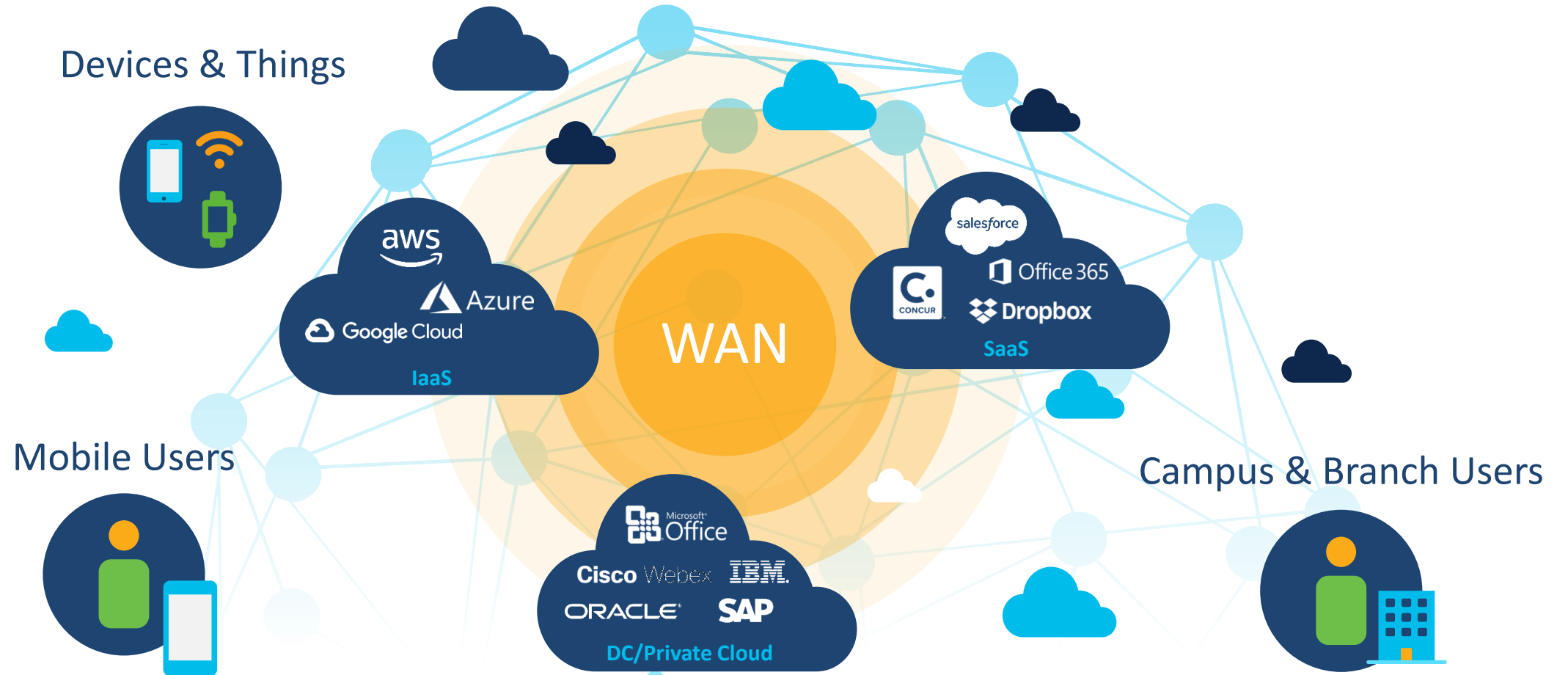# Catalyst 8000 Edge Platforms

Keegan Uchacz
Systems Engineer
December 10, 2020

Agenda

- Business Forecast

- Why is it "Catalyst"?

- What makes it great?

- How does this help us?

Journey to Cloud
Fueled by Technology Transformation

Multicloud

5G, Edge Compute

AI/ML Insights

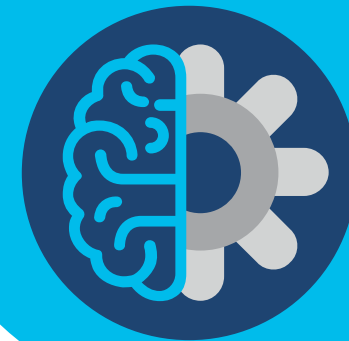"Cloud migration will continue to accelerate the adoption of SD-WAN"
- Markets & Markets

"5G Enterprise Market is expected... CAGR of over 42% during the forecast period (2020-2025)... pushing toward the industrial revolution 4.0"
- Mordor Intelligence Report

"By 2022, 72% of network strategists project using AI-enabled predictive insights or prescriptive remediation"
- Cisco VNI Report

Facilitating more service acceleration at the edge in a multicloud world

Powered by secure cloud scale SD-WAN
Cisco's flexible architecture for Intent-based Networking

Any Deployment

Management & Analytics

On-premise | Cloud | Multi-tenant
Automation | Network Insights | Machine Learning | AI
Open | Programmable | Scalable

Any Service

Multicloud Optimization
Multi-Layer Security
Analytics
Voice
Multi-Domain IBN Policy

Any Transport

Satellite
Internet
MPLS
5G/LTE

Any Location

Branch
Colocation
AWS Azure Cloud
Remote Work

Cisco Catalyst 8000 Edge Platforms Family

Cloud — VNF

Catalyst 8000v
Hypervisor/Cloud

Catalyst 8500

Headend — QFP

User Centric Design

Branch — x86

Catalyst 8300

IOS XE
Common Software Architecture

x86, QFP
Scalable Hardware Architecture

Under the Hood

Cisco Catalyst 8000 Edge Platforms Family
The Leading SD-WAN Edge Platforms with Rich Services

Performance and Rich Services →

C8500-12XQC (30Gbps+ SD-WAN IPsec)

C8500-12X (number coming soon)

C8300-2N2S-4T2X (5Gbps+ SD-WAN IPsec)
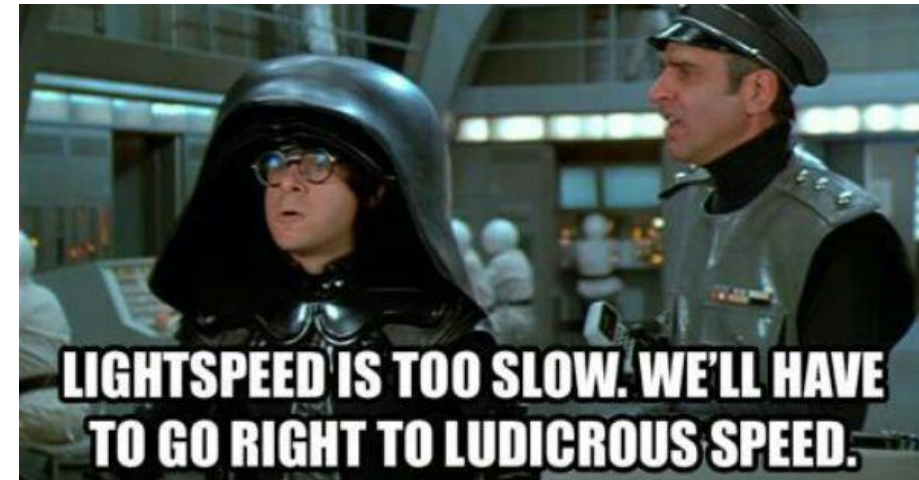
C8300-1N1S-4T2X (5Gbps+ SD-WAN IPsec)

C8300-2N2S-6T (up to 2Gbps SD-WAN IPsec)

C8300-1N1S-6T (up to 2Gbps SD-WAN IPsec)

LIGHTSPEED IS TOO SLOW. WE'LL HAVE TO GO RIGHT TO LUDICROUS SPEED.

Scalable Architecture with x86 and QFP

Third Generation QFP ASIC Innovation

2X queues
256k

Up to 2X NBAR
Up to 80Gbps

Inline crypto
Up to 133Gbps

3X CEF
Up to189Gbps

8X DRAM
32M CGN | 6M FW
Sessions

CISCO
© 08-1083-02
964142 ES
L842F021
MY
M8BG455600220

Integrated L2 MAC

Compact, Powerful
100/40/10/1 GE

Enhanced QoS/Buffering
Ingress classification, oversubscription

Security
WAN Macsec

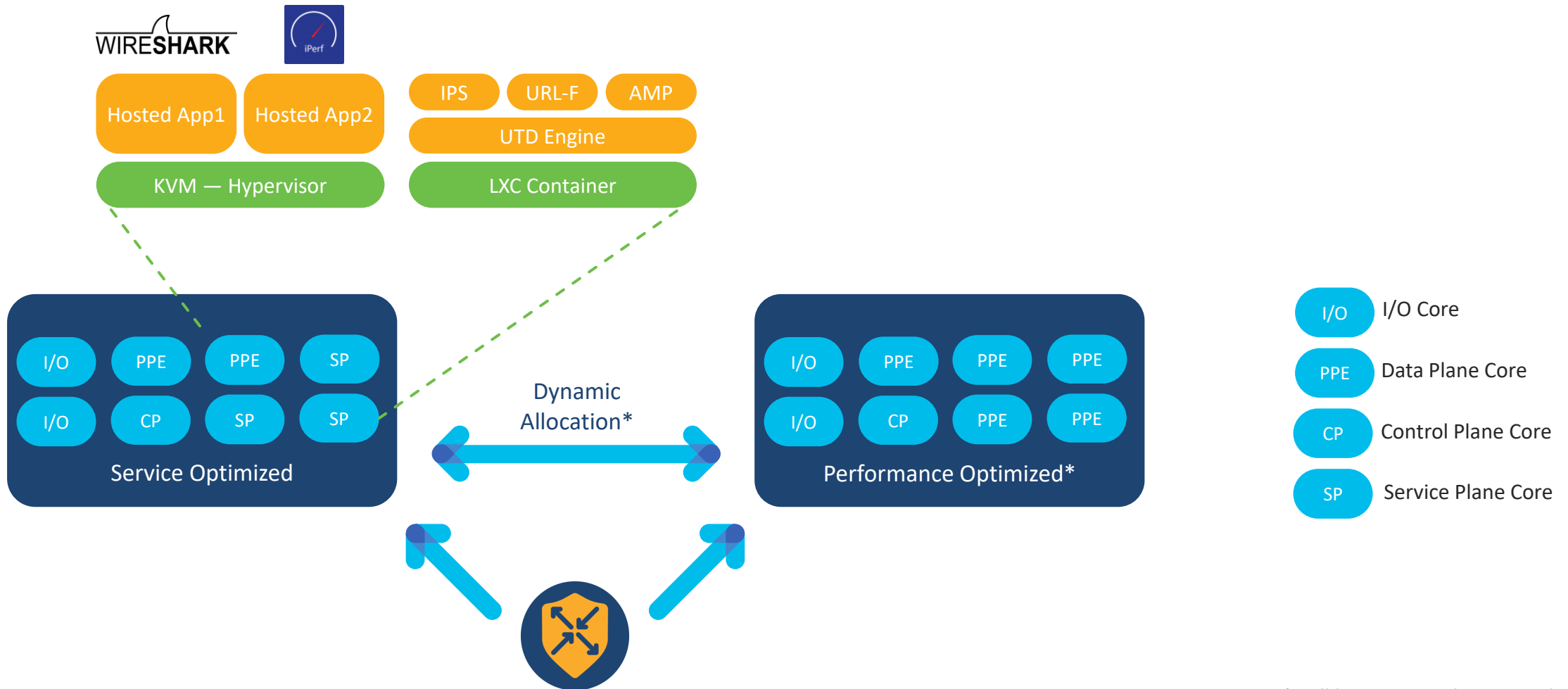Time Sensitive Networking
IEEE 1588*

* not supported in sw yet

Scalable & Programmable ASIC – Adapts to the New Technologies

x86 System on Chip (SoC) Architecture

x86

X86 Multi-core CPU

WIRESHARK iPerf

| Hosted App1 | Hosted App2 |
| IPS | URL-F | AMP |
| UTD Engine |
| KVM — Hypervisor | LXC Container |

Service Optimized

| I/O | PPE | PPE | SP |
| I/O | CP | SP | SP |

Dynamic Allocation*

Performance Optimized*

| I/O | PPE | PPE | PPE |
| I/O | CP | PPE | PPE |

I/O	I/O Core
PPE	Data Plane Core
CP	Control Plane Core
SP	Service Plane Core

* will be supported in 17.4 release

Flexible Core allocation – meet throughput and services demand
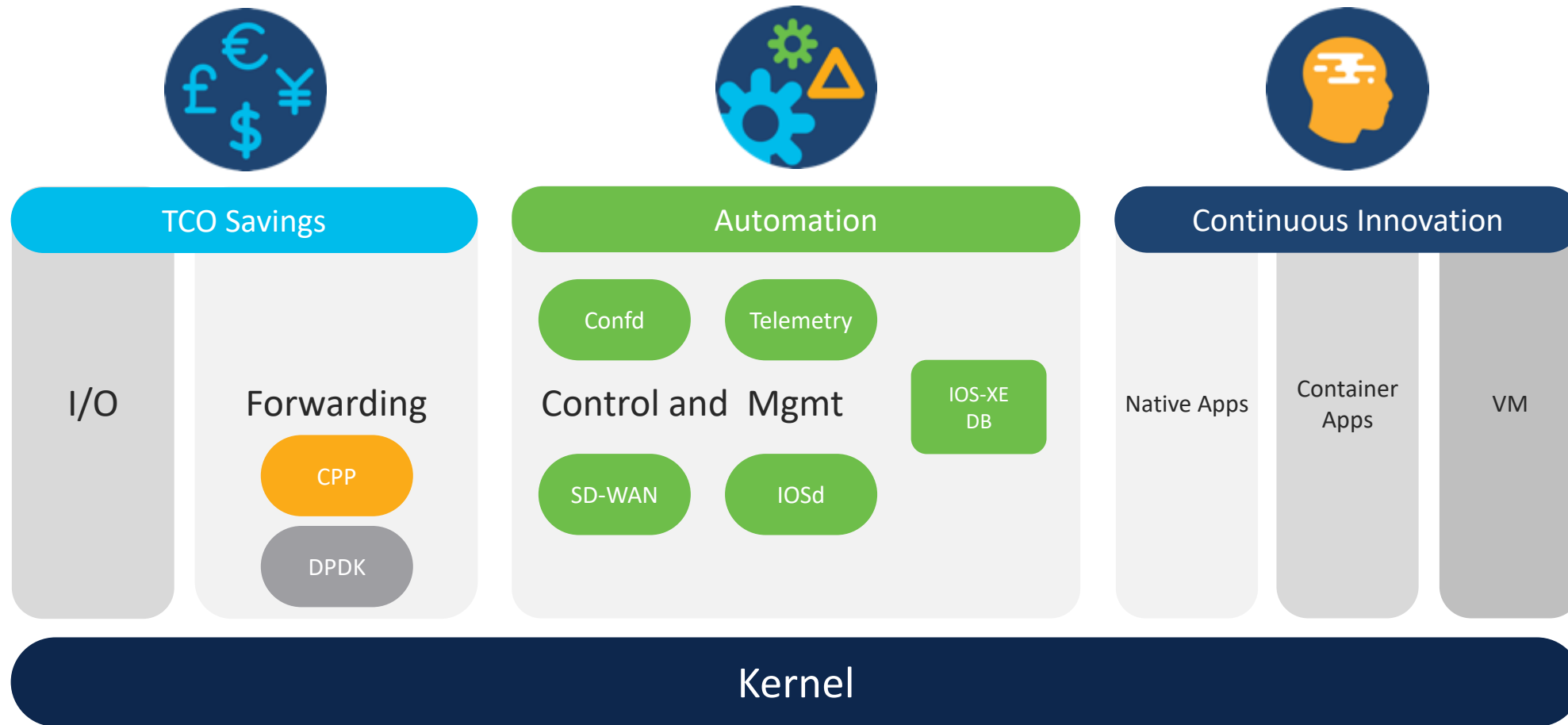
Catalyst 8000 Edge
User Centric Design

Catalyst 8K Family with Built-in Radio Frequency Identification (RFID)

Passive Ultra High Frequency (UHF) RFID

Locating the device easy

Good read range: 1 to 4 meters

Industry standard: ISO 18000-6C compliant

RFID Tag

Inventory Management (Tracking) has never been Easier

Catalyst 8K Family – Label Tray

A plastic strip contains

Product ID   TAN

Serial Number   MAC and

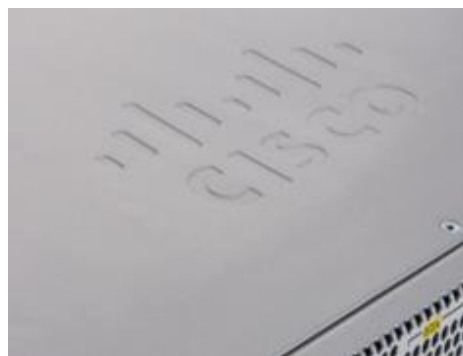CLEI   Hardware version number

QR code encoded above info

Label Tray

Catalyst 8K Family – Industrial Design & Ergonomics
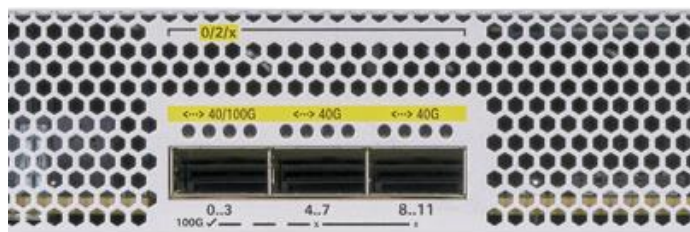
**Circle Pattern
Hex Packing**

**Satin Aluminum Based
Textured Finish**

**Rounded Frame
4 mm**

Catalyst 8500

Cisco Catalyst 8500 Series Edge Platforms
Highly Capable 1RU SD-WAN Headend

Multi-services Support

NBAR2, NAT, Firewall, QoS, etc.
Industry's Leading Service Edge Platforms

Edge Intelligence

Compute
Container based Apps

Scale

Up to 8000 SD-WAN Tunnel Aggregation
High Speed 100/40 Gigabit Ethernet Ports
High Density 10/1 Gigabit Ethernet Ports

Multi-Layer Security

High Throughput MACsec and IPsec
Trustworthy Systems

System

Cisco Catalyst
8500 Series
Edge Platform

Connectivity

All Ports Built-In	WAN MACsec	Third Generation QFP	Up to 200Gbps CEF	5G Ready

Manageability

vManage

Multi-tenant

Open APIs

Analytics
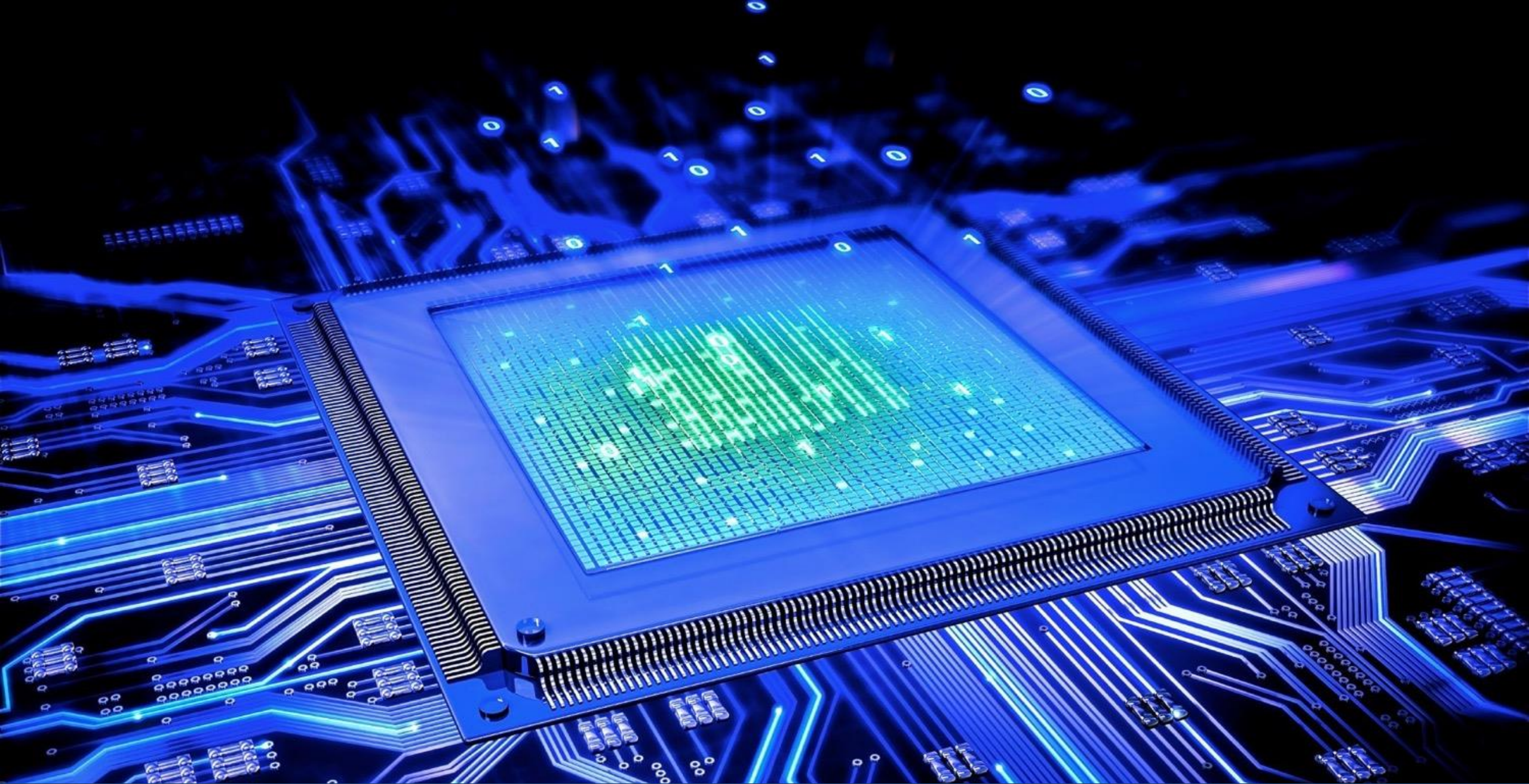
ASICs are a Pillar of Cisco Innovation…

Cisco Enterprise Routing ASIC Leadership
Continuing Investment in Network Processor Technology

QFP

Performance

Over 100 Patents Awarded!

1st Gen QFP
Up to 40G

Cores: 40
Threads: 160

2nd Gen QFP
Up to 60G

Cores: 64
Threads: 256

Fully integrated NPU and IO device

3rd Gen QFP
Up to 200G

Cores: 224
Threads: 896

NPU
#Cores: Number of Packet Processing Engines
Threads: concurrent, parallel threads processed

High Speed Backplane Aggregation ASIC

IO Oversubscription & Aggregation ASIC

2008

2012

2020

Increasing network intelligent and services requirements

Third Generation QFP Architecture

Multicore Architecture

- 28 clusters of 8 PPEs @ 1GHz
- 224 PPEs with 4 threads each = 896 threads

Specialized Hardware Assist

- High Speed Crypto – Inline execution
- Flow queues for complex stateful features

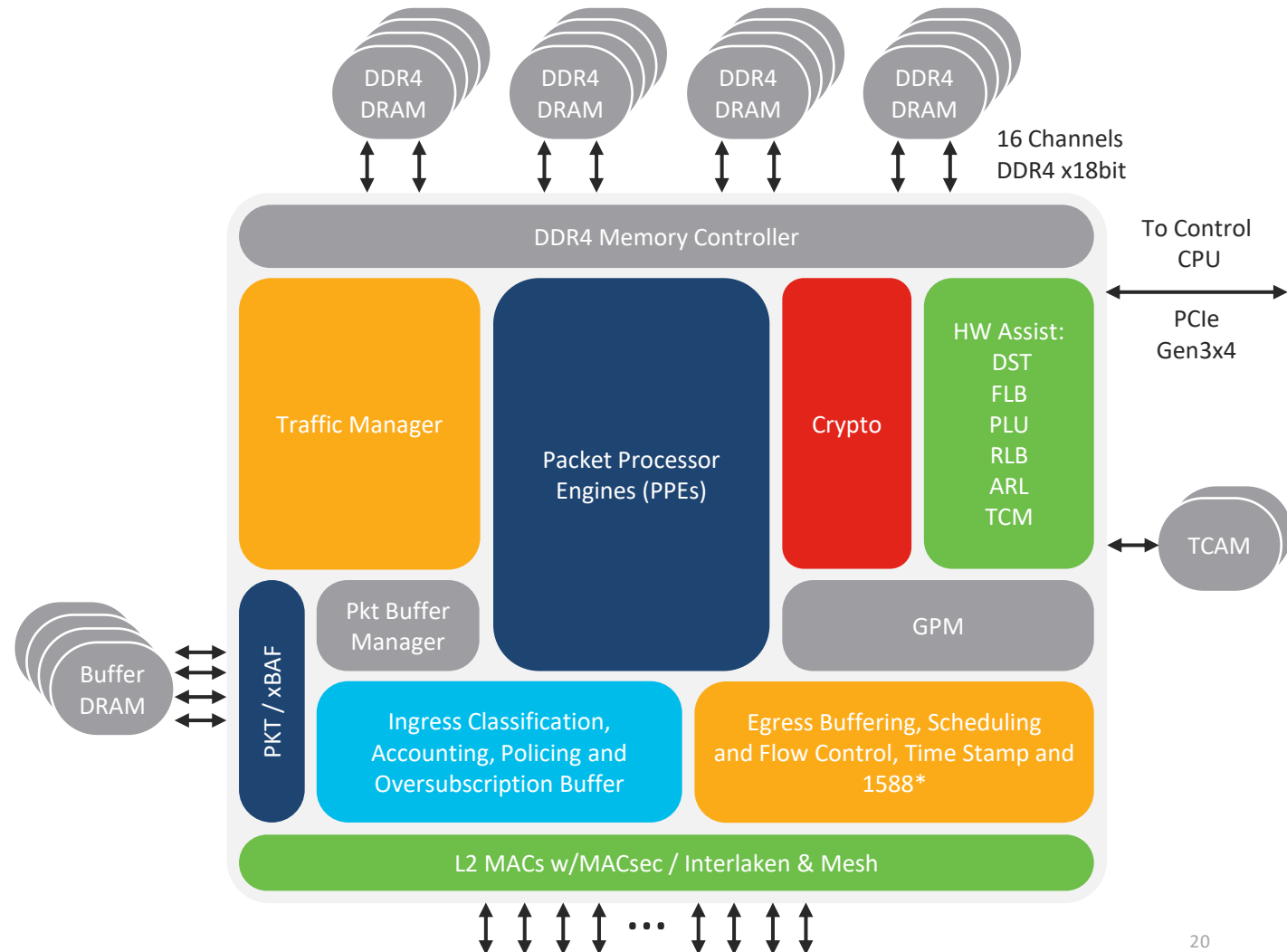## Memory

- 32GB DDR4 Resource memory
- 3 to 4 Billion accesses per second
- 8x increase in Memory for feature scale
- 1.5GB Packet Buffer

DDR4 DRAM · DDR4 DRAM · DDR4 DRAM · DDR4 DRAM

16 Channels DDR4 x18bit

DDR4 Memory Controller

To Control CPU

PCIe Gen3x4

Traffic Manager

Packet Processor Engines (PPEs)

Crypto

HW Assist: DST FLB PLU RLB ARL TCM

TCAM

PKT / xBAF

Pkt Buffer Manager

GPM

Buffer DRAM

Ingress Classification, Accounting, Policing and Oversubscription Buffer

Egress Buffering, Scheduling and Flow Control, Time Stamp and 1588*

L2 MACs w/MACsec / Interlaken & Mesh

*1588 is not supported currently

Third Generation QFP Features

Traffic Manager

256K useable queues

134K scheduling nodes

Event driven flow control

Layer 2 Sub-system

240Gbps Aggregation

Per Port L2/L3 classification
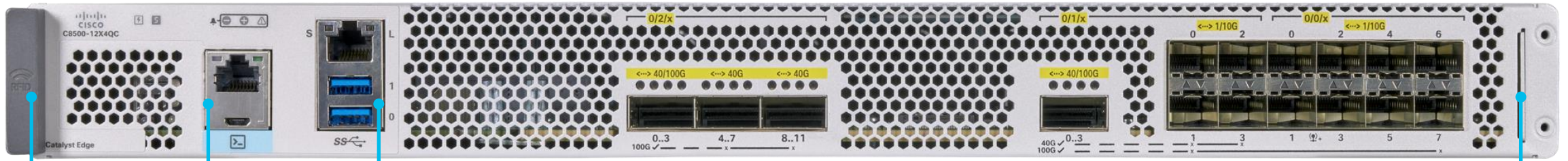
Line rate WAN MACsec

Inline Crypto

Higher IPsec throughput

16 Crypto Engines

Next Generation Strong Encryption: Suite-B

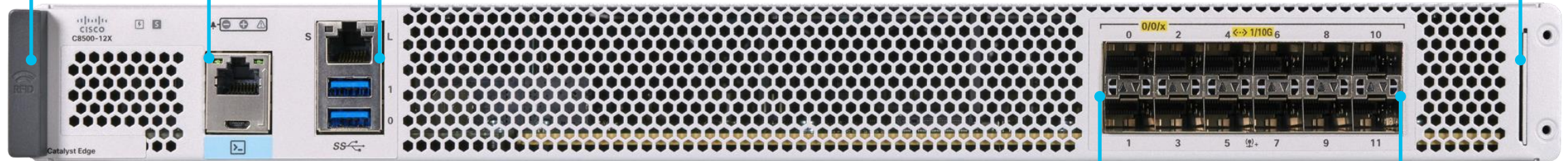# Catalyst 8500 Front View

Built-in I/O
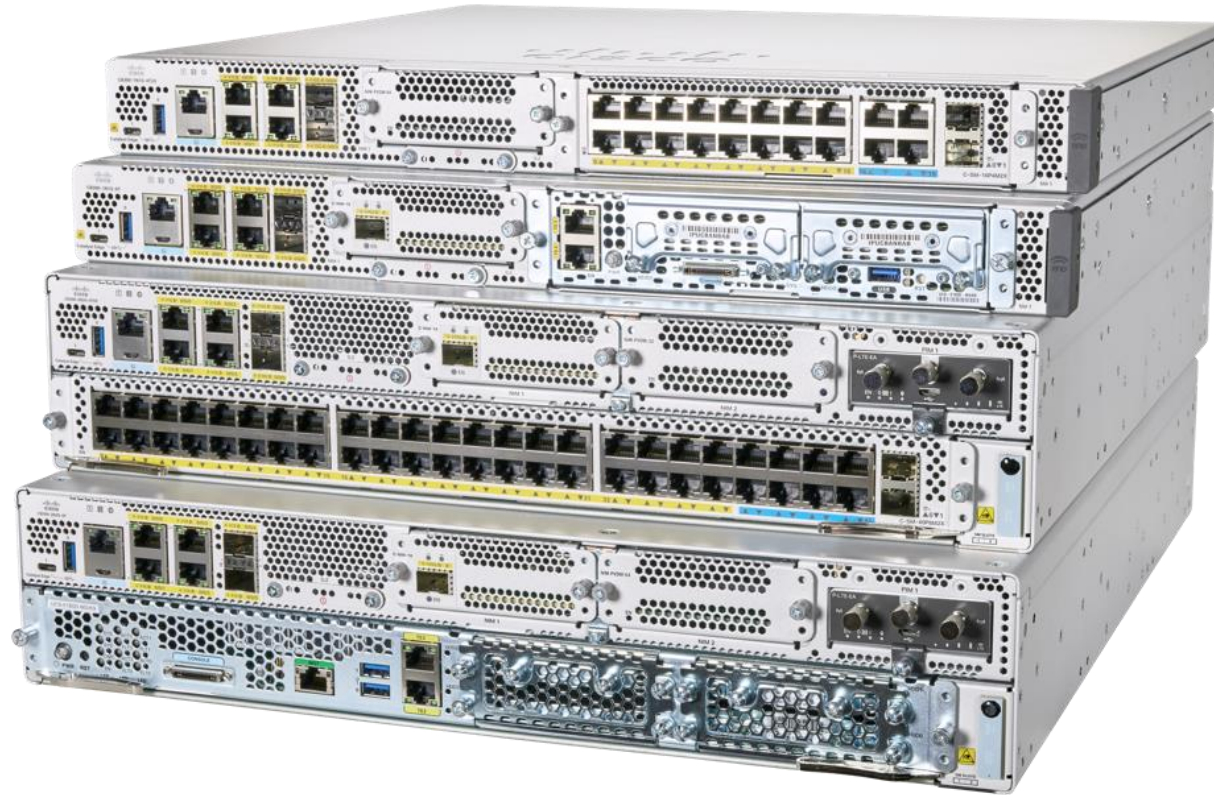
C8500-12X4QC

RFID Tag

RJ45 and Micro USB Console

Mgmt Ethernet & USB3.0

Label Tray

C8500-12X

Built-in I/O

Catalyst 8300

Cisco Catalyst 8300 Series Edge Platforms
Foundation for the Secure Cloud Scale SD-WAN Branch

YES
Modularity

Integrated Rich Services

Voice Survivability, Forward Error Correction and Packet Duplication, TCP Optimization

Edge Intelligence

Compute
Container based Apps

Scale

Up to 5x IPSec and IP CEF Performance
Core Availability for 3-4x
Services Performance

Multi-Layer Security

SSL Acceleration
Application Firewall
IPS/IDS, URL Filtering
AMP, Threatgrid

System

Cisco Catalyst 8300 Series Edge Platforms

Connectivity

Higher WAN Port density

Default 8G DRAM

10GE w/ MACSec

Pluggable NVMe Storage

5G Ready

Manageability

vManage

Multi-tenant

Open APIs

Analytics

Cisco Catalyst 8300 Series Edge Platforms
Introducing 10G in Access with higher port density

10G

C8300-2N2S-4T2X

C8300-1N1S-4T2X

4 RJ45
2 SFP+

1G

C8300-2N2S-6T

C8300-1N1S-6T

4 RJ45
2 SFP

NVMe Storage

UADP-based switch modules/10G WAN module

Higher-efficiency AC and DC power supplies
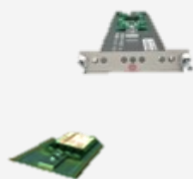
Catalyst 8300 Module Innovation and Compatibility

ISR 4400 Modules Supported*   New Modules

UCS-E M3
SM Modules
Compute

Ethernet WAN
1 x 10G NIM
NG SM-NIM Carrier

4P/8P/8P PoE
NIM Modules
Ethernet LAN
UADP Based 20P/48P
SM Modules

CAT 4/6
NIM Modules
LTE/5G
PIM CAT18 LTE
5G/EIO**

FXS/FXO/BRI/T1E1
SM-NIM Modules
Voice
Voice Modules for IP
Services

Serial/Aync/DSL
Legacy WAN
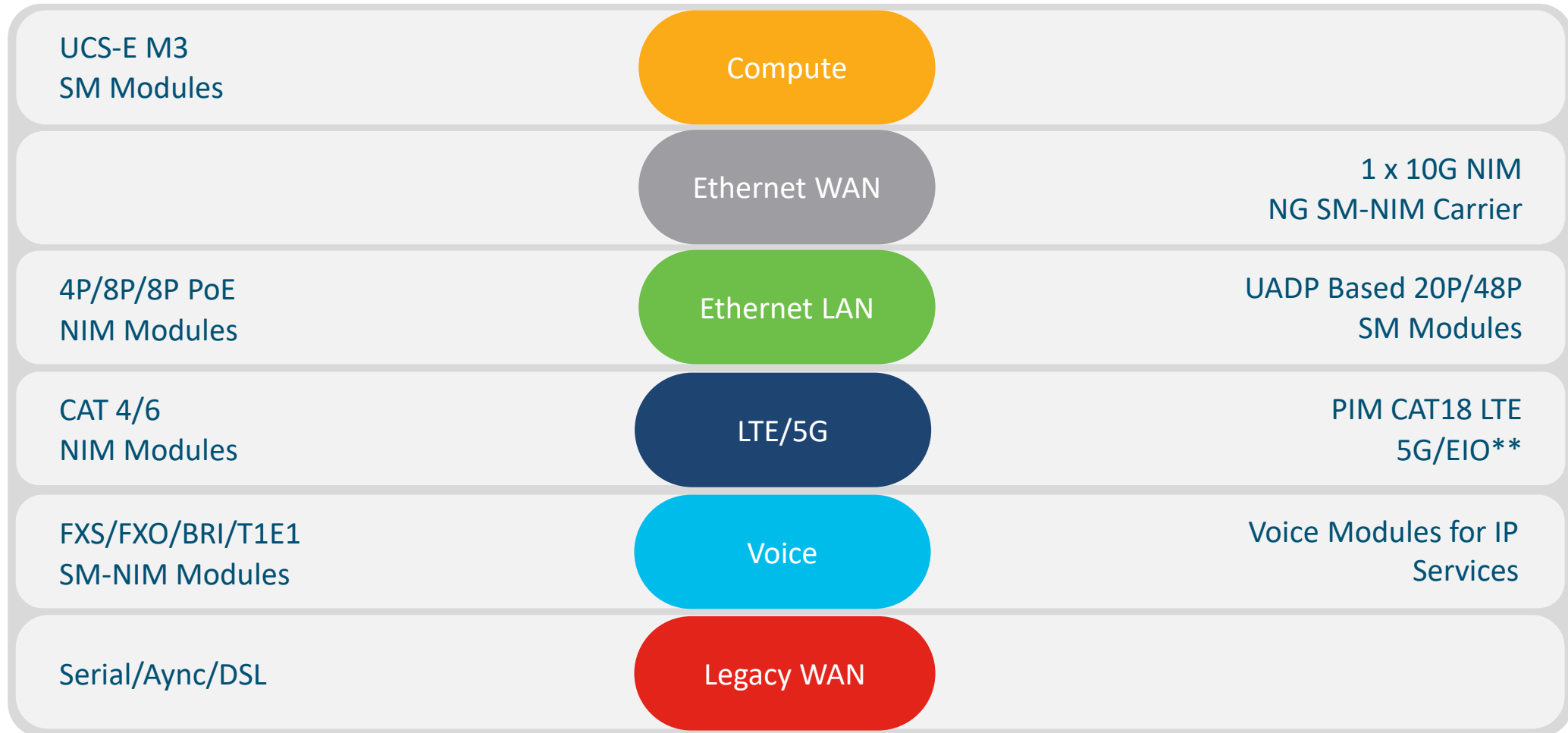
*ISR 4K Modules Not Supported: UCS-E M1/M2, Ethernet SM, Ethernet WAN, SM-NIM Carrier
**5G Roadmap

C8300 Supported Modules

LAN	WAN	LTE	Voice		DSL	Storage
NIM-ES2-8	C-NIM-1X	NIM-LTEA-EA	SM-X-PVDM-3000	NIM-2FXSP	NIM-VAB-A	SSD-M2NVME-600G
NIM-ES2-8-P	NIM-1T	NIM-LTEA-LA	SM-X-PVDM-2000	NIM-4FXSP	NIM-VA-B	M2USB-16G
C-SM-40G8M2X	NIM-2T	P-LTE-VZ	SM-X-PVDM-1000	NIM-2FXS/4FXOP	NIM-VAB-M	M2USB-32G
C-SM-16G4M2X	NIM-4T	P-LTE-NA	SM-X-PVDM-500	NIM-2FXO		
	SM-X-1T3/E3*	P-LTE-US	SM-X-24FXS/4FXO	NIM-4FXO		
	NIM-2BRI-S/T*	P-LTE-JN	SM-X-16FXS/2FXO	NIM-4E/M*		
	NIM-4BRI-S/T*	P-LTE-GB	SM-X-8FXS/12FXO	NIM-2BRI-NT/TE*		
		P-LTE-IN	SM-X-72FXS	NIM-4BRI-NT/TE*		
	WAN + Voice:	P-LTE-AU		NIM-PVDM-32		

Async	NIM-1MFT-T1/E1***	P-LTEA-EA		NIM-PVDM-64	ADAPTOR	UCS-E
NIM-16A	NIM-2MFT-T1/E1***	P-LTEA-LA		NIM-PVDM-128	C-SM-NIM-ADPT	UCS-E160S-M3/K9
NIM-24A	NIM-4MFT-T1/E1***	P-LTEAA-EA		NIM-PVDM-256		UCS-E1120D-M3/k9
SM-X-64A	NIM-8MFT-T1/E1***	P-LTEAP18-GL				UCS-E180D-M3/K9
	NIM-1CE1T1-PRI*	CAT 18 CGW*				
	NIM-2CE1T1-PRI*	5G sub 6GHz CGW*				
	NIM-8CE1T1-PRI*	5G (MMWave & Sub 6GHz) CGW **				
		5G sub 6GHz PIM **				

*   SD-WAN Support in Roadmap

**   SD-WAN & IOS-XE Support in Roadmap

***   Required PVDM4 card for Voice

Catalyst 8300 Layer 2 Switch Module

4 x mGig (2.5G Ethernet)

2 x 10G ports
(SFP+)

2 x 10G ports (SFP+)

16 x 1Gig (w/ 128-bit
LAN MACSec)

8 x mGig
(2.5G Ethernet)

40 x 1Gig
(w/ 128-bit LAN MACSec)
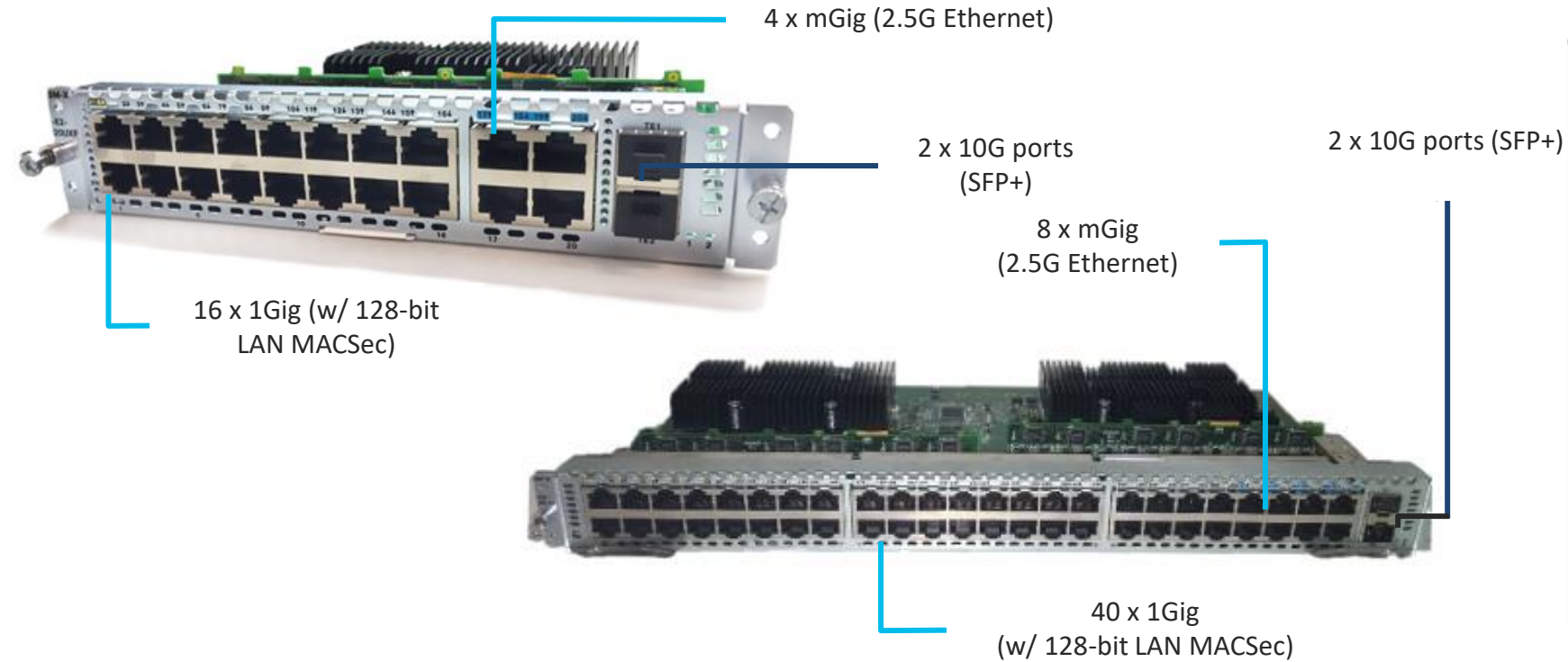
L2 Switch Module

1 Layer 2 Features compatible with Cat switch

2 LAN MACSec for switch to host communication

3 2.5 mGig to connect to future Access Point/ 5G

4 Support for SDWAN features

5 UPoE Capable

Port Speed and Diversity
(1G, 2.5G mGig, 10G Fiber)

LAN MACSec
(128-bit/ 256-bit***)

Power Over Ethernet
(PoE/ PoE+/ UPOE)

Cisco UADP ASIC
(UADP 2.0)

Catalyst 8300 10G WAN NIM Module

1 x 10Gig
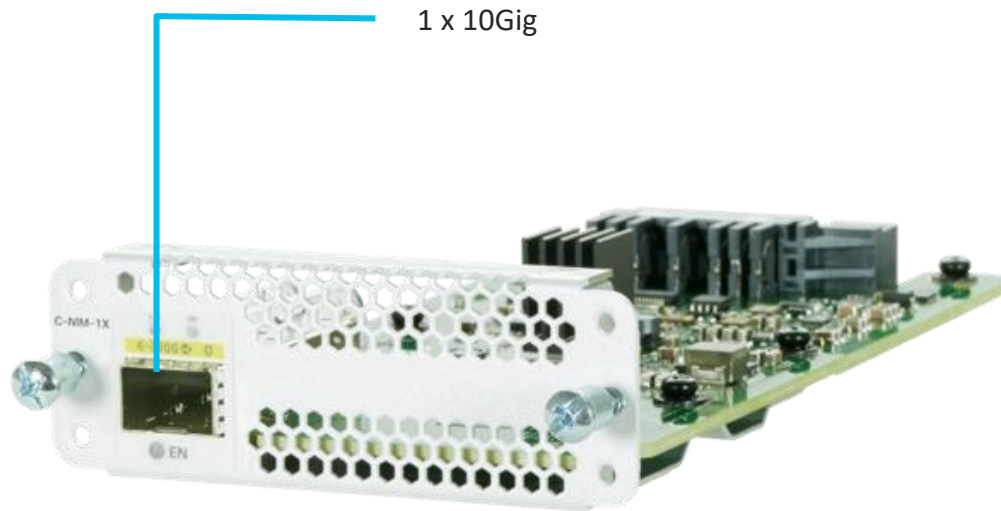
L3 10G WAN Module

1 Layer 3 Features compatible w/ Router FPGE

2 WAN MACSec for Secure WAN and Metro Ethernet links

3 SDWAN support

Port Speed and Diversity (10G Fiber)

WAN MACSec (256-bit)

Higher Performance

SD Managed

Catalyst 8300 DSP Voice NIM Modules
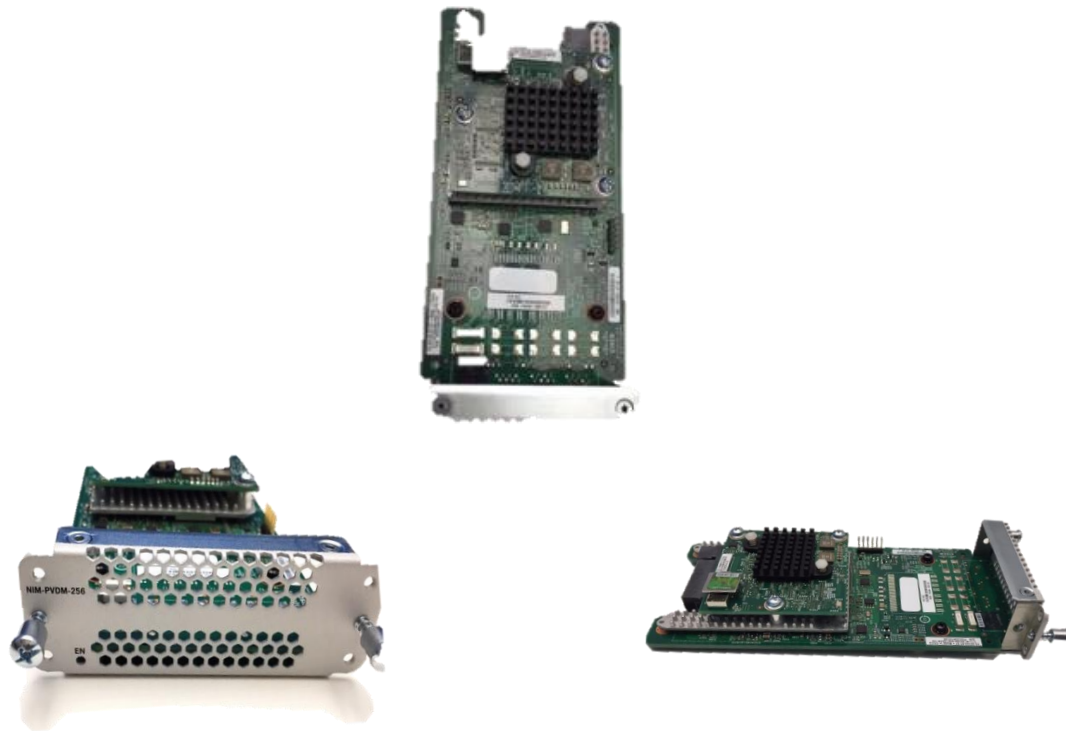
- Low-medium complexity deployments
- 4 different NIMs to support 32,64,128,256 voice channels
- IP based voice services like transcoding and conferencing
- Can be paired with service modules for DSP farm capability
- Supports wide range of codecs for different complexities
- Compatible with ISR4461 and Next Generation Platforms

Optimized for rich-media voice applications

Catalyst 8300 CAT18 PIM

CAT 18 LTE

Dual Micro SIM

1200/200 Mbps

Supported on ISR1120 and ISR1160 & C8300

SD-WAN support

PID	Modem	Region	LTE Bands
PLTEAP 18-GL	Telit Wireless	Global	1, 2, 3, 4, 5, 7, 8, 12, 13, 14*, 17, 18, 19, 20, 25, 26, 28, 29, 30, 32, 38, 39, 40, 41, 42, 43, 46, 48, 66, 71

*Support for LTE band dedicated for use by emergency services

SIM usage indicator

Diversity antennas
Used for additional reception or remote antennas

Micro USB Modem Debug
Micro USB access for modem diagnostics

Main antennas
Used for whichever SIM is active
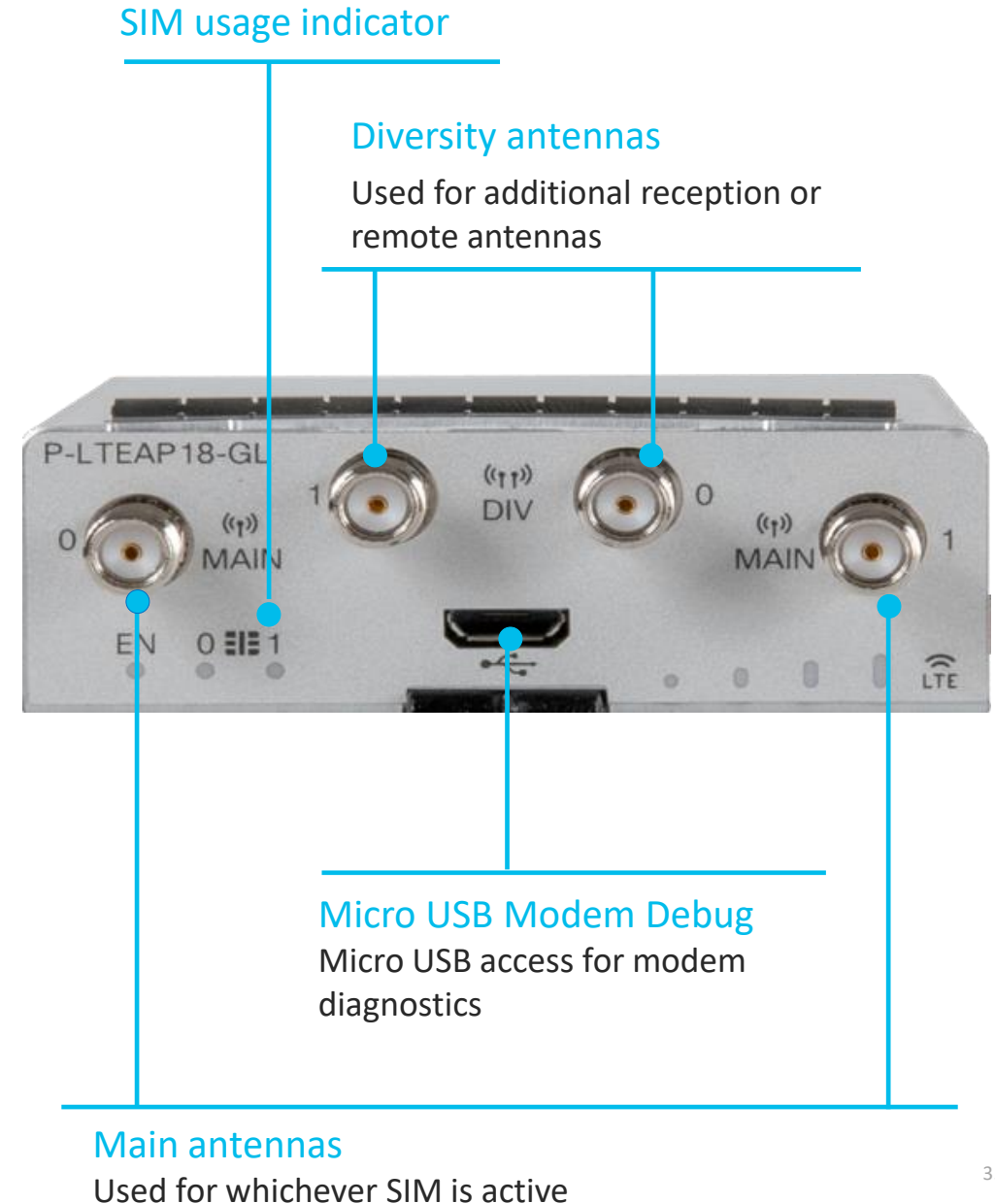
Cisco Catalyst Cellular Gateway
Flexibility & Simplicity Redefined for Multi-Gigabit Wireless WAN

Giga-Bit Class Cellular

LTE/Cat18 Speeds
Dual SIM

SD-WAN Ready

Automation, Assurance
API Support

Secure by Design

Trustworthy Systems
Failure Recovery

Operational Resiliency

Out-of-band management
IP Passthrough using Single PDN

High-speed Failover or Primary Cellular WAN

Precision Placement for Better Coverage

PoE or External Power Source

Catalyst 8300 2RU Front View
2 NIM and 2 SM

Status and physical security

Status LED

FAN LED

Power LED

Storage
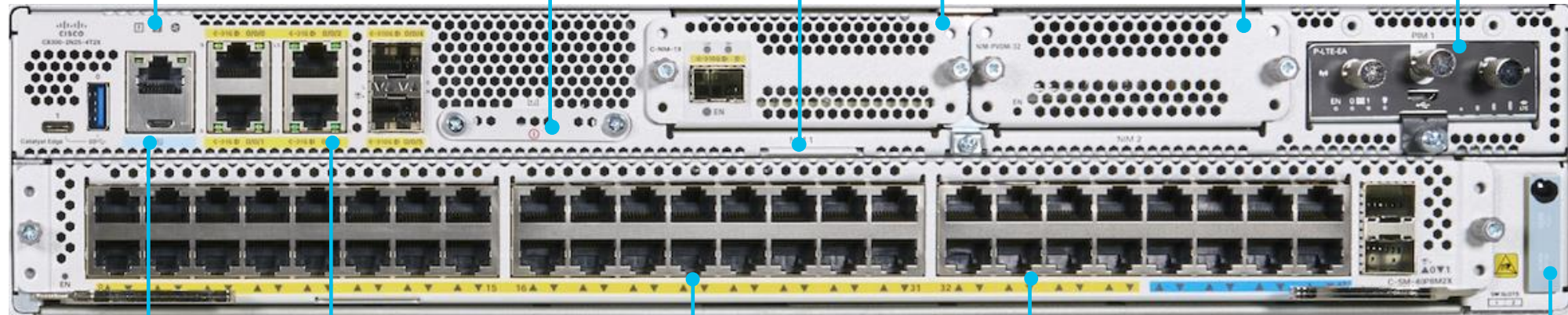
NVMe M.2 (16/32/600G)

Inventory

QR label tray

Network Modules

NIM slot

LTE WAN (PIM slot)

CAT 4/6/18 PIM

Management Interface

RJ45 Console

Micro-USB

USB Type A

Data Interfaces (FPGE)

4 RJ45 GE WAN

2 SFP+ WAN

Network Modules

SM-X slot

Inventory

RFID

C8300-2N2S-6T has in-built 2 SFP

C8300-2N2S-4T2X has in-built 2 SFP+

Catalyst 8300 1RU Front View
1 NIM and 1 SM

Status and physical security

Status LED

FAN LED

Power LED

Network Modules

NIM slot

SM-X slot

Management Interface

RJ45 Console

Micro-USB

USB Type A

Data Interfaces (FPGE)

4 RJ45 GE WAN

2 SFP+ WAN

Storage

NVMe M.2 (16/32/600G)

Inventory

RFID

QR Label tray

C8300-1N1S-4T2X has in-built 2 SFP+
C8300-1N1S-6T has in-built 2 SFP

Catalyst 8300 1RU Rear View

Power supply Slot 1

PSU Internal FAN

AC/DC PSU

Power supply Slot 0

PSU Internal FAN

AC/DC PSU

FAN

FANs

FAN Tray

LTE WAN (PIM slot)

CAT 4/6/18 PIM
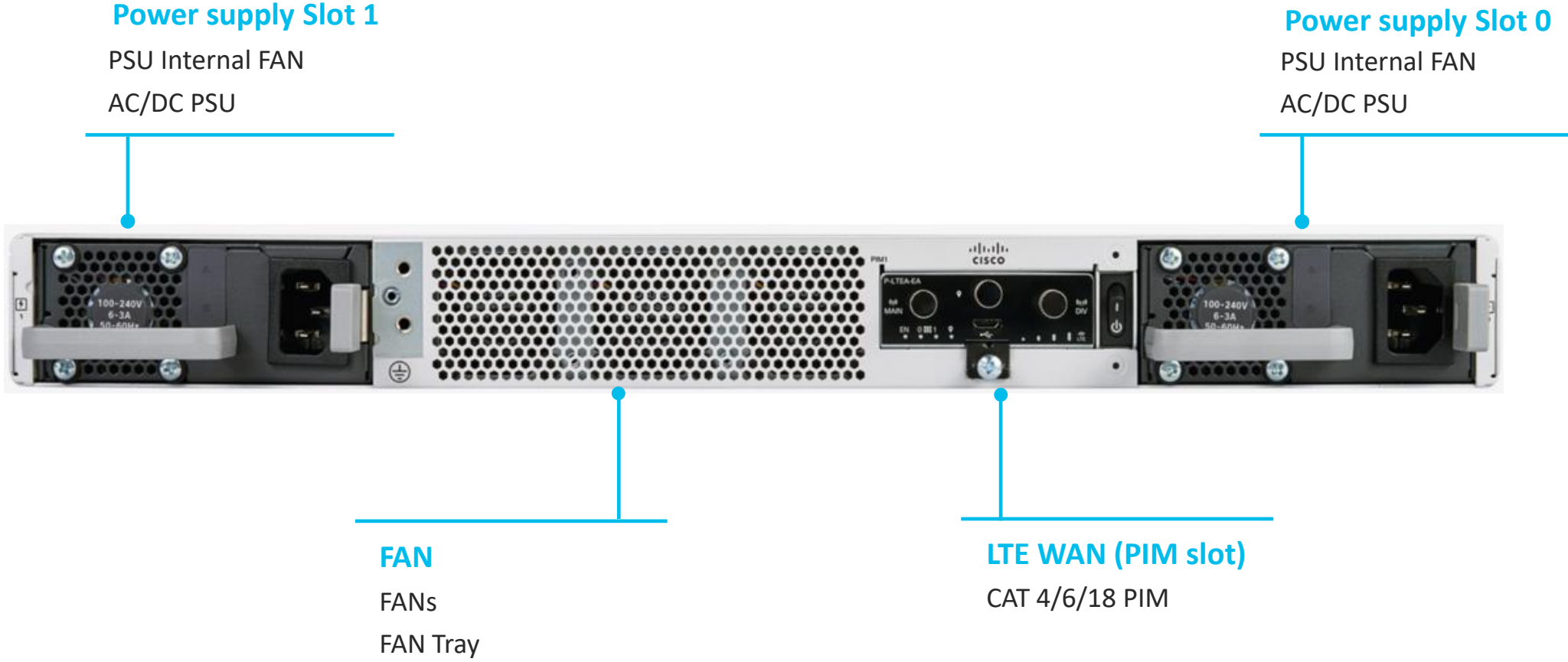
Catalyst 8300 Built for Service Optimization
CPU Core Allocation

SD-WAN security engine
App Hosting

Data Path
Processing

1 – Rx + Crypto Helper
1 – TM + Crypto Helper

Run IOSd, SD-WAN control processes

Number of Cores

5

4

2

2

3

1

2

2

1

CP   I/O   PPE   SP

■ C8300-1N1S, C8300-2N2S-6T   ■ C8300-2N2T-4T2X

Rx: receive packets from onboard I/O, NIM, SM, enqueue
TM: traffic manager, scheduler and queueing
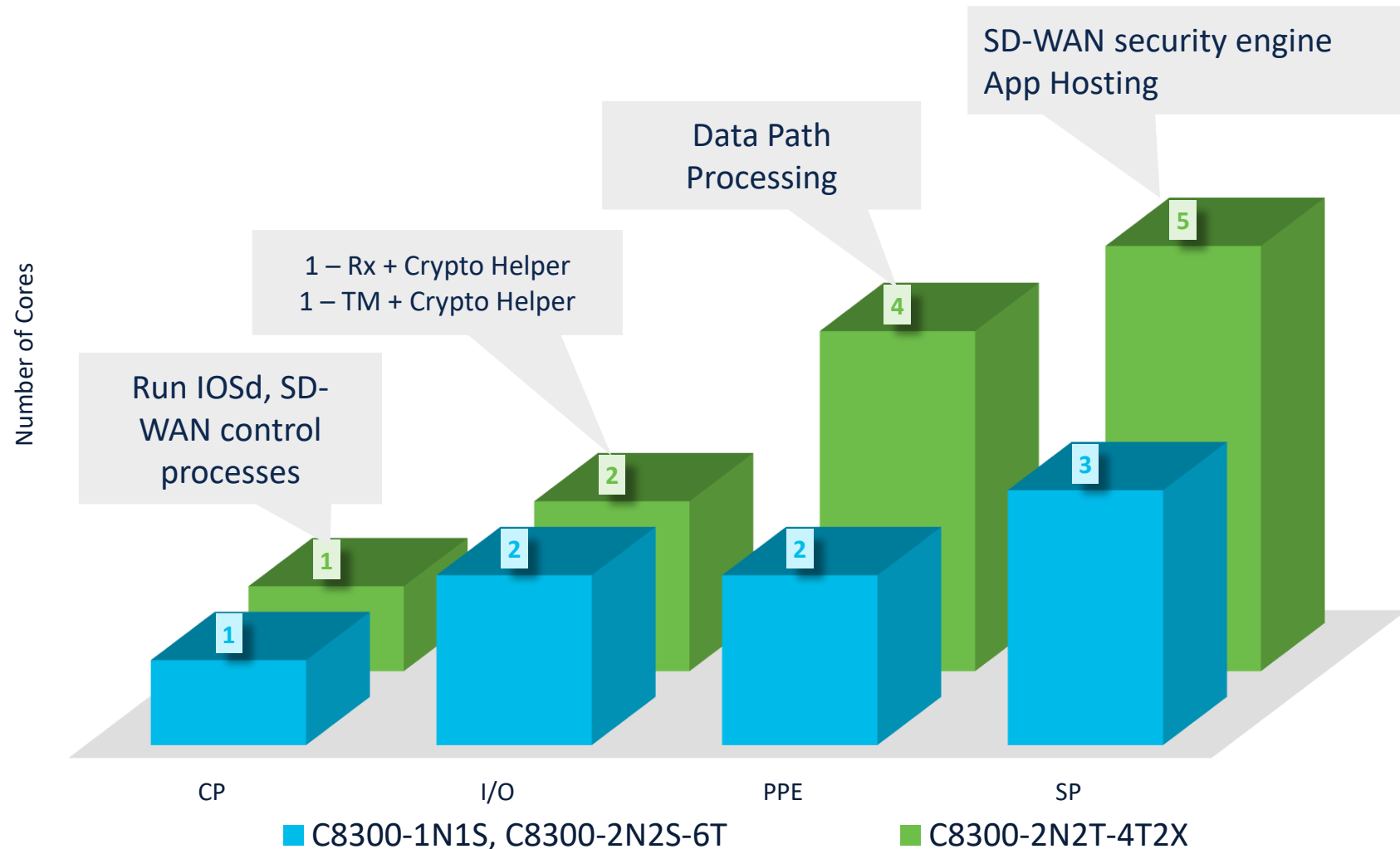
Cisco Catalyst 8000V Edge Software
Enterprise-class Networking and Security with Flexibility of a x86 Based VNF

Multi-Services Support

Feature-rich IOS-XE and XE-SDWAN software
Supported features such as NAT, Firewall, NBAR QoS, etc.
Runs on any x86 VM platform

Cloud Integration

Extends connectivity, visibility, security into public and private clouds
Auto-Scaling capability
Integration with Azure vWAN and AWS TGW
Supports wide variety of cloud instances

Performance Elasticity

CPU Hypervisors: 1 – 8 vCPU
Cloud Providers: 1- 16 vCPUs
Memory Scale: 4 – 16Gb

Multi-Layer Security

Secure object storage
High Throughput IPsec
IPS/IDS, URL Filtering

Highlights

Manageability

C8Kv
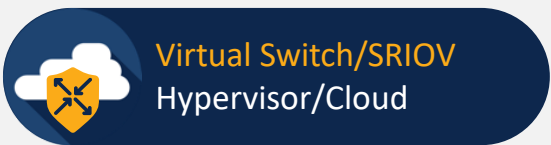
Virtual Switch/SRIOV
Hypervisor/Cloud

Up to 10 Gbps IPSEC in cloud	ENCS NIM support	TGW and vWAN integration	DPDK IO	SDWAN in AWS, Azure, and GCP

vManage

Multi-tenant

Open APIs

Analytics

Virtual Router Convergence

VNF Convergence Approach

| 17.1.x and earlier | 17.2/17.3 | 17.4.1 |

ISRv
IOS XE

ISRv
XE SD-WAN

ISRv
Unified

CSR 1000V
IOS XE

CSR 1000V
XE SD-WAN

CSR1Kv
Unified

C8Kv
Unified

vEdgeCloud
Viptela OS

vEdgeCloud
Viptela OS

vEdgeCloud
Viptela OS
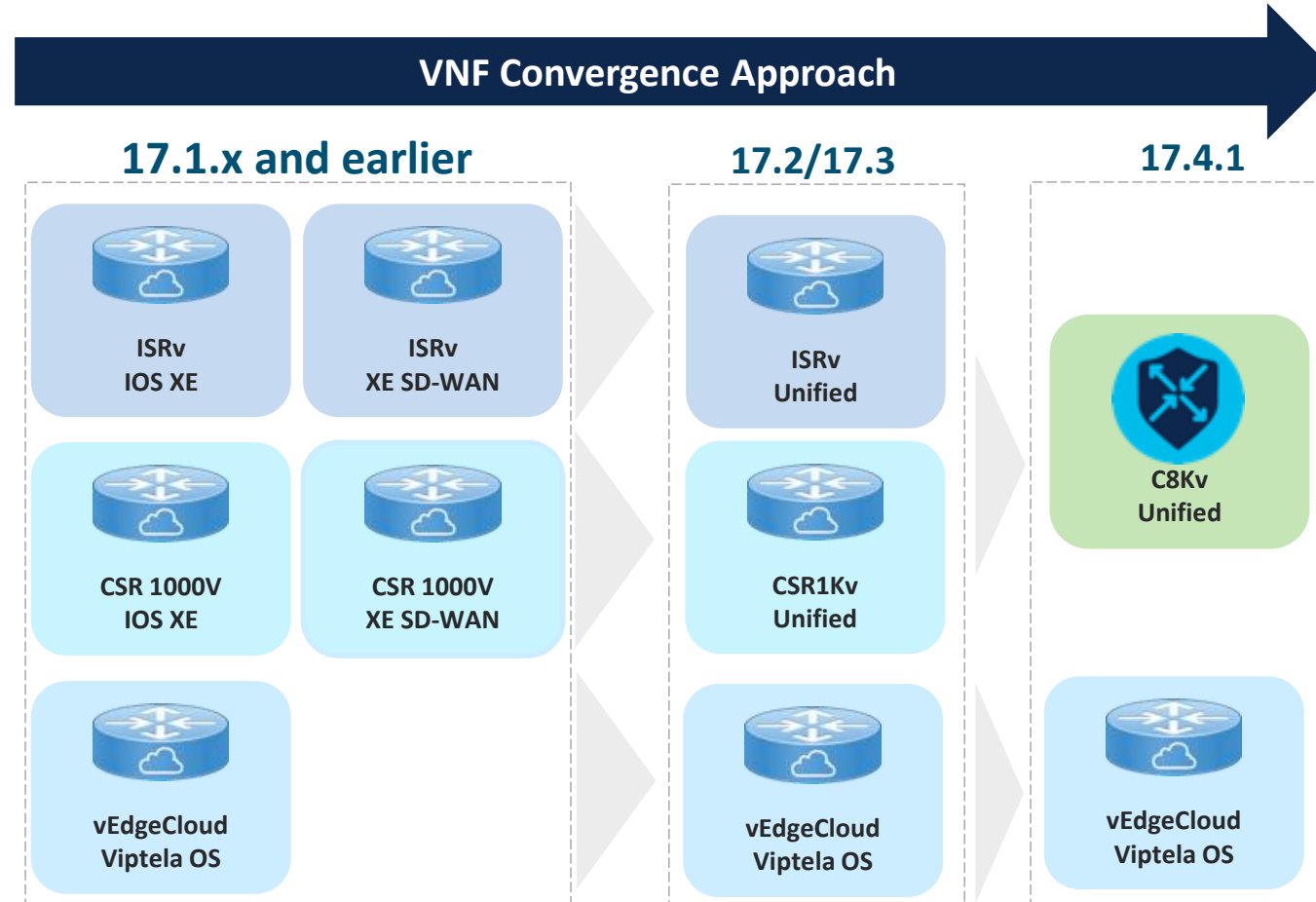
Cisco Catalyst 8000V Scalable Architecture

Versatile Network Connectivity Options

Cloud Transit and Gateway

ACI fabric cloud extension

L2 extension with LISP

Extend DMVPN into cloud

DNAC integration

Seamless SDWAN Extension in cloud

Automated deployment using Cloud onramp

Multicloud deployment

Integrate with AWS transit Gateway and Azure vWAN

Supports COR for co-location

Optimal SaaS experience

Infrastructure Agnostic

Runs on any x86 server

Supported with leading hypervisors and cloud providers

Elastic VM resource allocation

Consistent routing experience across cloud, DC and branch

Service Richness

Feature-rich IOS-XE software

Programmability with guestshell

Support for container-based apps

Security features: IPS/IDS, URL filtering, ZBFW

Open IOS XE Architecture

IOS XE Software Architecture
Seamless SD-WAN integration
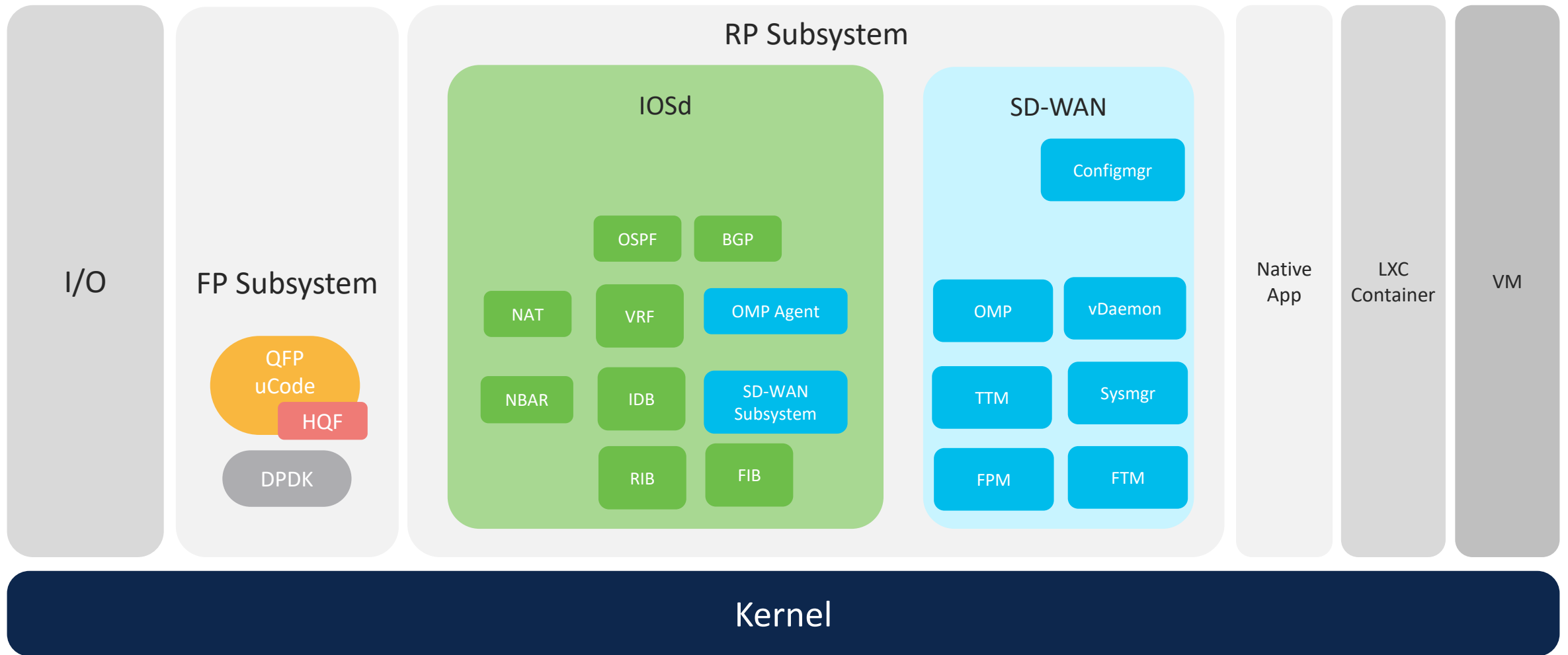
Easy Operations with Single Image

IOS XE 'Autonomous' mode

Single Image universalk9

IOS XE SD-WAN 'Controller' mode
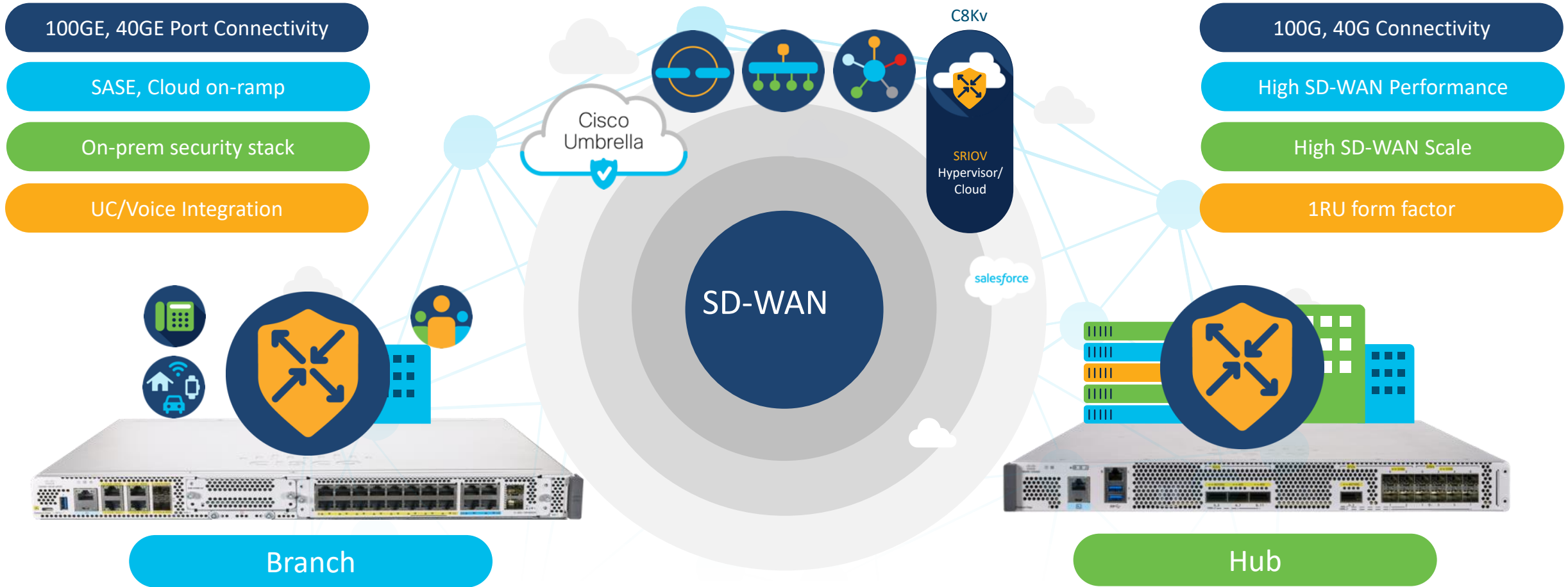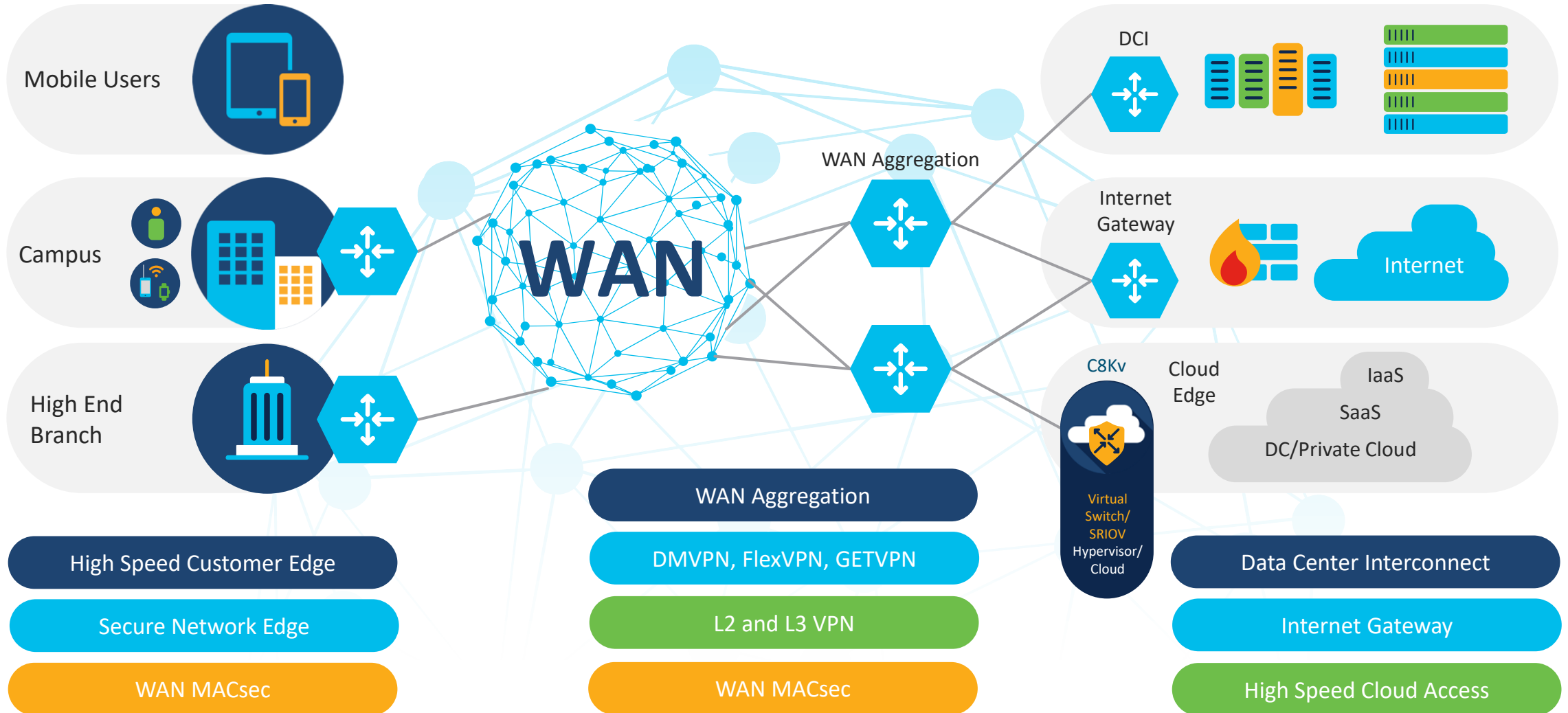
Accelerate SD-WAN Journey | Simplify Deployments | Cloud-scale Application Support

Solution and Use Cases

SD-WAN Hub, Branch and Cloud

100GE, 40GE Port Connectivity

SASE, Cloud on-ramp

On-prem security stack

UC/Voice Integration

C8Kv

SRIOV
Hypervisor/
Cloud

Cisco Umbrella

SD-WAN

salesforce

100G, 40G Connectivity

High SD-WAN Performance

High SD-WAN Scale

1RU form factor

Branch

Hub

Enterprise Applications

Mobile Users

Campus

High End Branch

WAN

WAN Aggregation

DCI

Internet Gateway

Internet

C8Kv

Virtual Switch/ SRIOV Hypervisor/ Cloud

Cloud Edge

IaaS

SaaS

DC/Private Cloud

High Speed Customer Edge

Secure Network Edge

WAN MACsec

WAN Aggregation

DMVPN, FlexVPN, GETVPN

L2 and L3 VPN

WAN MACsec

Data Center Interconnect

Internet Gateway

High Speed Cloud Access

Closing

Cisco Catalyst 8000 Edge Platforms Family
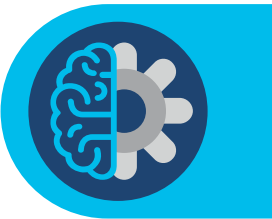## High Performance SD-WAN Headend, Intelligent Branch and Agile Cloud Edge

Ready for the Agile Cloud Journey
- High Speed Cloud Access
- Multi-Cloud Application Optimization
- Compact, Powerful 1RU/2RU

Ready for 5G, Edge Compute
- QFP and x86 higher performance
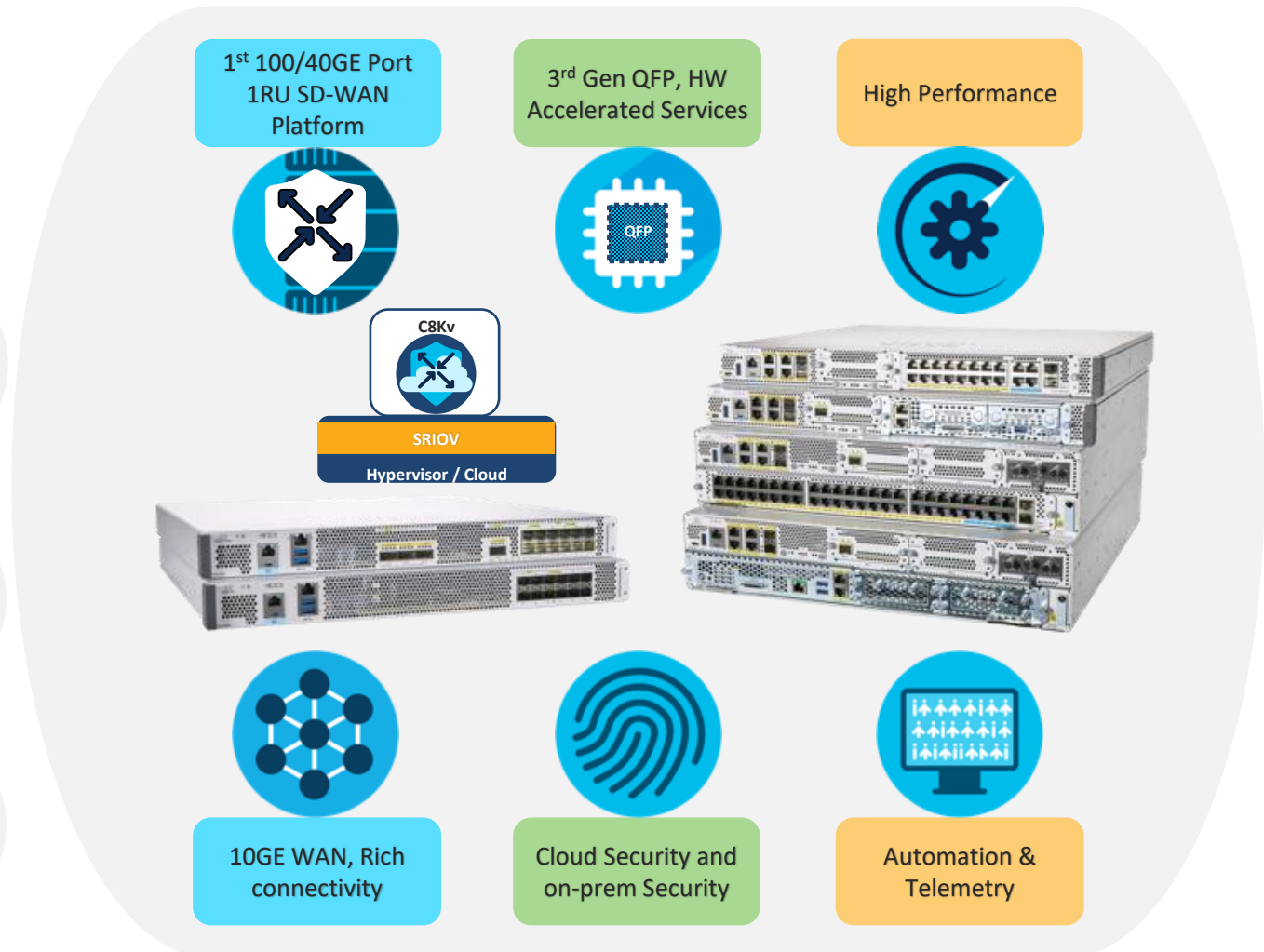- SASE driven Feature Innovations
- Full-stack on-premise security

Ready for Edge Intelligence
- Headend 100/40/10/1GE Port flexibility
- Branch for 10/1G WAN, LTE, DSL, PoE+

Equipped with User Centric Design
- Operational Ease for better Tracing
- Passive Radio Frequency ID
- Easy Access Label Tray
- Field Upgradable Options

1st 100/40GE Port 1RU SD-WAN Platform

3rd Gen QFP, HW Accelerated Services

High Performance

C8Kv

SRIOV

Hypervisor / Cloud

10GE WAN, Rich connectivity

Cloud Security and on-prem Security

Automation & Telemetry

Cisco Catalyst 8000 Edge Platforms DNA Licensing
Detail

NEW

Cisco DNA Essentials

Connectivity/Mgmt

- Cloud or On-Prem Management
- Flexible Topology
  - Hub and Spoke
  - Full Mesh/Partial Mesh
- App and SLA based policy
- Dynamic Routing (BGP, OSPF)
- VNF Lifecycle Management

Security

- Enterprise Firewall with Talos-powered IPS and application controls
- Cisco Umbrella DNS Monitoring (visibility only)

SD-WAN Services

- Basic Path optimization with FEC and Packet Duplication
- TCP Optimization

Cisco DNA Advantage

Cloud/Analytics

- Cloud OnRamp for IaaS and SaaS
- Automated Service Stitching
- Encrypted Traffic Analytics
- vAnalytics

Security

- Segmentation (Unlimited VPNs)
- Cisco AMP and SSL proxy
- URL filtering
- Cisco Umbrella app discovery

X-domain Innovations

- Integrated Border for Campus (SD-Access)
- Integration with ACI for Application SLA

Services

- Web Caching, DRE (incl. SSL proxy)
- Voice Module and SRST Integration
- Multicast

Cisco DNA Essentials

Cisco DNA Premier

Security

Cisco Umbrella SIG Essentials
Transactional
- Tier 0: 25 Licenses
- Tier 1: 40 Licenses
- Tier 2: 100 Licenses
- Tier 3: 285 Licenses

Enterprise Agreement
- Tier 0: Not Available in Premier
- Tier 1: 45 Licenses
- Tier 2: 110 Licenses
- Tier 3: 325 Licenses
- Additional Cisco Umbrella SIG Essentials licenses can be purchased separately.

Cisco Threat Grid
- Provides entitlement for 200 files per day per customer account
- Files sent to Threat Grid cloud for sandboxing. On-premises Threat Grid not available in Premier
- Global entitlement across all customer sites
- Additional Cisco Threat Grid licenses can be purchased separately.

Cisco DNA Advantage

Cisco DNA Essentials

Cisco Catalyst 8000 Edge Platforms Licensing
Network Stack Capabilities

Network Essentials
Catalyst 8300 only

Network Essentials — Perpetual

IOS XE

Routing Essentials: Routing Protocols, Vrf-lite, Multicast, NAT

Security: MACSEC-128, VPNs, ZBFW, PKI, ACLs, Umbrella Connector, Snort IPS

Application Experience: HQOS, PfR, PBR, AVC, NBAR, IPSLA, FnF

Unified Communication: Cube Connector

Router Management: TACACS+, NETCONF, AAA, DNS, DHCP

With DNA Essentials

Network Advantage

Network Advantage
(Inclusive of Essentials) — Perpetual

Overlay Technologies: MPLS, VPLS, LISP, VXLAN, OTV, EVC, OAM

Security: MACSEC-256, ALG for ZBFW, VASI

Cisco Innovation: SMU Patching, SGTs, ETA, ISSU, mDNS Bonjour, EPC

Unified Communication: SRST, Support for Voice Modules

WAN Optimization: Cisco WAAS RTU*

*Available on UCS-E on C8300

With DNA Advantage and DNA Premier