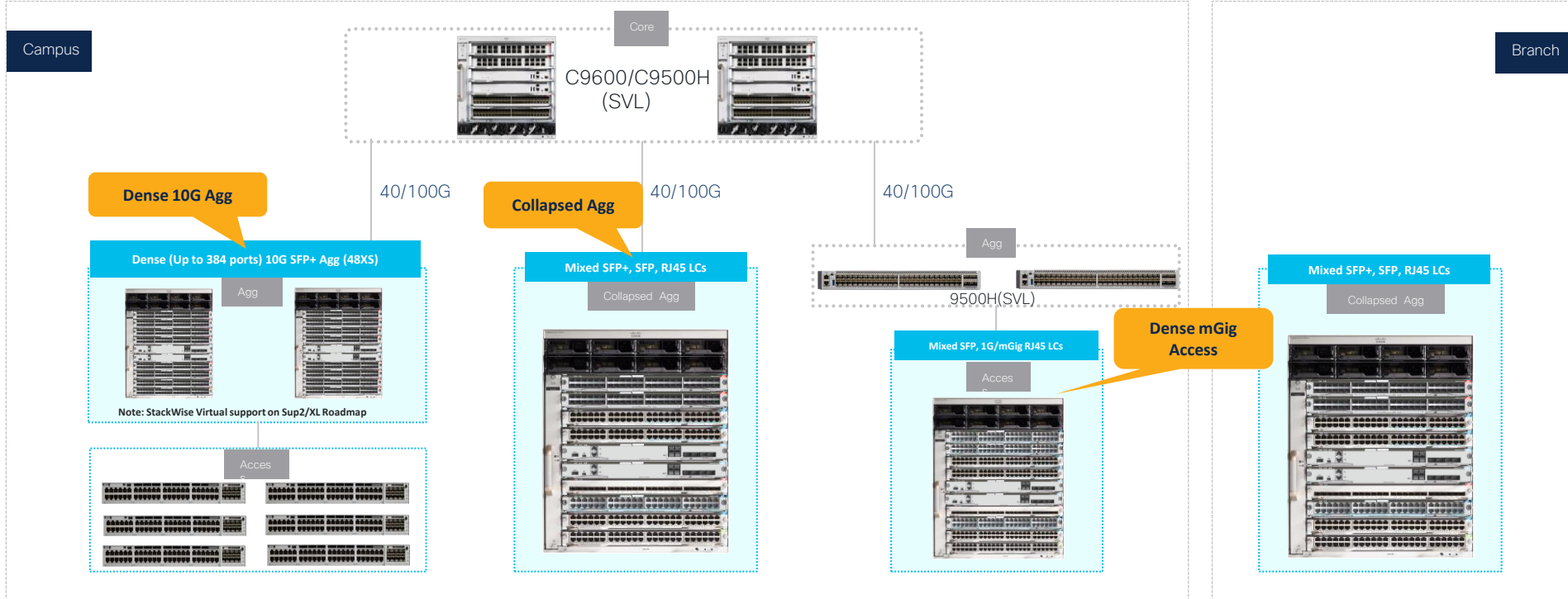
With 3200W Power Supply in Combined Mode(Fully loaded PSUs):



Total Ports	96 ports	240 ports	384 ports
UPOE + 90W	96 ports (Fully loaded chassis)	226 ports (Up to 4 fully loaded LCs + 34 Ports)	224 ports (Up to 4 fully loaded LCs + 32 Ports)
UPOE 60W	96 ports (Fully loaded chassis)	240 ports (Fully loaded chassis)	336 ports (Up to 7 fully loaded LCs)

Catalyst 9400 Deployment Flexibility

C9400X enables dense 10G SFP+ aggregation and multigigabit access use cases



Core and Distribution



C9500X - S1 Q200
C9500H - UADP 3.0
C9500 - UADP 2.0XL

Catalyst 9500

Cisco Catalyst 9500 Series

Purpose-built fixed core/aggregation switches

UADP 2.0XL



UADP 3.0



Silicon One Q200

- 40G at the price of 10G
- Industry's first 40G enterprise switch
- Optimized 10G switch for midsize backbone

- Up-to 48x 25 GE Ports
- Industry's first 100G enterprise switch
- Flexible templates

- Reversible Bi-directional Airflow
- Ultra Deep 8GB Buffers
- High route scale (2M) and Mac scale (256K)



Modular fans



Modular uplinks



Modular power supplies



Storage for application hosting

Catalyst® 9500X – Extending Cisco® Catalyst® 4500-X and 6800 Series leadership in fixed core

Up to 6 Tbps

Up to 8 Bpps

No oversubscription

8x 400GE Density

Pluggable SSD storage

USB 3.0

8x memory and 4x flash

8 core CPU

Customizable templates

Cisco StackWise® Virtual

Catalyst 9500X Family

Extending the Catalyst 9500 high-performance fixed core



Non-XL scale

Catalyst® 9500H
(UADP 3.0)



C9500-32C / C9500-32QC



C9500-48Y4C / C9500-24Y4C

3.2 Tbps
32x 100G or
48x 25G + 4x 100G

Core
+
Edge

XL scale

Catalyst 9500X
(Silicon One™ Q200)



C9500X-28C8D



C9500X-60L4D

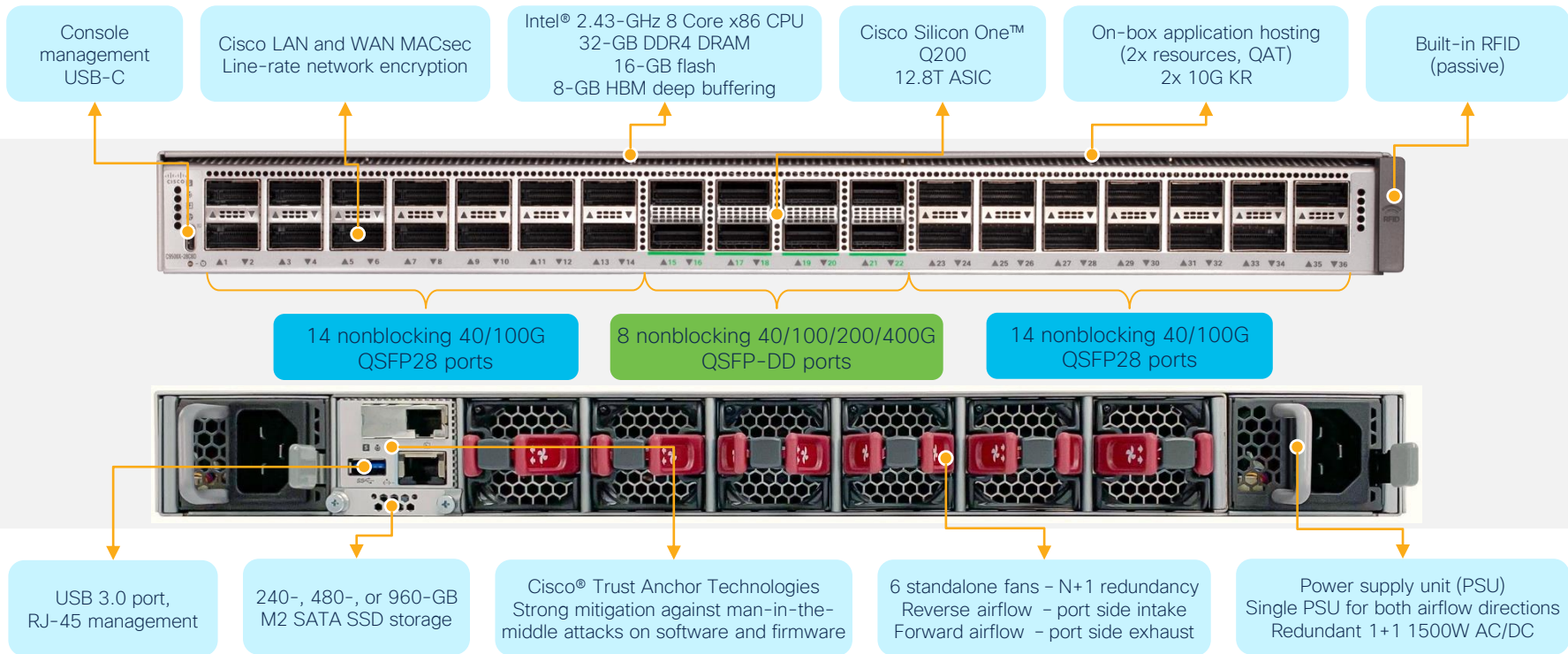
IOS-XE 17.10.1

2X

6.0 Tbps
28x 100G + 8x 40/100/400G or
60 x 10/25/50G + 4 x 40/100/400G

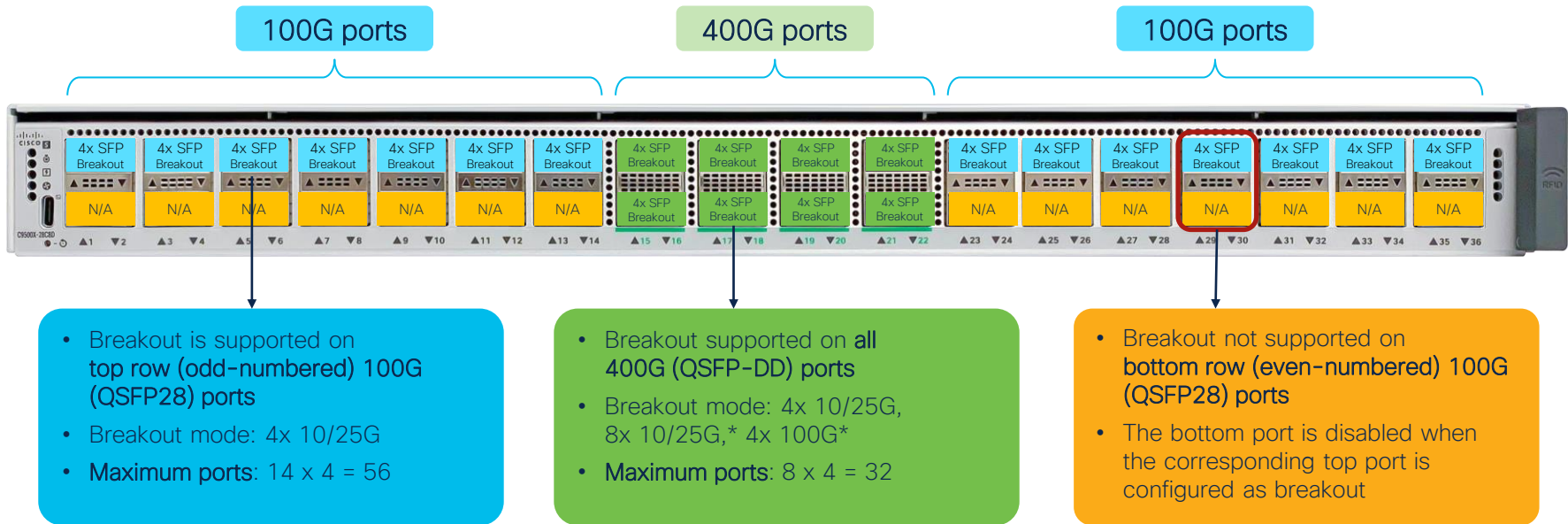
Cisco Catalyst C9500X-28C8D: line rate 6T of capacity

High-level overview



C9500X-28C8D

SFP breakout and QSA* support

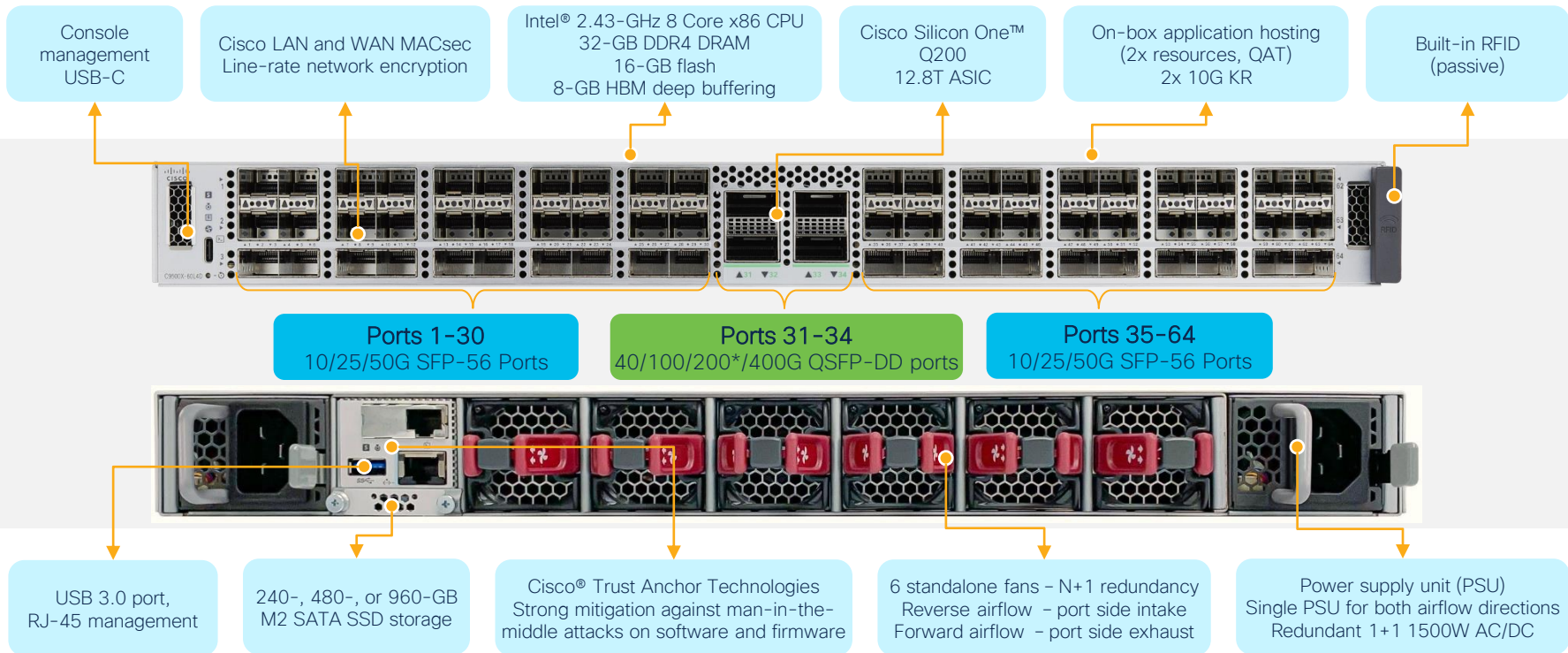


Maximum ports with breakout at FCS: 88 (56 + 32)

* Hardware capable. System can support up to 120x 10/25G.

Cisco Catalyst C9500X-60L4D: line rate 4.6T of capacity

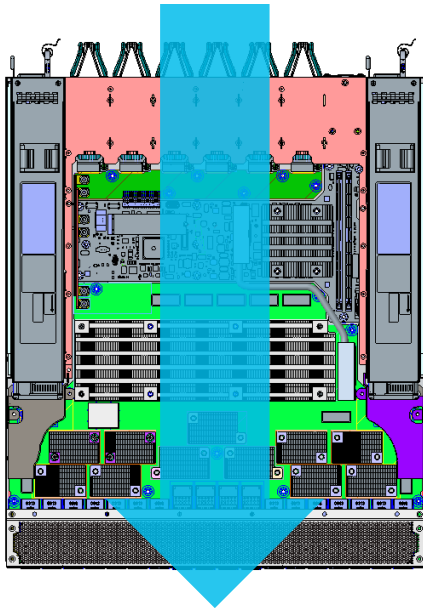
High-level overview



C9500X – Reversible Airflow

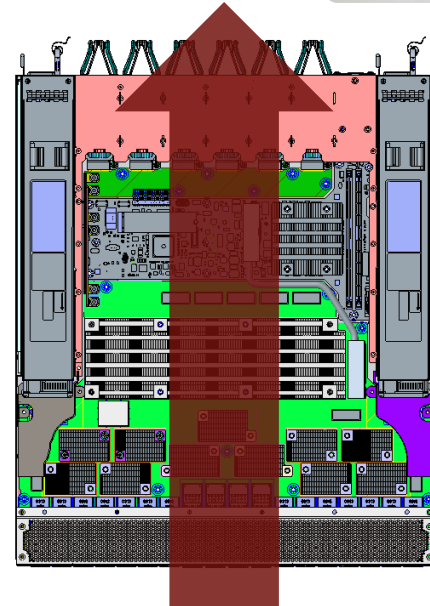


Back to Front
Port-side Exhaust



- Color of Fan Unit handle/latch represents direction of airflow
- Different Fan PIDs for different airflow directions
 - **Royal Blue** – Back to Front
 - **Burgundy** – Front to Back
- All Fans must be the same color (direction) to work correctly

Front to Back
Port-side Intake



Single 1500W AC/DC PSU
with Cisco Grey latch
for both airflow directions

Catalyst 9600

Catalyst 9600 Series

Extending Modular Core with a Performance-Optimized Supervisor 2



Supervisor 1

Total Capacity

4.8 Tbps

Slot B/W

1.2 Tbps



Gen1
1.2T /slot

Gen2
3.2T /slot



Supervisor 2

Total Capacity

12.8 Tbps

Slot B/W

3.2 Tbps

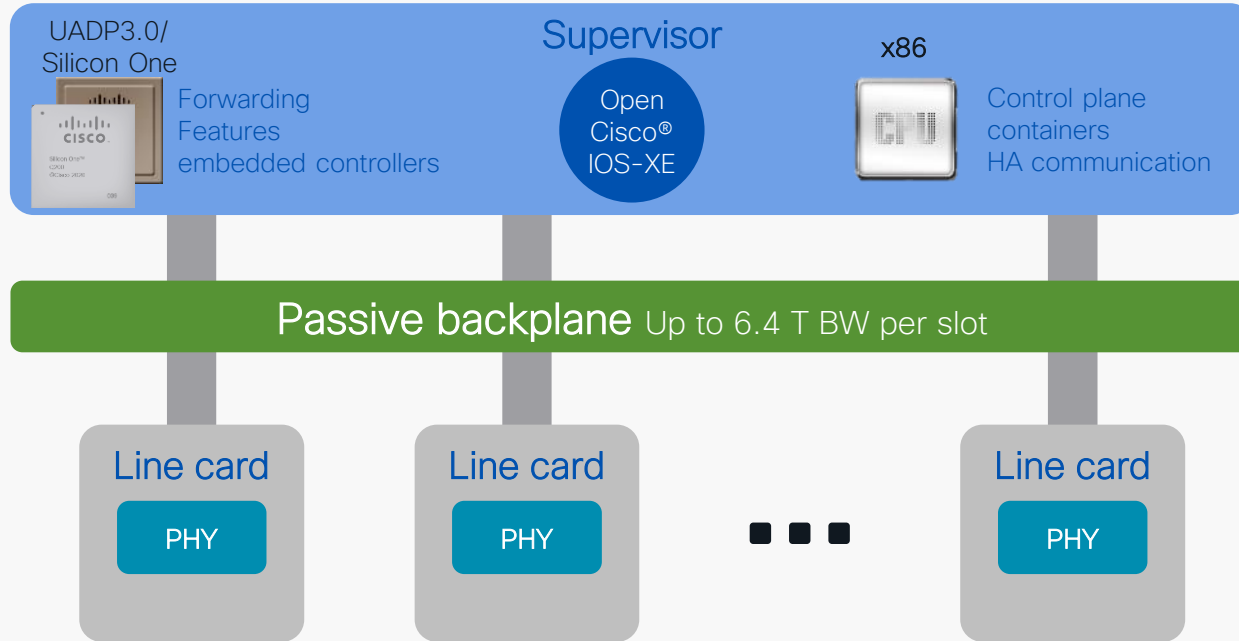


Gen1
1.2T /slot

Gen2
3.2T /slot

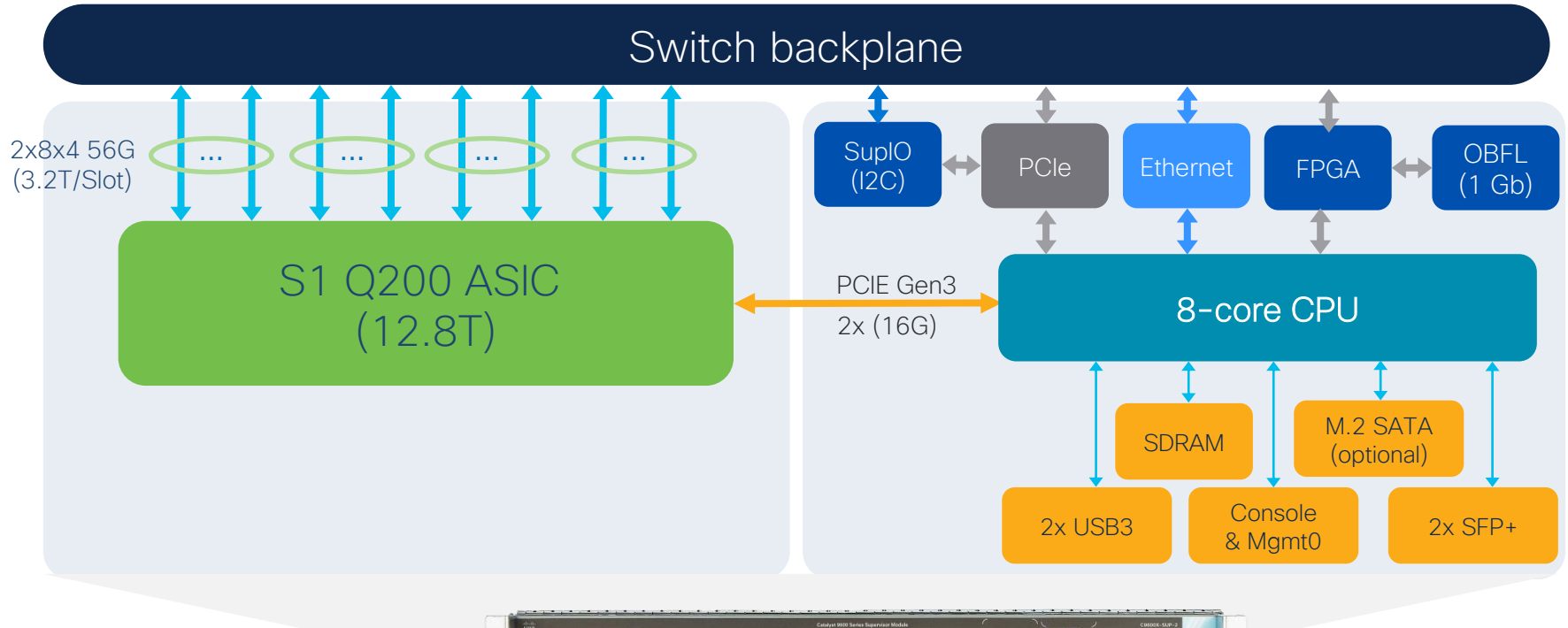
Architecture

Centralized architecture



- Centralized architecture => **Uninterrupted supervisor switchover**
- Centralized architecture (Forwarding, queuing, and security are done on the supervisor) => **Unlock new capability** with a supervisor upgrade
- **Transparent line cards => Compatible** with new sup
- Passive backplane => **High MTBF**
- x86 CPU + storage => **App hosting**

C9600X-SUP-2 Block Diagram

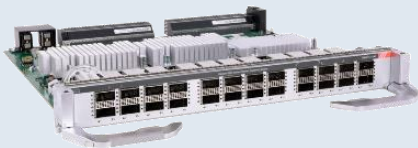


Cisco Catalyst 9600 Series Line cards

Generation 1 Line Cards

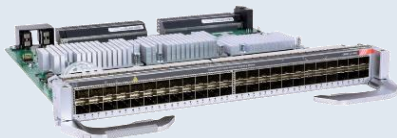
C9600-LC-24C - 100G/40G (fiber)

- 24 ports
- QSFP28/QSFP+
- Supports 100G and 40G



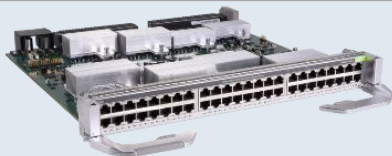
C9600-LC-48YL - 50G/ 25G/10G/1G (fiber)

- 48 ports
- SFP28/SFP+/SFP
- Supports 25G, 10G, and 1G



C9600-LC-48TX - mGig (copper)

- 48 ports
- Copper 10G (NBASE-T/10BASE-T)
- Supports 10G,5G,2.5G,1G,100M and 10M



C9600-LC-48S- 1G (fiber)

- 48 ports
- SFP
- Supports 1G



Generation 2 Line Cards

IOS-XE 17.7.1

C9600-LC-40YL4CD - 400G/200G*/100G/50G/40G/ 25G/10G (fiber)

- 40+2+2 ports
- SFP56/QSFP56+/QSFPDD
- Supports 400G,200G*, 100G,50G,40G,25G and 10G



IOS-XE 17.9.1

C9600X-LC-32CD - 400G/200G*/100G/40G(fiber)

- 30+2 ports
- SFP28/QSFPDD
- Supports 400G,200G*, 100G, and 40G



C9600-LC-40YL4CD

Gen2 Modules - Combo 40 x SFP + 4 x QSFP

IOS-XE 17.7.1

3.2 Tbps

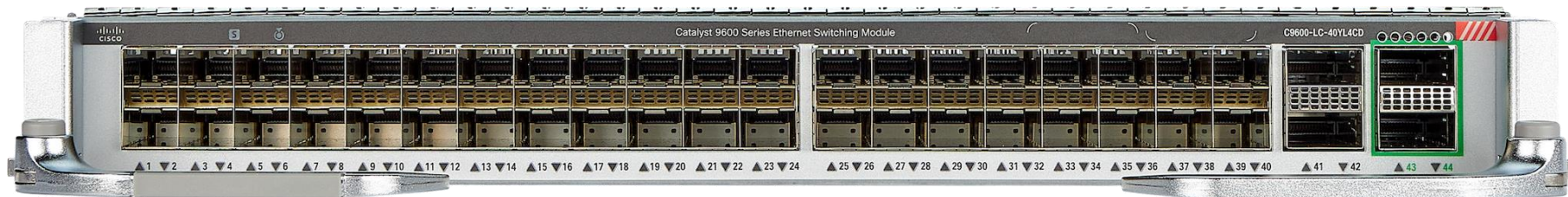
- 3.2 Tbps when working with C9600X-SUP-2
 - 40x SFP56 ports - 10/25/50GE
 - 2x QSFP56 ports - 40/100/200GE
 - 2x QSFPDD ports - 40/100/200/400GE
- 1.2 Tbps when working with C9600-SUP-1
 - 40x SFP28 ports - 1/10/25GE
 - 2x QSFP28 ports - 40/100GE
- 8x **Marvell 7121M CDR5M PHYs**
 - MACSec, WAN-MACSec, ClearTag v3.4
 - IEEE 1588 & PTPv2
 - Hitless MUX (HMUX)
- Various Breakout & QSA support (QSFP ports)*



Supervisor 2



Supervisor 1



C9600X-LC-32CD

Gen2 Module - 30 x QSFP28 + 2 x QSFP-DD

3.2
Tbps

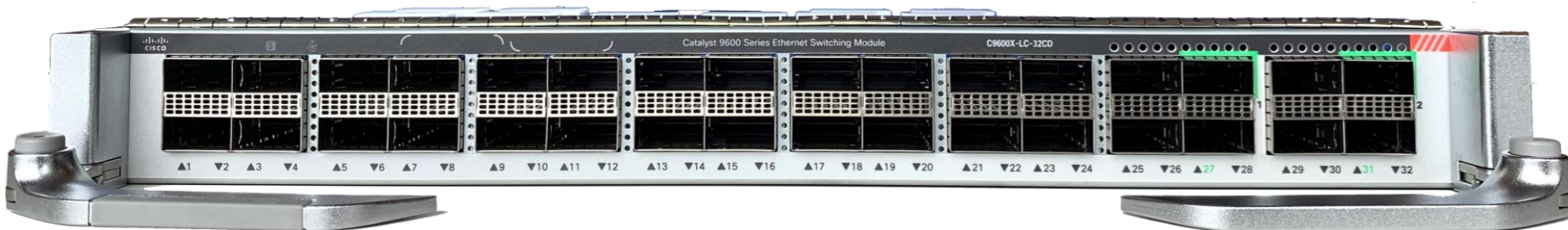
- **3.2Tbps with Supervisor 2 Only**
 - 30 x QSFP28 ports, 40/100GE
 - 2 x QSFP-DD ports, 40/100/200*/400GE
- **NOT supported with Supervisor 1**
- **8 x CDR5M + 2 x CDR5L PHYs**
 - MACSec, WAN-MACSec, ClearTag v3.4
 - IEEE 1588 & PTPv2 (Precision Time Protocol)
 - Hitless MUX (HMUX)



Supervisor 2



Supervisor 1



* Hardware capable

Catalyst 9600 Line Card Support Matrix



	C9606 Chassis	
	C9600-SUP-1	C9600X-SUP-2
C9600-LC-24C	✓ 24x 40G or 12x 100G	✓ 24x 40G/100G (No MACsec)
C9600-LC-48YL	✓ 48x 1/10G and 25G	✓ 48x 10/25G and 50G* (No MACsec, no 1G)
C9600-LC-48TX	✓ 48x 1/2.5/5G and 10G (Multigigabit)	✓ 48x 10G (No MACsec, no 1/2.5/5G)
C9600-LC-48S	✓ 48x 1G SFP	✗
C9600-LC-40YL4CD	✓ 40x 1/10G and 25G + 2x 40G and 100G	✓ 40x 10/25G and 50G + 2x 40/100G and 200G* + 2x 40/100/200G* and 400G MACsec and WAN MACsec (no 1G)
C9600-LC-32CD	✗	✓ 30x 40/100G + 2x 40/100/200G* and 400G MACsec and WAN MACsec (no 1G)



SUP2 hardware does not support 1GE or below speeds natively

If 1GE downlinks are required, use SUP1

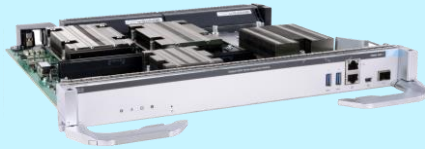


Catalyst 9500 & 9600 Series Core Positioning

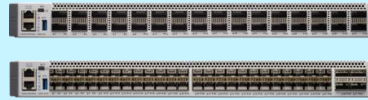
Next Generation Core + Edge Switching with Silicon One™ Q200



Feature Optimized C9500 & C9600-SUP-1



C9600-SUP-1



C9500

- ✓ Best-in-class Enterprise Core feature set
- ✓ Low speeds (1G – 40G) and port density
- ✓ Comprehensive MPLS, EVPN and SDA
- ✓ Ideal for Campus Core, Collapsed Core + Agg

Ideal for **C6K non-XL** deployment migration



Performance Optimized C9500X & C9600X-SUP-2



C9600X-SUP-2

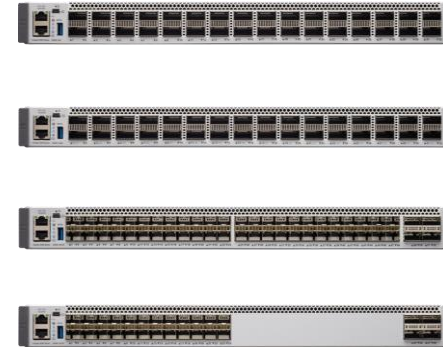


C9500X

- ✓ Unmatched forwarding scale and performance
- ✓ High speeds (10G – 400G) and port density
- ✓ Scaled MPLS and SDA, WAN-MACsec
- ✓ Ideal for Campus Core + Edge, or Centralized WLC

Ideal for **C6K XL** deployment migration

Modular vs. Fixed Platforms



Modular

PROs

- **More Flexible**
- Longer Life-Cycle
- Higher Port Density
- More Power/Cooling
- Redundant Processors

CONs

- **More Complex**
- BW limit by Chassis
- Slow(er) Dev & Test
- Lower MTBF
- Higher COGs

Fixed

PROs

- **Less Complex**
- Swap Chassis for BW
- Faster Dev & Test
- Higher MTBF
- Lower COGs

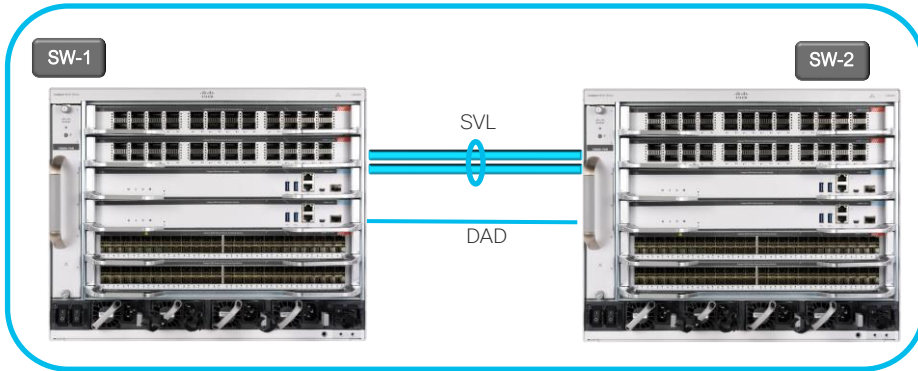
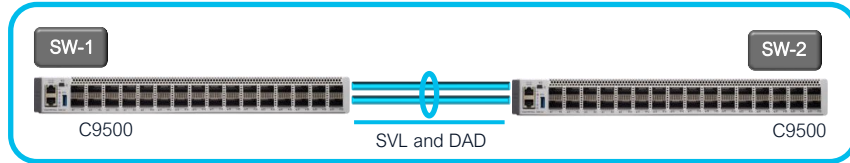
CONs

- **Less Flexible**
- Shorter Life-Cycle
- Lower Port Density
- Less Power/Cooling
- Single Processor

Features



StackWise Virtual



- Supported on C9400, C9500 and C9600 platforms.

- Simplify Operations by Eliminating STP, FHRP and Multiple Touch-Points
- Double Bandwidth & Reduce Latency with Active-Active Multi-chassis EtherChannel (MEC)
- Minimizes Convergence with Sub-second Stateful and Graceful Recovery (SSO/NSF)

App Hosting on C9K Switches

Existing Hardware

Managed via CLI
or Cisco DNA Center

Real Time Processing

Lower Latency

Save Bandwidth



IT Operations and
Monitoring Tools

Consolidate Physical
Infrastructure



Security Agents
and Functions

Enhance Visibility &
Security Enforcement



Cloud Gateways with
Serverless Edge Compute

Reduce App Latency
& Optimize App Traffic

Cybervision



NS1.

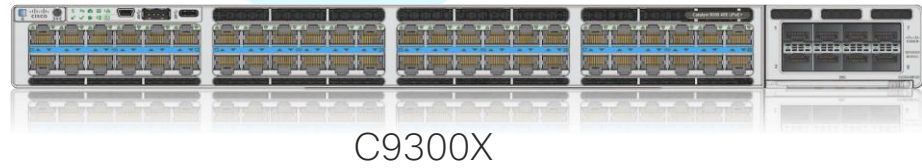
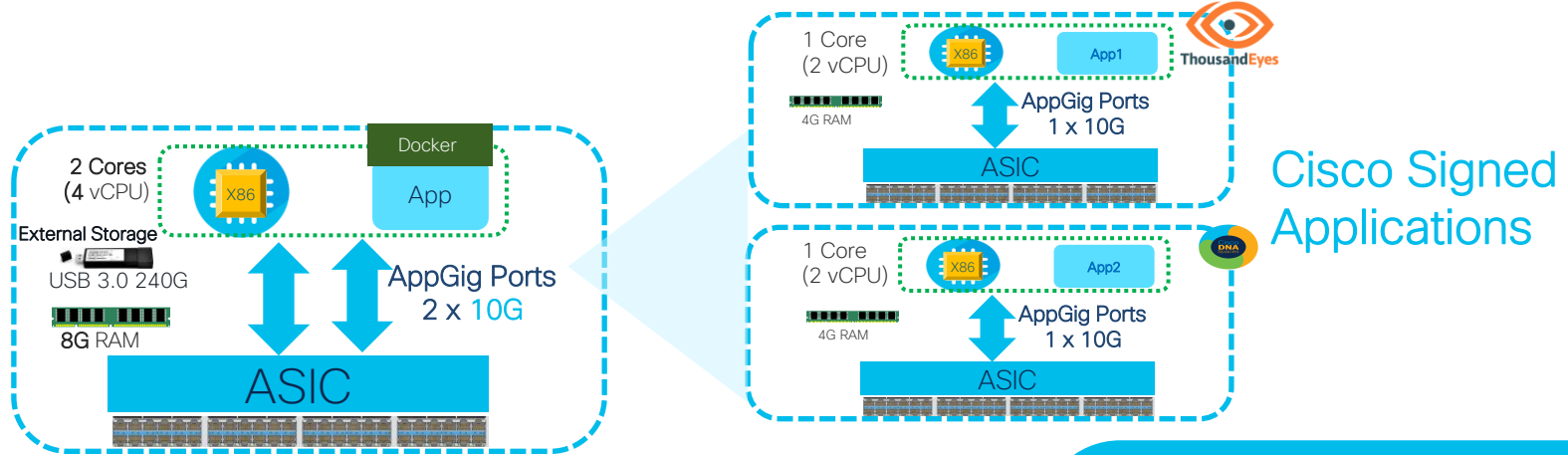


Customer Specific
Applications

3rd Party App Hosting

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

Enhanced Application Hosting Infrastructure on C9300X



- Support for Multiple Docker applications**
With Additional RAM Memory and 2 x AppGigabit Ports, multiple Cisco Signed performance savvy Applications can be hosted on C9300X
- Hardware Acceleration and Security**
QAT is a special engine on the x86 CPU which helps in accelerating the performance of Applications

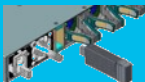
HW resources for App Hosting

	Resource type	Catalyst 9300	Catalyst 9300-X	Catalyst 9400	Catalyst 9400-X	Catalyst 9500	Catalyst 9500-X	Catalyst 9600	Catalyst 9600-X
Networking	AppGig Port	1x1G	2x10G	1x1G	2x10G	Mgmt Port*	2x10G	Mgmt Port*	Mgmt Port* (2x10G CPU ports)
Resources	Memory	2GB	8GB	8GB	8GB	8GB	8GB	8GB	8GB
	CPU	1 core	2 core	1 core	1 core	1 core	1 core	1 core	1 core
	Storage	240GB (USB3.0/SSD)	240GB (USB3.0/SSD)	480-960GB (SATA)	480-960GB (SATA)	480-960GB (SATA)	480-960GB (SATA)	480-960GB (SATA)	480-960GB (SATA)

* Using loopback with any external ports

Catalyst 9300-X

USB 3.0
240GB




Back panel



Catalyst 9400-X

M2 SATA
480/960GB




Plug into removable SUP



Catalyst 9500-X

M2 SATA
480/960GB




Back panel



Catalyst 9600-X

M2 SATA
480/960GB



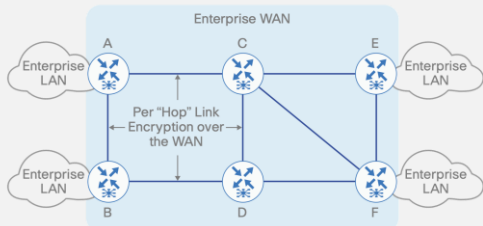
Plug into removable SUP



WAN MACsec overview and use cases

Enabled in hardware on Catalyst 9000 Switches

MACsec

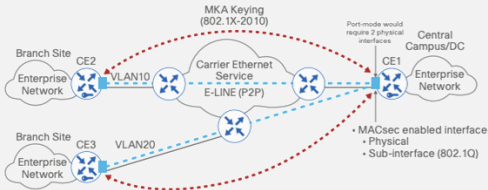


- Hop-by-hop encryption
- Directly connected Layer 2 links **only**
- Secure any direct link in campus/WAN, including DWDM
- 256/128-bit AES encryption



Supported on **all Catalyst® 9000** models
All ports and speeds simultaneously

WAN MACsec



- End-to-end encryption across Layer 2 Ethernet WAN service
- EoMPLS/VPLS, Q-in-Q
- Point-to-point or point-to-multipoint
- Applications include secure site interconnect, DCI, storage replication
- 256/128-bit AES encryption



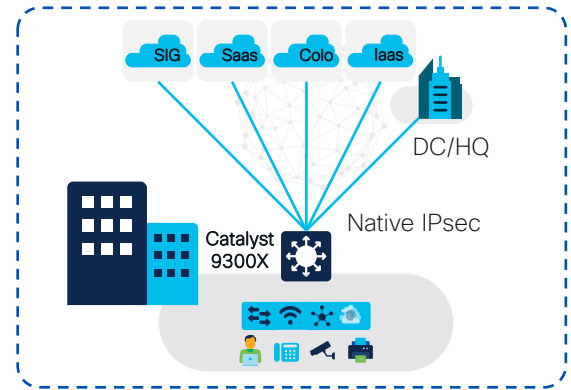
Catalyst 9600X Catalyst 9500X
Supported on **Silicon One™** platforms*
All ports/speeds (up to 400G) simultaneously

Catalyst 9300X – Purpose built for the new edge

Software
Cisco IOS® XE 17.6.2
With Cisco DNA Advantage
(HSEC key for export control)



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

Policy Based Routing

VRF-aware

Multicast Routing

NAT traversal

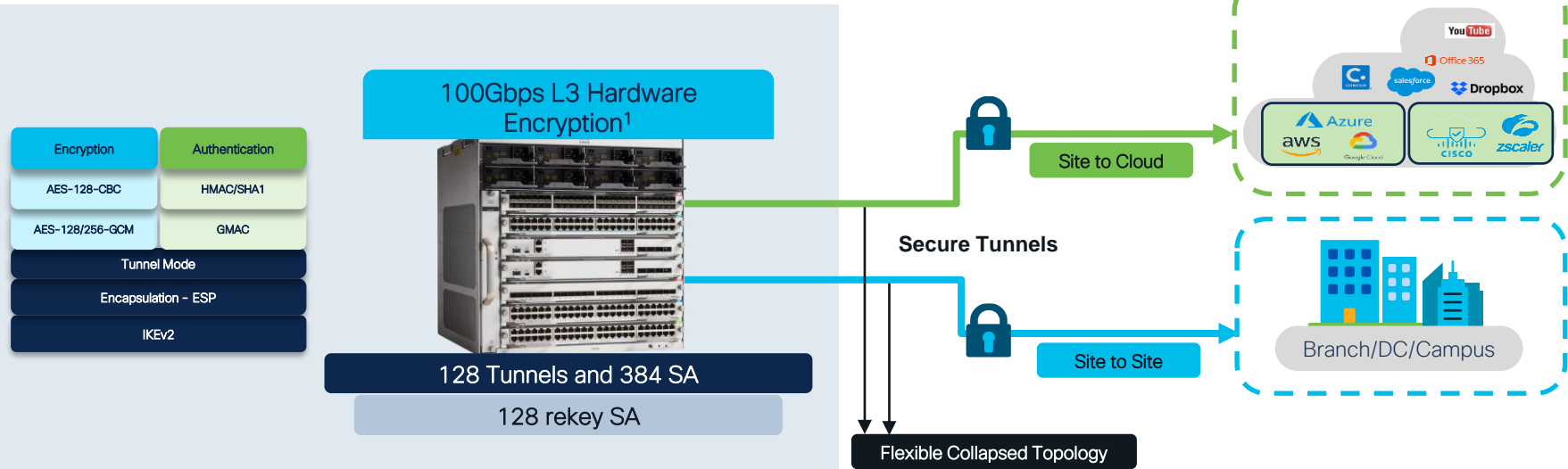
Layer 3 segmentation over IPsec

Layer 2 extension over IPsec

Catalyst 9400X – Modular Collapsed Edge/Distribution

100Gbps IPsec support powered by UADP 3.0sec ASIC

IOS-XE 17.10.1 



Consistent with C9300X IPsec*

With added flexibility and redundancy of modular platforms

IPsec HA on dual sup is not supported

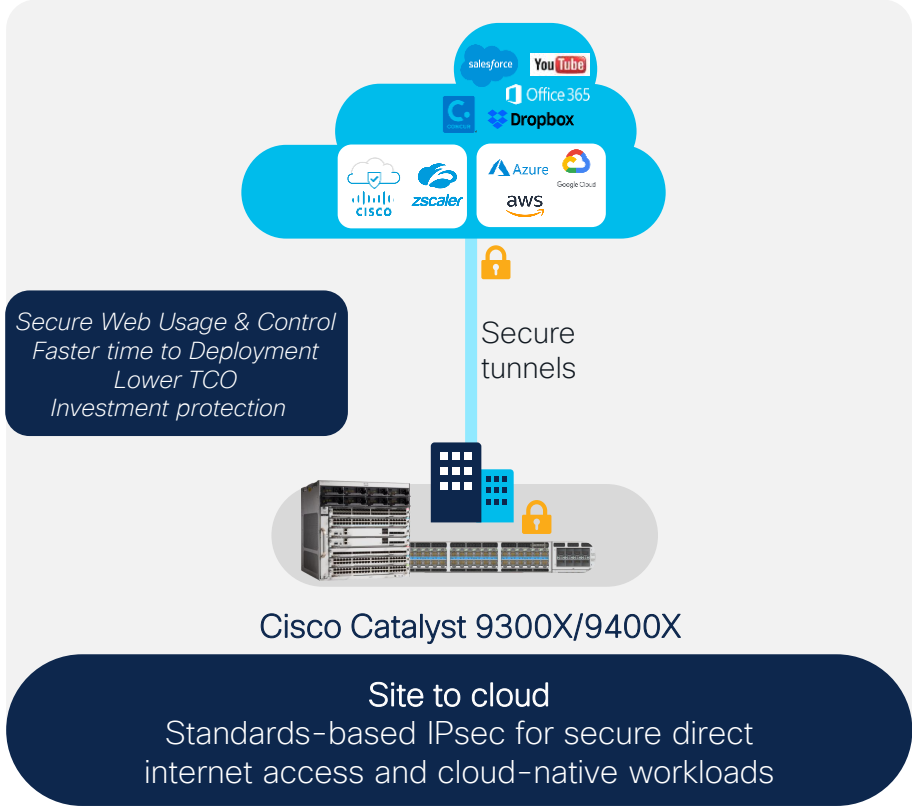
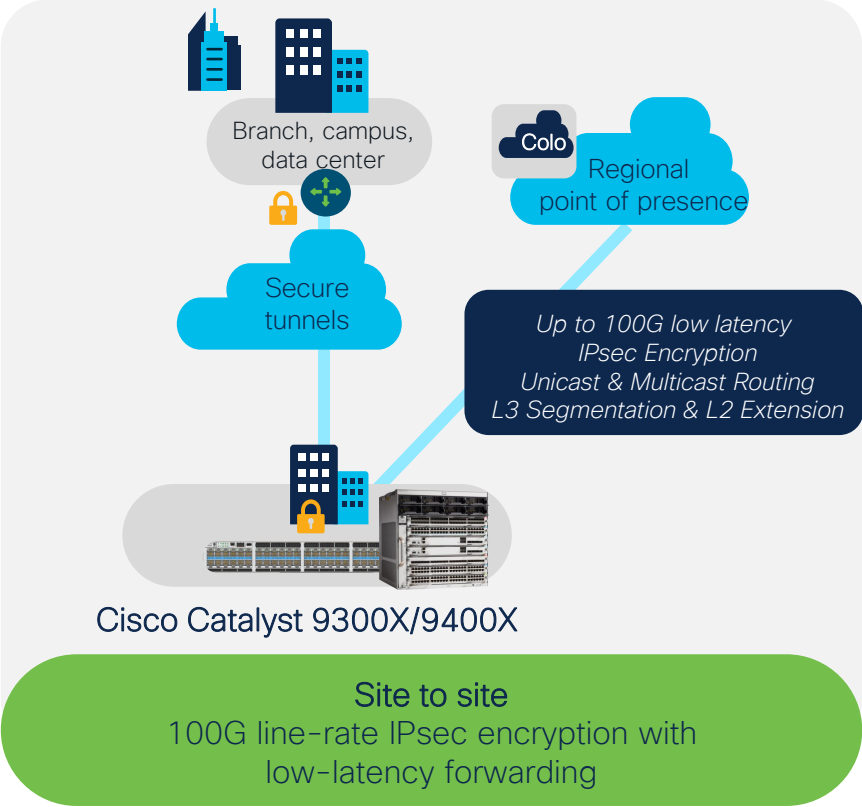


*Roadmap (NAT-Traversal, BGP-EVPN Over Ipsec)

¹Requires a HSEC License to Enable IPsec

Catalyst 9300X/9400X – Purpose built for the New Edge

Secure connectivity to anywhere



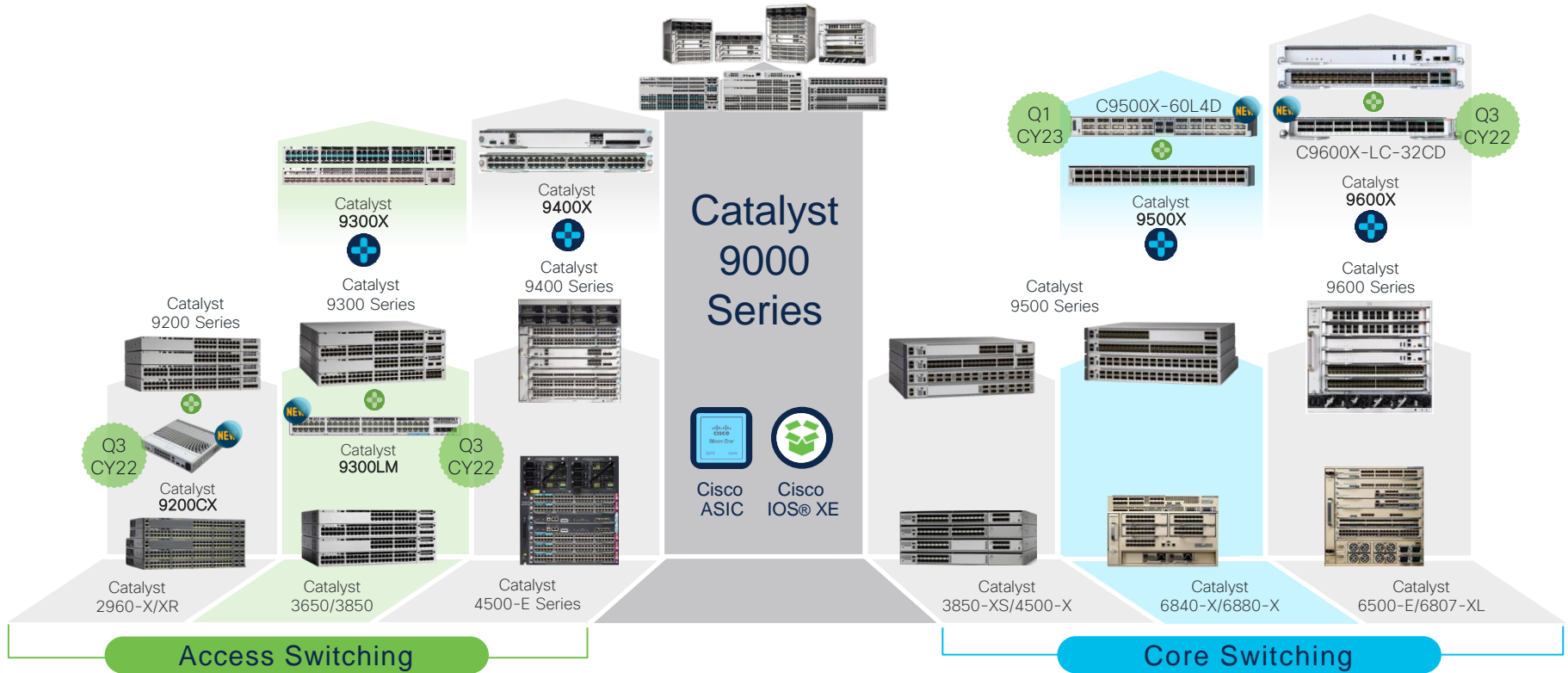
Summary



Cisco Catalyst 9000 Switching Portfolio

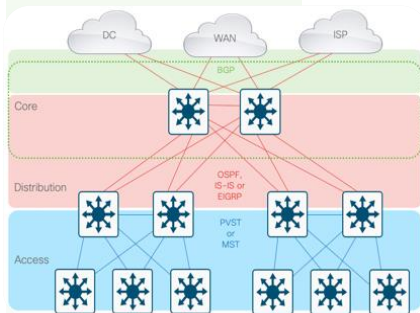
One Family from Access to Core – Common Hardware & Software

2022 **NEW**



Campus Architectures with Catalyst 9000

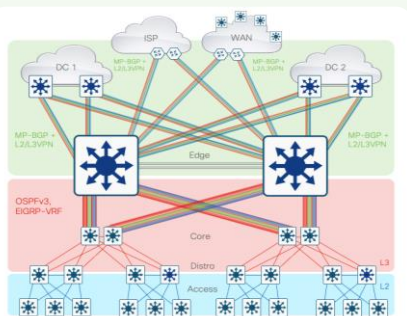
1 Traditional (L2/L3)



- L2 (PVST, MST) Services at Access
- L2/L3 boundary at Distribution
- L3 - Dist. & Core
- BGP between Core & WAN

Base L2 Switching, Base L3 Routing,
Simple ACL, Simple QoS

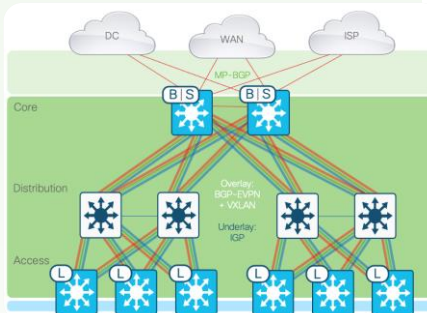
2 MPLS (L2/L3VPN)



- L3 Underlay + L2/L3 VPN Overlay
- Virtual Private Networks
- L3 VRF-based Segmentation
- WAN/Edge + VPN Services

MP-BGP, PIC, LDP, MPLS/VPLS, SR
MVPN, LSM, Extranet, MSR
SSO, NSF/NSR, ECMP, GIR
VPN-FNF, Uniform/Pipe QoS, PBR, IPACL

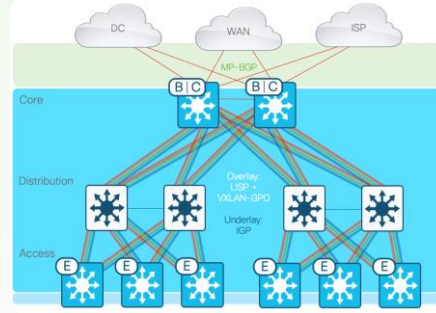
3 EVPN (L2/L3VNI)



- L3 Underlay + L2/L3 VNI Overlay
- Virtual Network Instances
- L2/L3 VNI-based Segments
- Common WAN/LAN Services

MP-BGP + EVPN AF, VXLAN, VRF-Lite
Anycast Gateway, TRM, L2 BUM
SSO, NSF/NSR, ECMP, GIR
Fabric-FNF, Uniform QoS, IPACL/OGACL

4 SDA (L2/L3VNI + SGT)



- L3 Underlay + L2/L3 VNI Overlay
- Scalable Group Tagging
- L2/L3 VNI + SGT Segments
- LAN Services + Group-Based Policy

LISP, VXLAN, MP-BGP, VRF-Lite
Anycast GW, LISP HER/Native, L2 BUM
SSO, NSF/NSR, ECMP, GIR
Fabric-FNF, App QoS, SGACL

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