Cisco Refresh

NCS 500: Build a 5G ready mobile backhaul design with end-to-end network slicing and service differentiation

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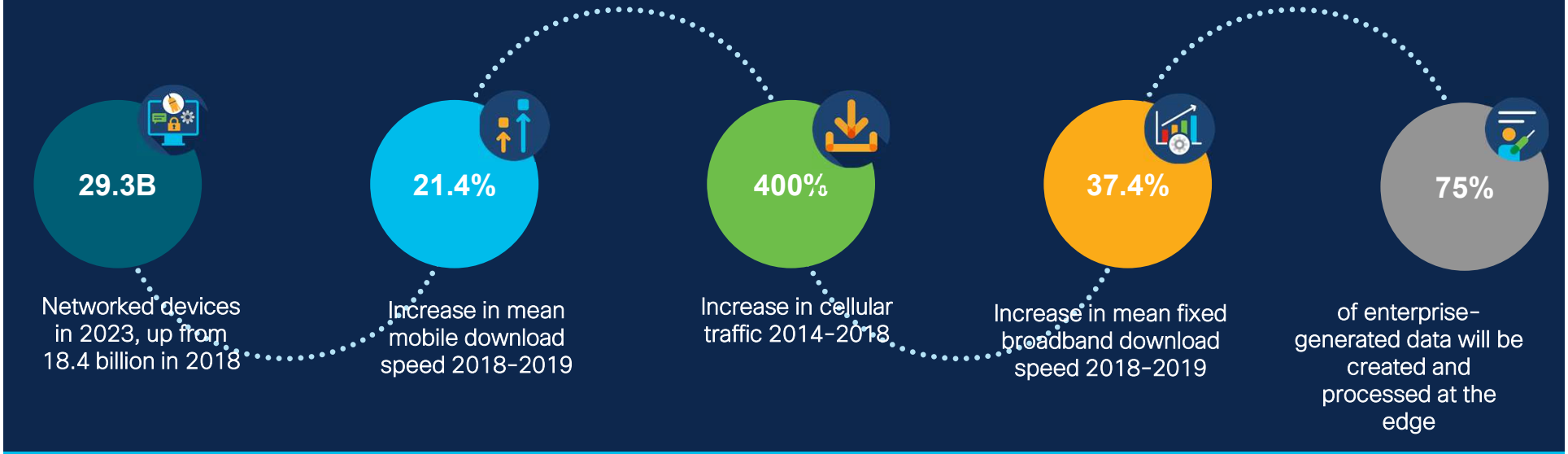
Product Management
Apr 8th, 2021

Agenda

- Market Landscape
- NCS 540 Portfolio Update
- NCS 560 Portfolio Update
- Licensing & Commercials

Industry is changing and so should your Access Network

5G adoption will further accelerate changes...



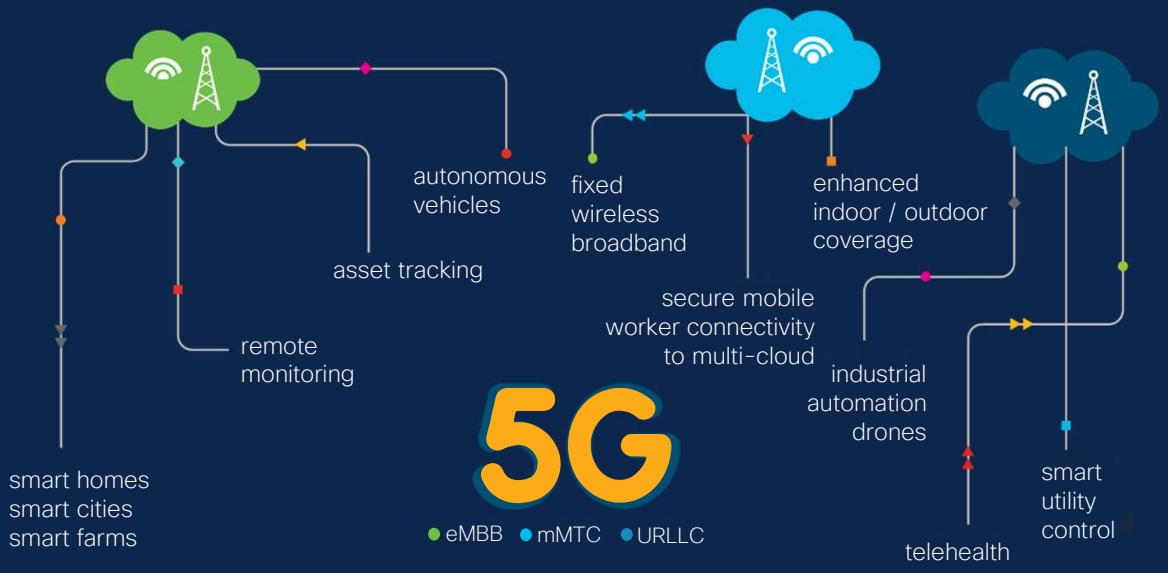
Bandwidth at scale

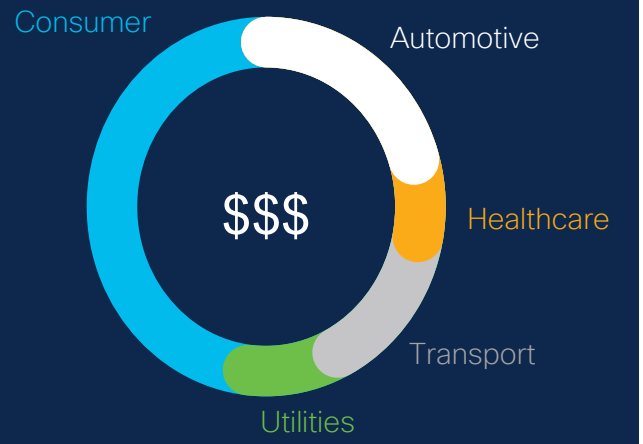
Network Simplicity

Secure Infrastructure

Better timing accuracy

5G Services = Heterogenous



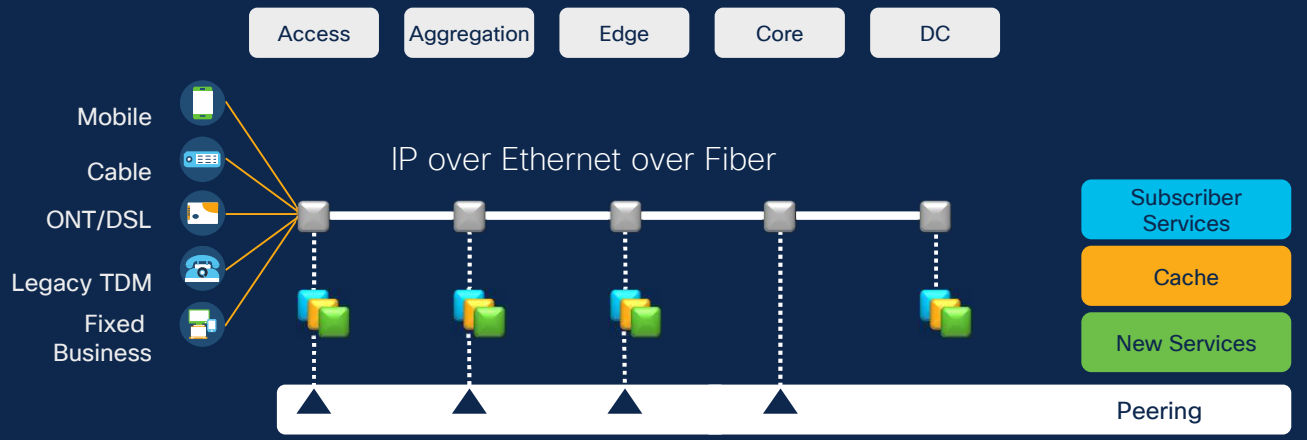


2025
Vertically targeted services will accelerate operator business growth

Source: European Commission Report, 2016

eMBB	uRLLC	mMTC
1000x BW, 50 msec – 300 msec	~1 – 25 msec Latency	1000x Density

Converged Access Networks is Key for CAPEX/ OPEX Optimized Network

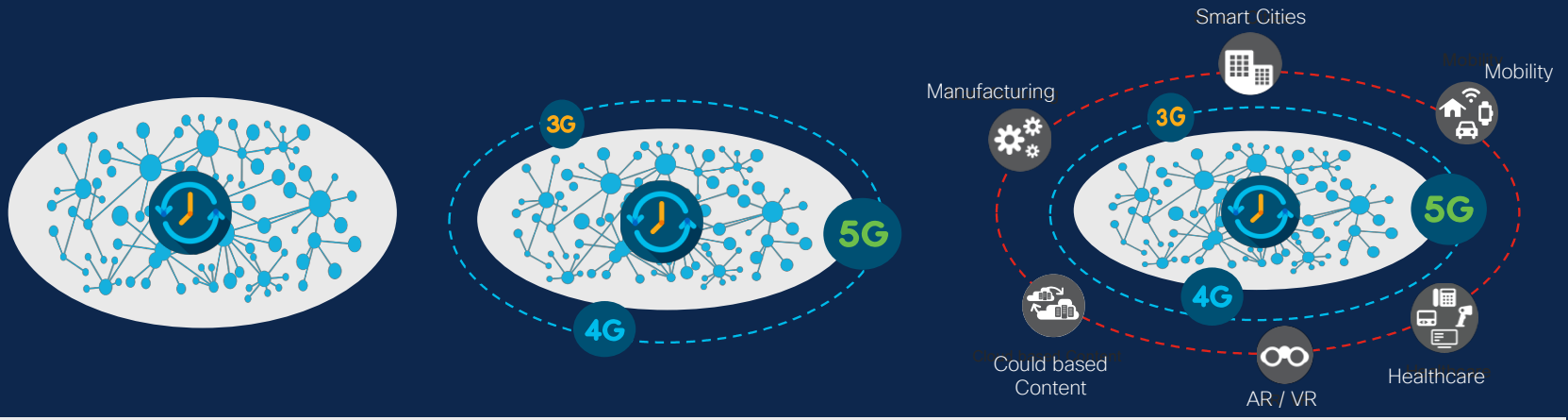


evolve
towards a converged, software-defined network architecture

shift
compute, subscriber management, and peering closer to the end user

open
what if your RAN was as open as IP?

Accurate Timing, from Core to Access



Sync for Computer Networks → **Sync for Mobility Networks** → **In NG networking Sync is critical for every use case**

Class C certified Product line	Deterministic Latency	Multi-profile	GNSS & APTS
Better Accuracy	Real Time Use Cases	Ease of Migration	Supports Legacy Networks

Secure Access Deployment

Trust begins in Hardware
Anti-counterfeit & Trust Anchor Infrastructure

Verifying Trust : Network OS
Image Signing & Secure Boot Infrastructure

Maintaining Trust at Runtime
Run-time Defense, Encrypted Transport, DDos Protection

Visualize and Report on Trust
Integrity Measurement & Verification Infrastructure

8+ years of CSDL devotion
30+ years of leadership

Secure Deployment

Runtime Defence | Secure ZTP

JTag, Trust Anchor

SP Access – Fixed Platform Journey

NCS 500 Adoption is Accelerating!!!

Platforms

shipping since June 2018

600+ Customers

...and growing!

82,000 Chassis

Shipped!

NCS 540 Portfolio Update

NCS 540- Converged Access Platform

High bandwidth 10Gbps peak data	Temp hardened high capacity systems 140-300 Gbps Dense 1/10G UNI with 25/40/100G NNI
Ultra low latency 1-5ms RTT	Low latency switching 2 – 8 usec Switching latency not a bottleneck for RTT
Stringent timing & sync 10-500 nsec	G8265.1, G8275.1 & 2, G.8273.1, G.8273.2 (Class B,C) 1PPS,10MHz,ToD, Inbuilt GNSS
Ultra Reliability	Secure, reliable, carrier class IOS-XR Reduced down time with SMUs
Network Slicing	Application aware network with traffic engineering SR enabled differentiated SLAs
Programmability Automation	IOS XR with Telemetry, WAE/XTC Integration SDN ready with Netconf/Yang Interfaces

N540(X)-ACC-SYS

Shipping

Key Highlights

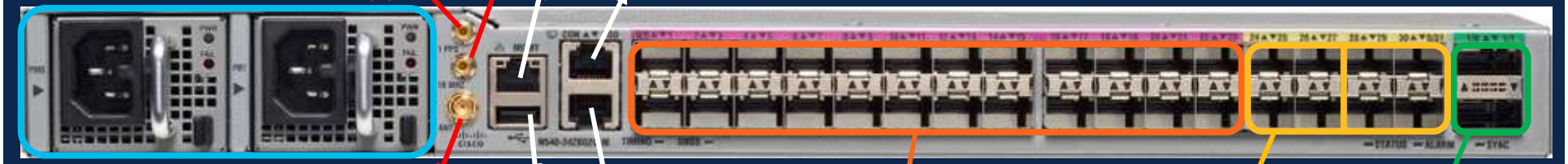
- ASIC: Q-AX 300G
- Intel CPU, 16GB DRAM
- i-Temp : - 40C to +70C
- Conformal coated SKU for hot humid conditions

Hardware

- 24x1/10G SFP+, 8x 25G SFP28, 2x100G QSFP28
- F2B airflow
- Modular & redundant PSUs and fans

Timing

- 1588/SyncE, GNSS, 1PPS, ToD, 10MHz
- Class B



N540X-16Z4G8Q2C-D/A

Shipping

Key Highlights

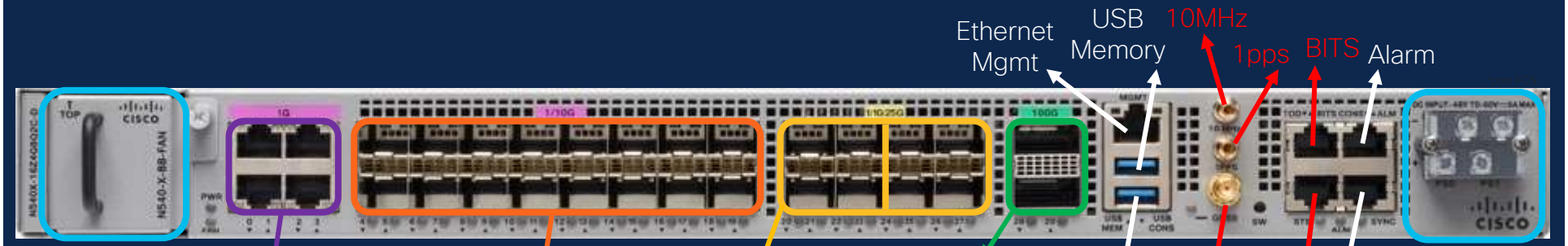
- ASIC: Q-AX 300G
- Intel CPU, 8GB DRAM
- i-Temp : - 40C to +70C
- Conformal coated

Hardware

- 16x10G SFP+,4x1G Cu,8x25G SF28,2x100G QSFP28
- S2S airflow
- Fixed: Dual DC/Single AC
- Fixed Fans

Timing

- 1588/SyncE, GNSS, 1PPS, ToD, 10MHz
- Class-C



N540-28Z4C-SYS-A /D

Shipping

Key Highlights

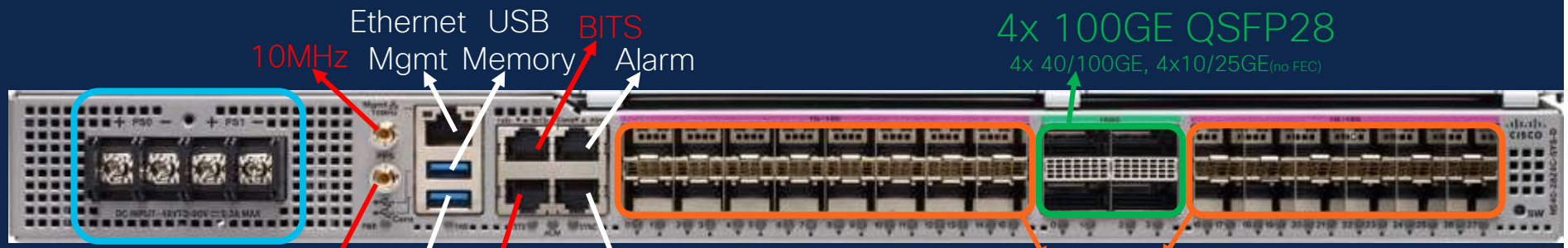
- ASIC: Q-AX 300G
- Intel CPU, 8GB DRAM
- C-Temp : - 5C to +55C

Hardware

- 28x10G SFP+ + 4x100G QSFP28
- F2B airflow
- Fixed: Dual DC/Single AC
- Fixed Fans

Timing

- 1588/SyncE,1PPS, ToD, 10MHz
- Class-B



N540X-12Z16G-SYS-D/A

Shipping

Key Highlights

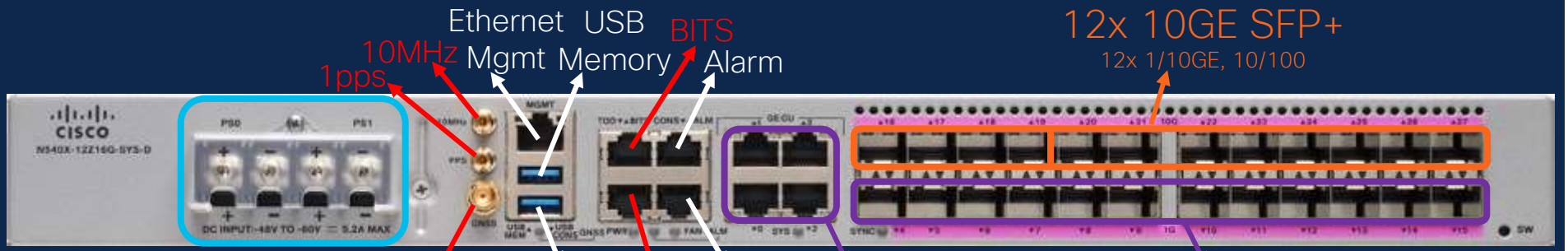
- ASIC: Q-AX 160G
- Intel CPU, 8GB DRAM
- i-Temp : - 40C to +70C
- Conformal coated

Hardware

- 12x1G SFP,4x1G Cu,12x10G SFP+
- S2S airflow
- Fixed: Dual DC/Single AC
- Fixed Fans

Timing

- 1588/SyncE, GNSS, 1PPS, ToD, 10MHz
- Class-C



N540-12Z20G-SYS-D/A

Shipping

Key Highlights

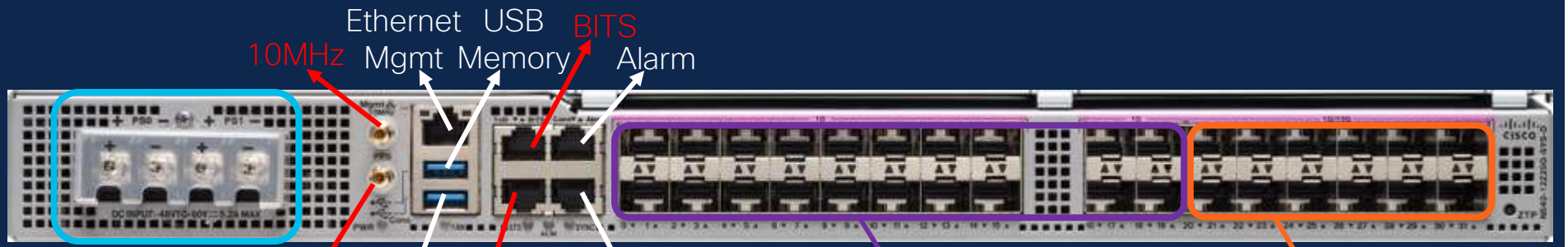
- ASIC: Q-AX 160G
- Intel CPU, 8GB DRAM
- C-Temp : - 5C to +55C

Hardware

- 20x1G SFP, 12x10G SFP+
- F2B airflow
- Fixed: Dual DC/Single AC
- Fixed Fans

Timing

- 1588/SyncE, 1PPS, ToD, 10MHz
- Class-B



New - NCS 540 Small Density Router

Introducing …

Fixed Platform

Smallest
Lowest Cost
XR Router

What's Unique About New Small Density Routers

NCS 540 Small Density Router Variants

- N540X-6Z18G-SYS-A/D: Available for ordering
- N540X-6Z18G-SYS-A/D: Available for ordering
- Min RTU/SIA: 3 x 10G licenses for 6Z and 4 x 10G licenses for 8Z and 4Z variants

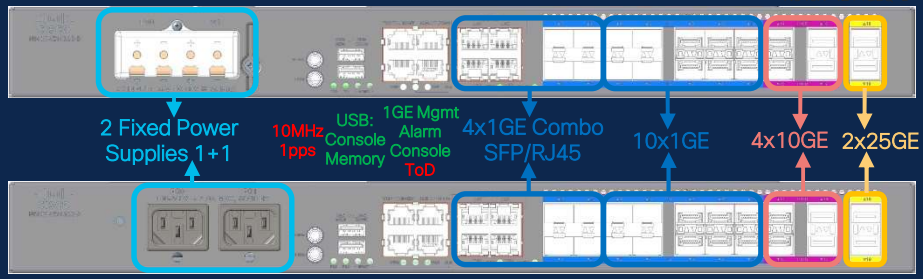
SKU	Port Configuration					ASIC	Conformal Coating	Power Supplies	Oper Temp	Ship on
	1G	Cu	CSFP	1G/10G	25G					
N540X-6Z18G-SYS-A	18			6		Qumran UX	Y	Fixed, 1+1 AC/DC	iTemp	Q1'21
N540X-6Z18G-SYS-D	18			6		Qumran UX	Y	Fixed, 1+1 AC/DC	iTemp	Q1'21
N540X-8Z16G-SYS-A	12	4	Yes (8 ports of 12x1G)	8		Qumran UX	Y	Fixed, 1+1 AC/DC	iTemp	Q1'21
N540X-8Z16G-SYS-D	12	4	Yes (8 ports of 12x1G)	8		Qumran UX	Y	Fixed, 1+1 AC/DC	iTemp	Q1'21
N540X-4Z14G2Q-A	10	4		4	2	Qumran UX	Y	Fixed, 1+1 AC/DC	iTemp	Jul'21
N540X-4Z14G2Q-D	10	4		4	2	Qumran UX	Y	Fixed, 1+1 AC/DC	iTemp	Jul'21

Any-Gen 1/10/25G Cell Site Router | 'sub-6' 5G Non-Metro CSR | FTTx | Pre-Agg for Carrier Ethernet | Low Speed Ethernet rings

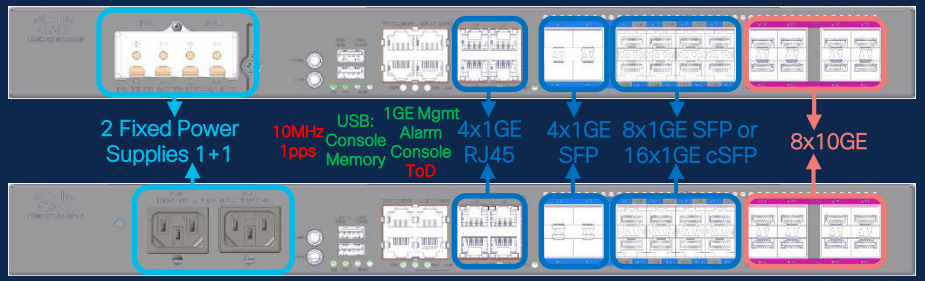
Fixed Wireless Access | Small Cell BH | National Broadbands | 1/10G – Enterprise Branch & Business

QUX 120G/64G @125Mpps	ARM 4C CPU 8GB DRAM	Power: Fixed 1+1 DC/AC	S2S Airflow 3+1 Fans
IOS XR LNT 7.3.1+	I-Temp -40/+70C	Part. Conformal Coated + Heat Sink Cover	G.8273.2 Class C (Target)

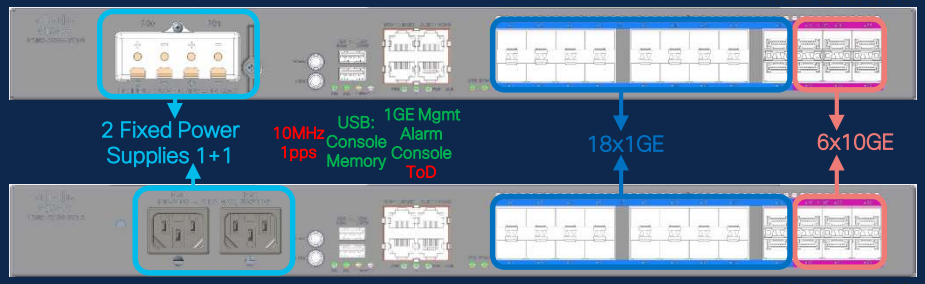
N540X-4Z14G2Q



N540X-8Z16G-SYS



N540X-6Z18G-SYS



Software Features at FCS

BFD v4/v6, Timers, Routing Protocols, Bundle Interfaces, BFD unnumbered

BGP v4/v6, LU, PIC, Path Selection, Attributes, TE, Authentication, Security, LS, AIGP

SR ISIS v4/v6, SR OSPF v2, SR BGP, SR TE, SR PCE, TI-LFA v4/v6, TE Services, BGP, PCE Head-end, SR-PCE (multi domain)

ISIS v4/v6, Authentication

OSPF v4/v6, Authentication

MPLS RSVP TE, LDP, LDP Authentication, VRF, MPLS OAM – LSP Ping, Traceroute, L3 VPN

EVPN IRB/BVI v4/v6, VPWS, ELAN

L2 – VPWS, VPLS, IRB/BVI v4/v6, L2CP, LLDP, Stormcontrol on physical, EFP and BD, 802.1q, 802.1ad Q-in-Q, EFP, EVC, L2PT, UDLD, G.8032, LAG, ARP, GRE v4/v6, VRRP

IP SLA, Logging, ICMP, EEM, SPAN, FTP, TFTP, Telnet, TTY/VTY

Multicast – PIM BFD, IGMP, MLD, RPF, Interfaces, PIM-SM, PIM-SSM, mLDP

OAM – MPLS OAM, Ethernet OAM, Y.1731, CFM, TWAMP, VCCV

Netconf/Yang, ZTP, Netflow, SNMP MIB Support

Security – AAA, TACACS, Radius, ACL v4/v6 (Logging, Stats, Modification, Ingress, Egress), uRPF, LPTS, SSH,

Optics
1G, 10G, 25G Optics

Smart Licensing

Timing
SyncE Timing
1588 Timing G.8275.1 with G.8273.2 Class B, G.8275.2, G.8265.1, GNSS, PTP in VRF

QOS – Policing, Shaping, Match, Stats, Classification, Queue management, IPv4/v6 Uniform and Pipe Mode, H-QOS

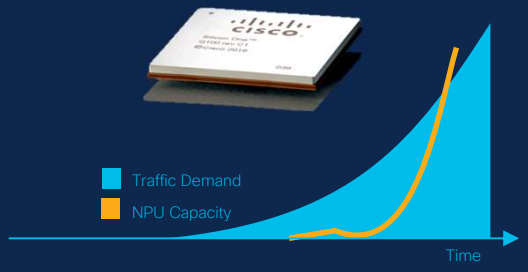
IOS XR 7.2.1 baseline Feature Parity with NCS540 at FCS

New- NCS 540 Large Density Router

Shifts in Economics and Technologies

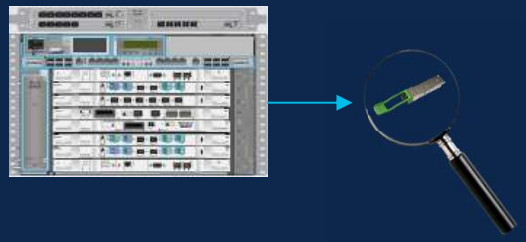
Optics and Routing

Routing Scale Evolution



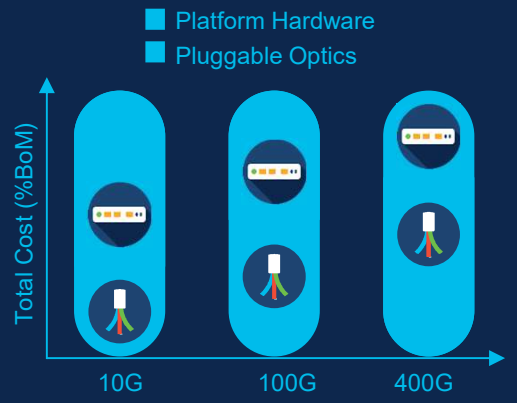
Router capacity outpaces projected traffic demand

Optical Systems Evolution



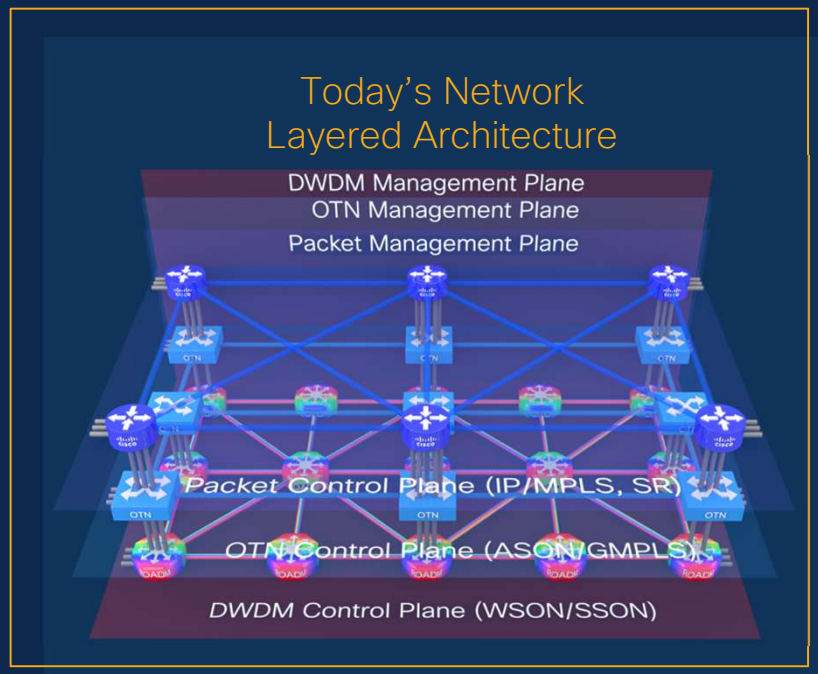
Chassis-based solutions replaced by pluggable optics for short to medium distance applications

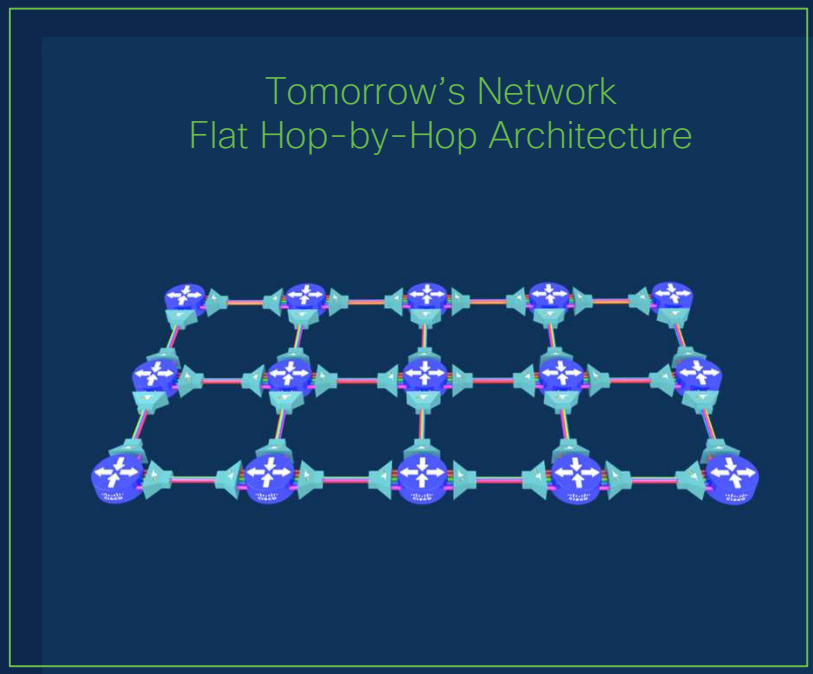
Shift in Economics



Optics cost becomes greater than router port cost

Simplified Architecture delivering up to 45% TCO savings





Automation

100G/200G CFP2 FCO	100G QSFP-DD ZR	400G QSFP-DD ZR/ZR+
NCS560: N560-IMA1W (1x 100G/200G CFP2 DCO IM)	NCS560: N560-IMA-2C-DD (2x100G QSFPDD/QSFP28 IM) NCS540: N540-24Q8L2DD-SYS	NCS540: N540-24Q8L2DD-SYS

Introducing 1RU- 400G NCS 540 Platform

Q2' CY21

SKU	Port Configuration			ASIC	Power Supplies	Operating Temp	Ship on	Release
	400/200/100G	50/25/10G	25/10/1G					
N540-24Q8L2DD-SYS	2	8	24	Qumran 2A	Dual redundant AC/DC	i-Temp	Q3'21	XR 7.4.1

ZR/ZR+

1M IPv4 routes

MACSec

512k IPv6 routes

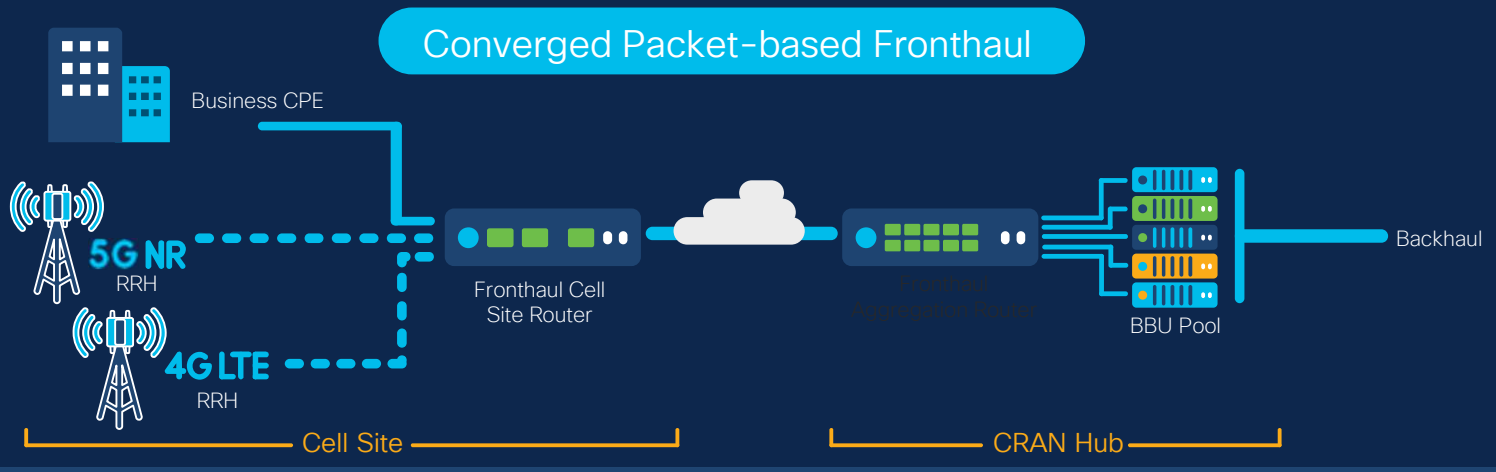
400G/50G interfaces

RON Architecture

New- NCS 540 Fronthaul Router

Cisco Converged Packet-based Fronthaul Solution

"Extending to meet the needs of Fronthaul, Midhaul, & Backhaul"



BENEFITS

- High-Speed and Ultra-Low Latency Forwarding w/ Stat Mux
- Flexible and programmable architecture
- Precise timing and synchronization capabilities
- End to end IP based network for a simplified architecture
- Open and automated management

GSO GO-TO-MARKET STRATEGY & OPERATIONS

Introducing NCS 540 Fronthaul Routers

Q1/Q2' CY21

NEW

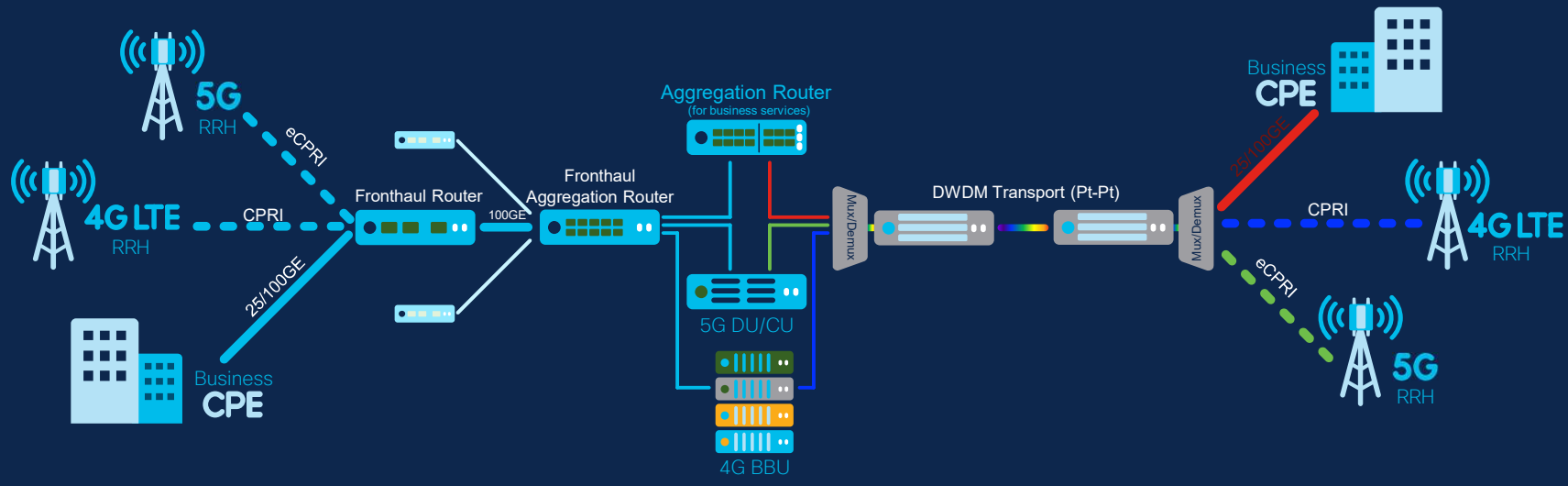
N540-FH-CSR-SYS
(Cell Site Router)

N540-FH-AGG-SYS
(Aggregation)

Fronthaul Router	Use Case	Port Config	RU	Capacity	Software
N540-FH-CSR-SYS (Cell Site Router) 	Remote Indoor Router [Packet + CPRI +TSN]	• 8xCPRI (Option 3-8) • +*4x1/10G/CPRI (Option 3-8) • 8x1/10G • 4x10/25G • 2x10/25G (802.1Qbu) • 2x100G *Universal Port = Port can be used for CPRI or eCPRI or Ethernet (1/10/25GE)	1 RU	300Gbps	IOS XR 7.3.1-LA 7.3.2-GA
N540-FH-AGG-SYS (Aggregation) 	Aggregate Site Router [Packet + CPRI + TSN]	• 24x10G/25G* • (802.1Qbu, CPRI 3-8) • 4x100G *Universal Port = Port can be used for CPRI or eCPRI or Ethernet (1/10/25GE)	1 RU	900Gbps	IOS XR 7.3.2-GA

Why Cisco for Fronthaul?

TCO Analysis of Packet vs Optical Fronthaul solutions – You are saving Ownership Costs!



Packet-based fronthaul

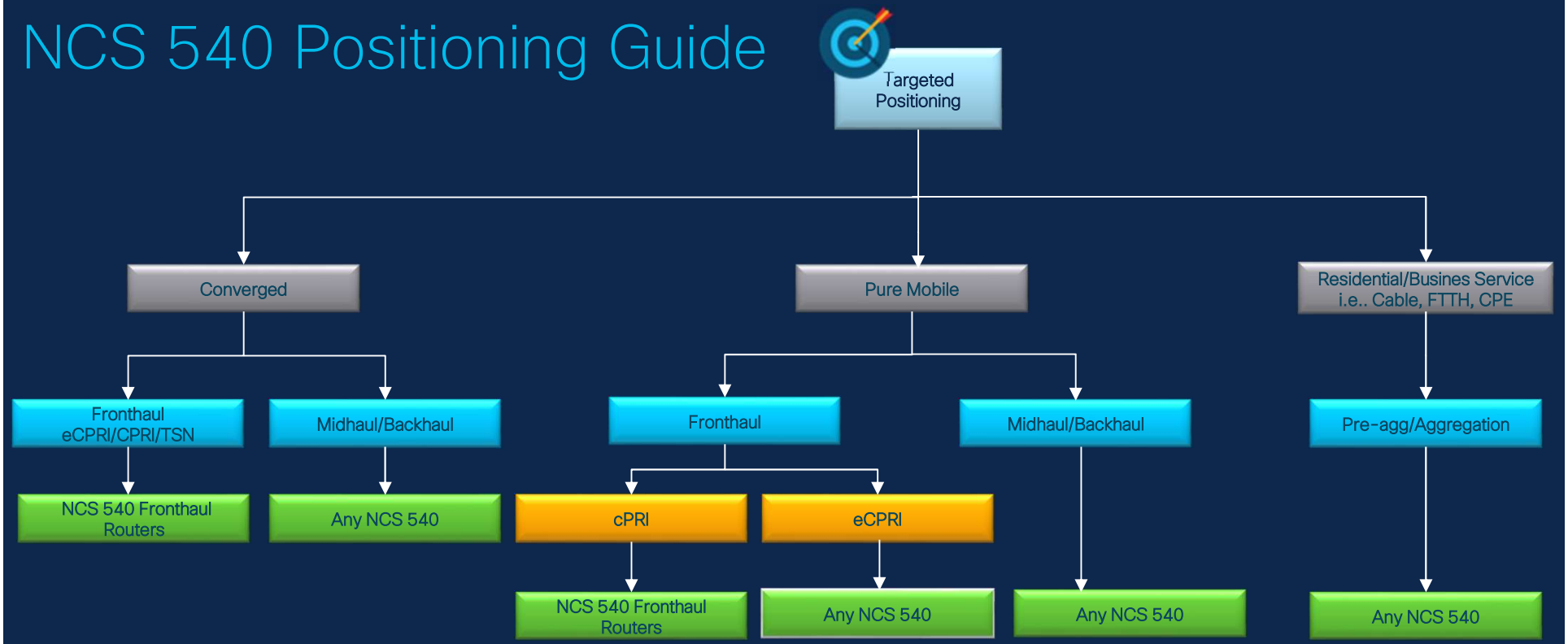
Up to **65%** TCO Savings

Optical-based fronthaul

Savings							
+65%	ROADM	+46%	P2P Active DWDM	+40%	P2P Passive DWDM	+13%	P2P Passive CWDM

Source: ACG – An Economic Comparison of Fronthaul Architectures for 5G Networks

NCS 540 Positioning Guide



NCS 540 Family in 2021

EVPN SR SRv6 MEF 3.0 CERTIFIED

Small

NEW

64G:

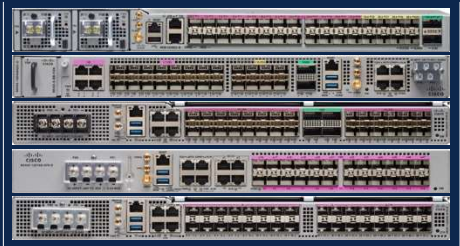
N540X-6Z18G-SYS-D/A

120G:

N540X-4Z14G2Q-D
N540X-8Z16G-SYS-D/A

Q1/Q3 2021

Medium



300G:

- N540-ACC-SYS
- N540X-16Z4G8Q2C-D/A
- N540-28Z4C-SYS-D

140G

- N540X-12Z16G-SYS-D/A
- N540-12Z20G-SYS-D/A

Shipping

Large

NEW

800G

- N540-24Q8L2DD-SYS

Q3 2021

Fronthaul

NEW

300G/900G

- N540-FH-CSR-SYS
- N540-FH-AGG-SYS

Q1/Q3 2021

Small Aggregation Platform Evolution

NCS 560 Portfolio Update

NCS 560 Variants

NCS 560	NCS560-7 (7 RU)	NCS650-4 (4 RU)
ASIC/CPU/Mem	800 Gbps BCOM, Intel Broadwell 4C 1.8GHz CPU 32GB RAM, 128G SSD	800 Gbps BCOM, Intel Broadwell 4C 1.8GHz CPU 32GB RAM, 128G SSD
Port Config	Modular. 4 x 100G QSFP28, 40 x 10G SFP+, 96 x 1G CSFP	Modular. 4 x 100G QSFP28, 32 x 10G SFP+ or 72 x 1G CSF
PSU/Fan	Modular & redundant PSUs and fans Side-to-side airflow. Front-to-back airflow plenum option	Modular & redundant PSUs and fans Side-to-side airflow. Front-to-back airflow plenum option (2RU)
Temperature Support Range	iTemp -40C to +65C	iTemp -40C to +65C Conformal coated SKU's for hot humid conditions
Software	FCS 64 bit IOS XR 6.6.25 (GA, NCS 540, NCS 5500 parity)	FCS 64 bit IOS XR 6.6.25 (GA, NCS 540, NCS 5500 parity)
Timing	1PPS in/out, 10Mhz in/out, ToD, Internal GNSS, External GNSS SyncE, G.8265.1, G.8275.1/2, Class B BC	1PPS in/out, 10Mhz in/out, ToD, Internal GNSS, External GNSS SyncE, G.8265.1, G.8275.1/2, Class B BC
Service Scale*	2M v4/v6 prefixes, 1K VRF, 8K Bridge Domain, 8K VFI, 16K EFP/EVC, 256K MAC, 26K Queues, 10K Policers	2M v4/v6 prefixes, 1K VRF, 8K Bridge Doman, 8K VFI, 16K EFP/EVC, 256K MAC, 26K Queues, 10K Policers
Programmability	Netconf yang, Restconf, BGP-LS, PCEP XTC Integration	Netconf yang, Restconf, BGP-LS, PCEP XTC Integration
Advanced Routing	SR, SR-TE, TI-LFA, On Demand Next Hop	SR, SR-TE, TI-LFA, On Demand Next Hop

N560-IMA-2C

Shipping

Key Highlights

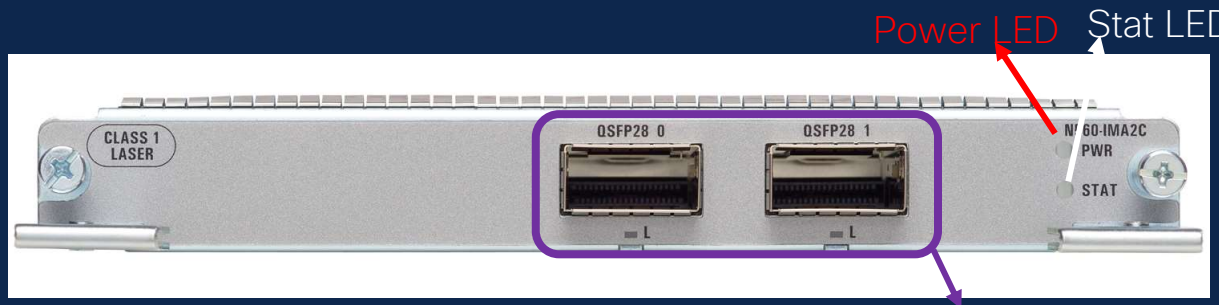
- Scalable 100GE support to cater to pre-aggregation/ aggregation requirements in MBH, Carrier Ethernet, SDN transport use cases
- Support for OTU4 and OTU3 with G.709 FEC

Hardware

- 2 x 40GE/100GE QSFP28
- Each port can work as 40G when QSFP+ optics is used in the port

Timing

- 1PPS in/out, 10Mhz in/out, ToD,
- SyncE, G.8265.1, G.8275.1/2, Class B BC



A900-IMA-8Z

Shipping

Key Highlights

- Dense 10 GE IM to cater to pre-aggregation/ aggregation requirements in MBH, Carrier Ethernet, SDN transport use cases
- G.709 / OTN Wrapper – GFEC

Hardware

- 8 x 10GE SFP+

Timing

- 1PPS in/out, 10Mhz in/out, ToD,
- SyncE, G.8265.1, G.8275.1/2, Class B BC

A900-IMA-8CS1Z

Shipping

Key Highlights

- Dense 1GE IM with CSFP (8 (SFP) to 16 (CSFP)) to cater to pre-aggregation/aggregation requirements in MBH, Carrier Ethernet, SDN transport use cases
- MACsec for 1G ports (In Roadmap)

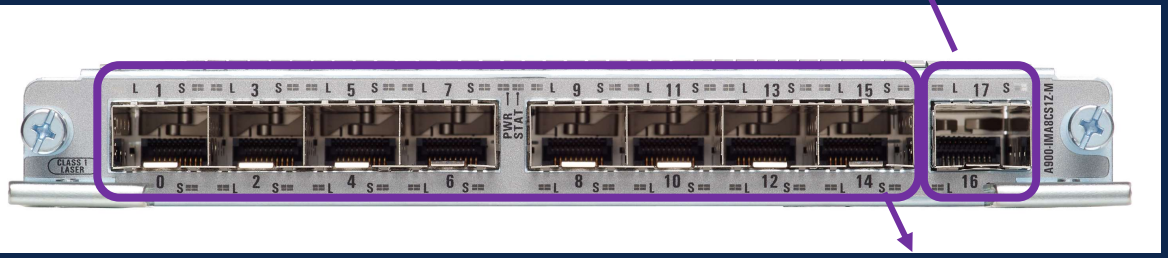
Hardware

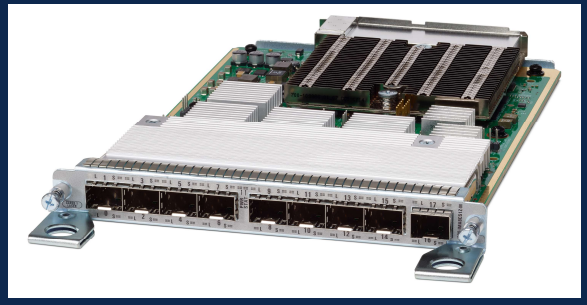
- 8 x 1GE SFP/CSFP Ports + 1 x 10GE SFP+ / 1X1GE SFP/CSFP Ports

Timing

- 1PPS in/out, 10Mhz in/out, ToD,
- SyncE, G.8265.1, G.8275.1/2, Class B BC

1x10GE SFP+ / 1xGE SFP/CSFP Ports





8x1GE SFP/CSFP Ports

New – NCS 560 Interface Modules

CFP2 DCO Interface Module

Key Highlights

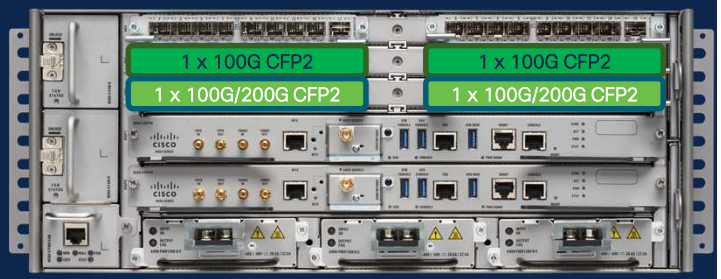
- Interface Module extending Cisco's IPoEoF solution to IOSXR based modular portfolio
- Longer transmission distance support at 100/200G capacity with integrated Tuneable IPoDWDM capabilities (Transponder/ Muxponder) on an IM with CFP2 optic form factor

Hardware

1-port 100G/200G CFP2 DCO Interface Module

- NCS560-7: Supports 1 X 100G/200G in two slots or a maximum of 2 X 100/200G on the chassis
- NCS560-4: Supports 100G mode in 4 slots and 200G mode in two slots

Q2'CY21



SW - 7.2.1

2x100G QSFPDD/ QSFP28 Interface Module

Key Highlights

- Interface Module extending Cisco's IPoEoF solution to IOSXR based modular portfolio
- Longer transmission distance (80km) support at 100G capacity with integrated IPoDWDM capabilities (Transponder/ Muxponder) on an IM with QSFPDD optic form factor

Hardware

2x100G QSFPDD/ QSFP28 Interface Module

NCS560-7

- Supports 2 x 100G in two slots or a maximum of 4 X 100G

NCS560-4

- Supports 2 X 100G in two slots (0,1) for 4 x 100G
- Support of 1x100G in two slots (2,3) on roadmap (> XR 7.3.1)

Q2/Q3' CY21

SW - 7.3.1

8 x 10GE SFP Lite Interface Module

Key Highlights

- Cost optimized dense 10GE Interface module
- Dense 10 GE IM to cater to pre-aggregation/ aggregation requirements in MBH, Carrier Ethernet, SDN transport use cases

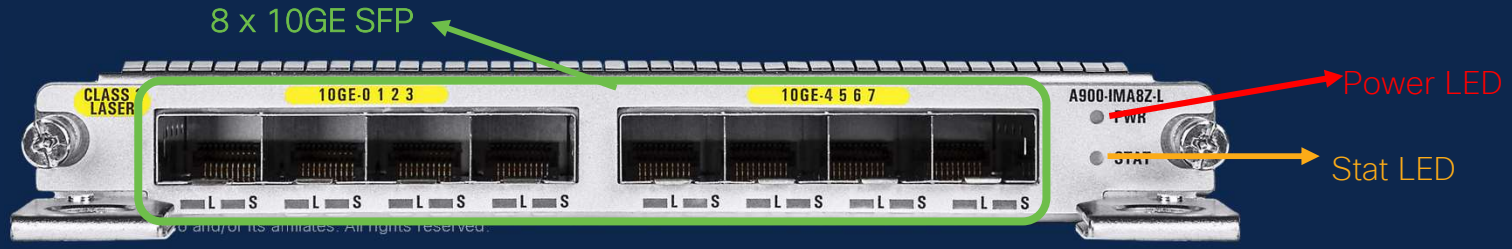
Hardware

8x10GE SFP Interface Module Lite (no G.709 OTN/FEC, no over subscription support)

- NCS560-7: Supports 8 x 10G in 6 slots
- NCS560-4: Supports 8 X 10G in all slots

Q2' CY21

SW - 7.3.1



8 x 10G/25G SFP+/SFP28 or 4 x 50G Interface Module

Key Highlights

- Multi-rate 10G/25G interface to support increased density for xHaul/MBH deployments, aggregating many cell site routers such as NCS540 and/or ASR-920
- Bringing in 50G support to the Routing Portfolio

Hardware

8 x 10G/25G SFP+/SFP28 or 4X50G Interface Module

NCS560-7:

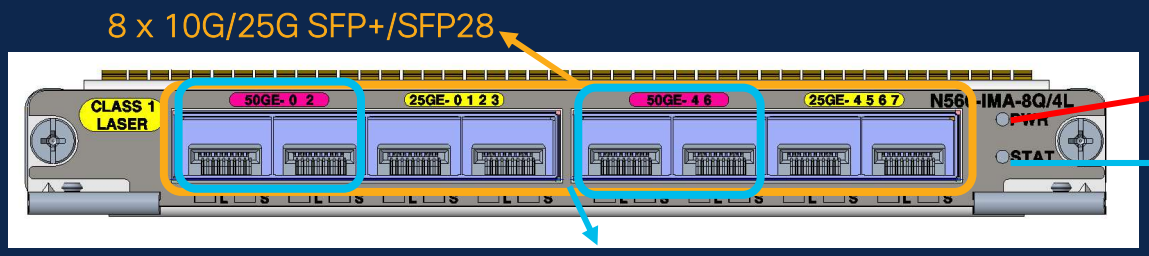
- Supports 8 X 25G in two slots or a maximum of 16 X 25G
- Supports 4 X 50G in two slots

NCS560-4:

- Supports 8 x 25G in two slots and 4 X 25G + 4 X 10G in two slots or a maximum of 24 X 25G
- Supports 4x 50G in two slots and 2x50G in another 2 slots
- Supports 8 x 10G in all slots

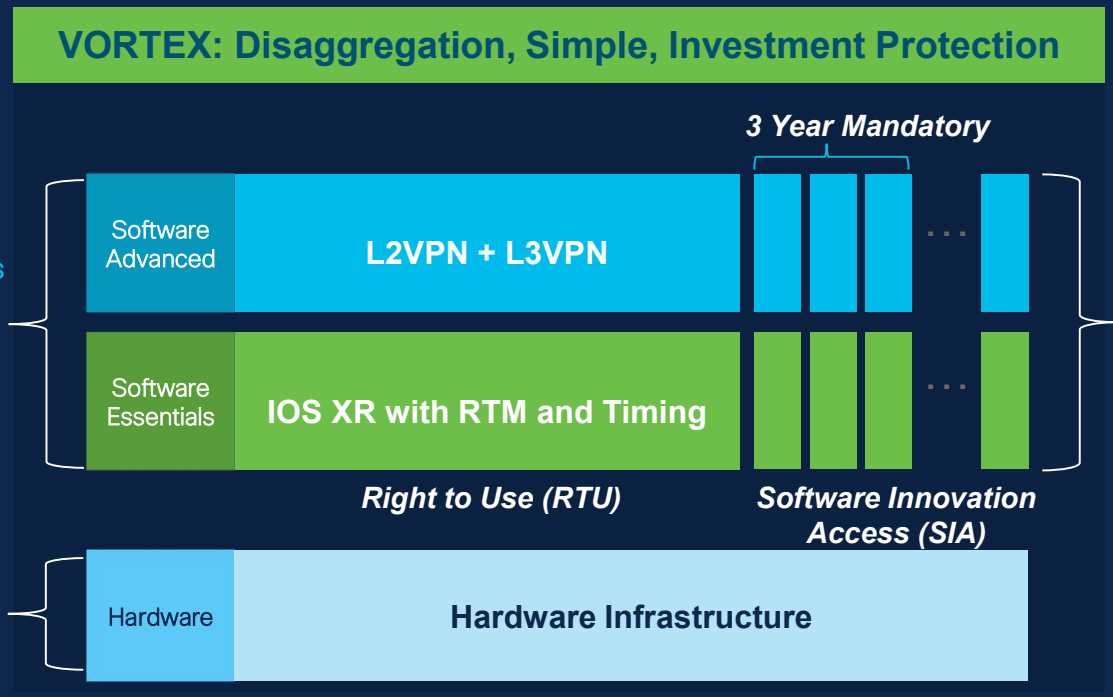
Q3' CY21

SW - 7.4.1



FCM Licensing & Commercials

NCS FCM Structure



2

Two simple suites: Essentials and Advanced

Hardware is separated out from new Software suites

1

SIA annualized subscription provides access to innovation and investment protection

3

Note: Smart Licensing is “Mandatory” requirement for all Vortex customers

Flexible consumption model (FCM)

What is FCM?

- New IOS XR capability
- Software licenses used to add capacity as needed
- Simplified license tracking

How does FCM work?

- Deploy router with minimum software fill-rate
- Easily add capacity as demand increases
- Global network visibility

Why use FCM?

- Reduced upfront capital and network-wide pooling
- Software innovation
- Investment protection

Why is FCM better?

- On-going software innovation keeps IOS XR software cutting edge
- Only Cisco has network-wide pooling, license portability, more visibility

Introducing volume-based offer

- Requirement: Purchase “50” min quantity of any NCS 540 or NCS 560 chassis
- Benefit: 12-20% LP reduction
- Restriction: None!!! Open to all customers and partners

Driving leadership in Access Deployments

Breadth of portfolio
1G/10G/25G/50G/100G/400G
30G to 800G systems

Temp-Hardened, Low Latency,
Class C, extensive timing support

Technical expertise & Industry thought leadership
SR, EVPN, Coherent Optics

IOS XR 7 - Simple, Modern and
Trustworthy network operating system

Packet based fronthaul solution for
end-to-end IP/MPLS solution

Innovative Business Model
Subscription based SIA, RTU Licenses

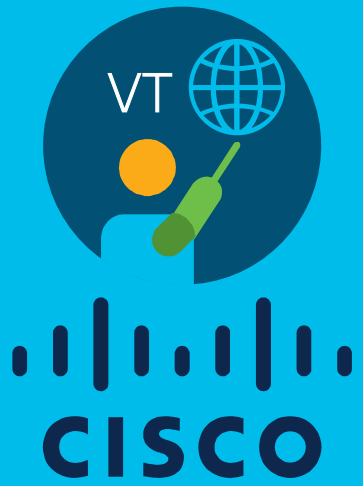
Slide 48

T(10 [@Dennis Pai (depai)] [@Sairam Potnuru (saipotnu)] Please check this slide
Tripti Shetty (trshetty), 4/6/2021

D(27 [@Tripti Shetty (trshetty)] [@Sairam Potnuru (saipotnu)] I made some changes to this slide. For some reason I can't launch desktop PPT on this so I edited in the browser. Please check the formatting.
Dennis Pai (depai), 4/7/2021

S(20 Looks good. Updated formatting
Sairam Potnuru (saipotnu), 4/7/2021

Q & A


VT
CISCO