The bridge to possible

Cisco Knowledge Network

Drive the Metro Network Evolution with the NCS 5700

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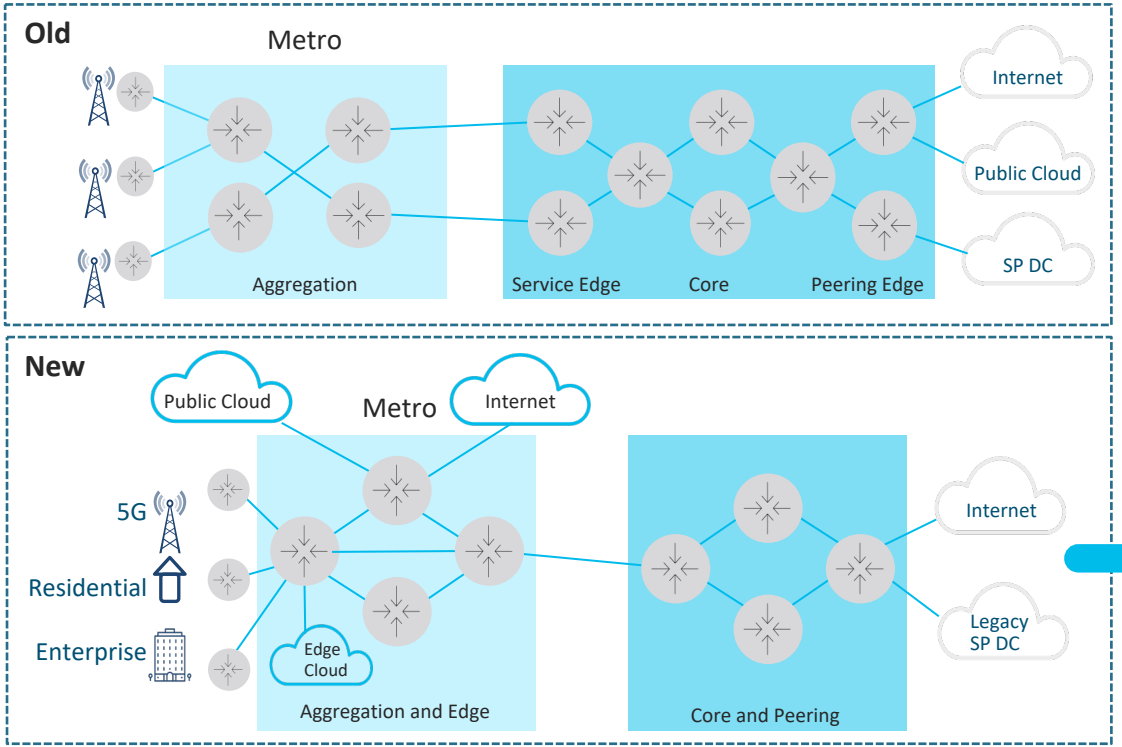
Agenda

1. Converged Metro use case with NCS 5700
2. NCS5500 /5700 Platform Evolution and latest HW updates
3. Metro Architecture Evolution
4. Secure Metro with NCS 5700

Service Provider Architecture Shift

Metro as new point of service delivery



Trends

- Metro architecture shifting

- Metro Cloud Peering | Handoff Closer to User
- Broadband Growth | 8K Video, Gaming, AR/VR, Rural Broadband
- CapEx/OpEx driven Convergence | Wireless fixed IP, TDM & Optical networks

Shift to Converged, service-rich, metro networks

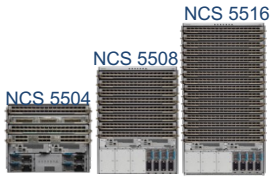
Converged Metro solution with NCS5700

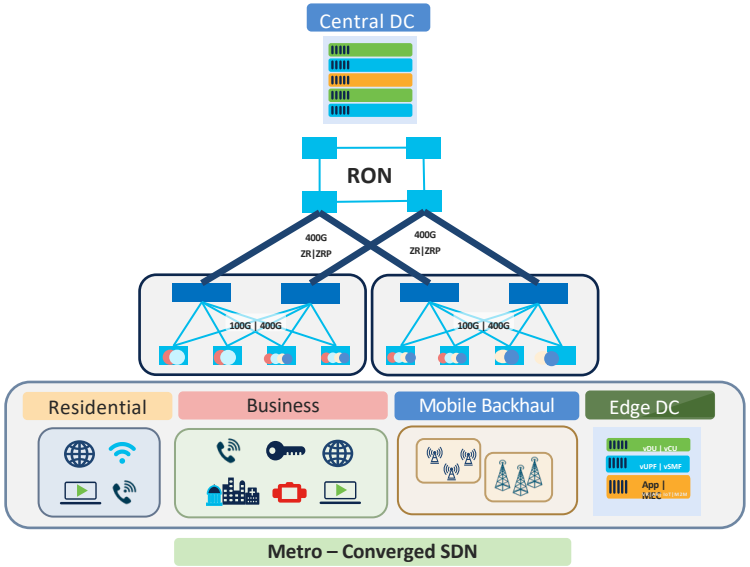
Metro Fabric
Integrated Spine/Leaf

NC57: (400G)
400G/100G
NC57-24DD
NC57-18DD-SE

NC57: (100G)
40G/100G/400G
NC57-36H6D-S
NC57-36H-SE

NC57: (MOD)
10/25/50/100/400G
NC57-MOD-S





Business | Residential
- *SR | SRTE | SRv6 | FlexAlgo | Multicast*
- *EVPN | ELINE | ELAN | ETREE*
- *Secure Boot | TAM Chip | MACSec | DDoS*
- *Telemetry | Automation | YANG*

5G xHaul
- *SR | SRTE | SRv6 | FlexAlgo*
- *L3VPN*
- *Secure Boot | TAM Chip | MACSec | DDoS*
- *Telemetry | Automation | YANG*

Metro Fabric
Clos Architecture Spine/Leaf

NCS 57D2
Fixed: Up to 7.2T
XR7.8.1
NCS-57D2-18DD

NCS 57B1
Fixed: Up to 4.8T
NCS-57B1-6D24H
NCS-57B1-5D24H-SE

NCS 57C3
Fixed: Up to 4T
NCS-57C3-MOD
NCS-57C3-MOD-SE

NCS 57C1
Fixed: Up to 2.4T
NCS57C1-48Q6D-S

NCS 5500/5700 Evolved Use cases

5G Mobile x-Haul

SR/SRv6 | SRTE | BFD | FlexAlgo
Class C Timing | MDB L3 Profiles
1G, 10G, 25G, 100G

Routed Optical

Core | MACSEC | TI-LFA
400G ZR/ZRP | BFD | MDB L3 Profiles
Peering | Flowspec | Hybrid ACL,LPTS

Distributed Metro Edge

SR/SRv6 | SRTE | BFD | FlexAlgo
Class C Timing | MACSec | Flowspec
MDB L2, L3 Profiles |1G ~ 400G

Enterprise & Residential Agg.

SR/SRv6 | SRTE | mVPN | EVPN
MDB L2 Profiles | IGMP/MLD | TWAMP
Egress TM | 10/25/50G |100/400G

Converged SDN

SR/SRv6 | SRTE | EVPN | BGP PIC
MDB L2, L3 Profiles | IPSLA | G8032
Egress TM | 1G ~ 400G

High End Aggregation

SR/SRv6 | SRTE | PWHE | FlexAlgo
VxLAN| MACSec | Flowspec
MDB L2, L3 Profiles |1G ~ 400G

Naming Logic

NCS57C1-48Q6D-S

NCS55 → Q/Mx/J/J+
NCS57 → J2/J2c/Q2c

0 → Jericho
A → J+
B → J2
C → J2C/Q2C
D → J2C+

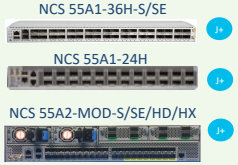
#RU

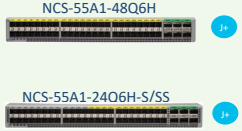
48x1/10/25G + 6x400G

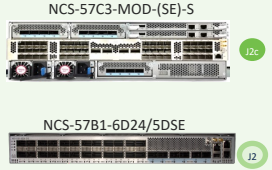
S = MACSEC

NCS 5500/5700 Platform Evolution

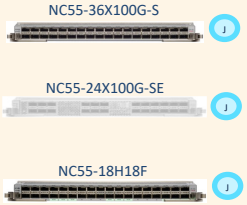
Fixed

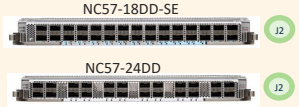


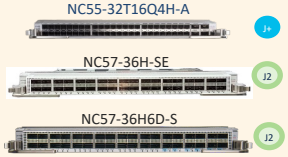




Modular







2015-2016

- Web + Core + Peering use cases (10G/100G)

2017-2018

- SP Aggregation 1G/10G/100G
- MACSec
- Timing

2019-2020

- 400G enablement
- High Scale 100G / 400G Aggregation
- NCS5700 Native & Compatibility mode
- Class C Timing

2021

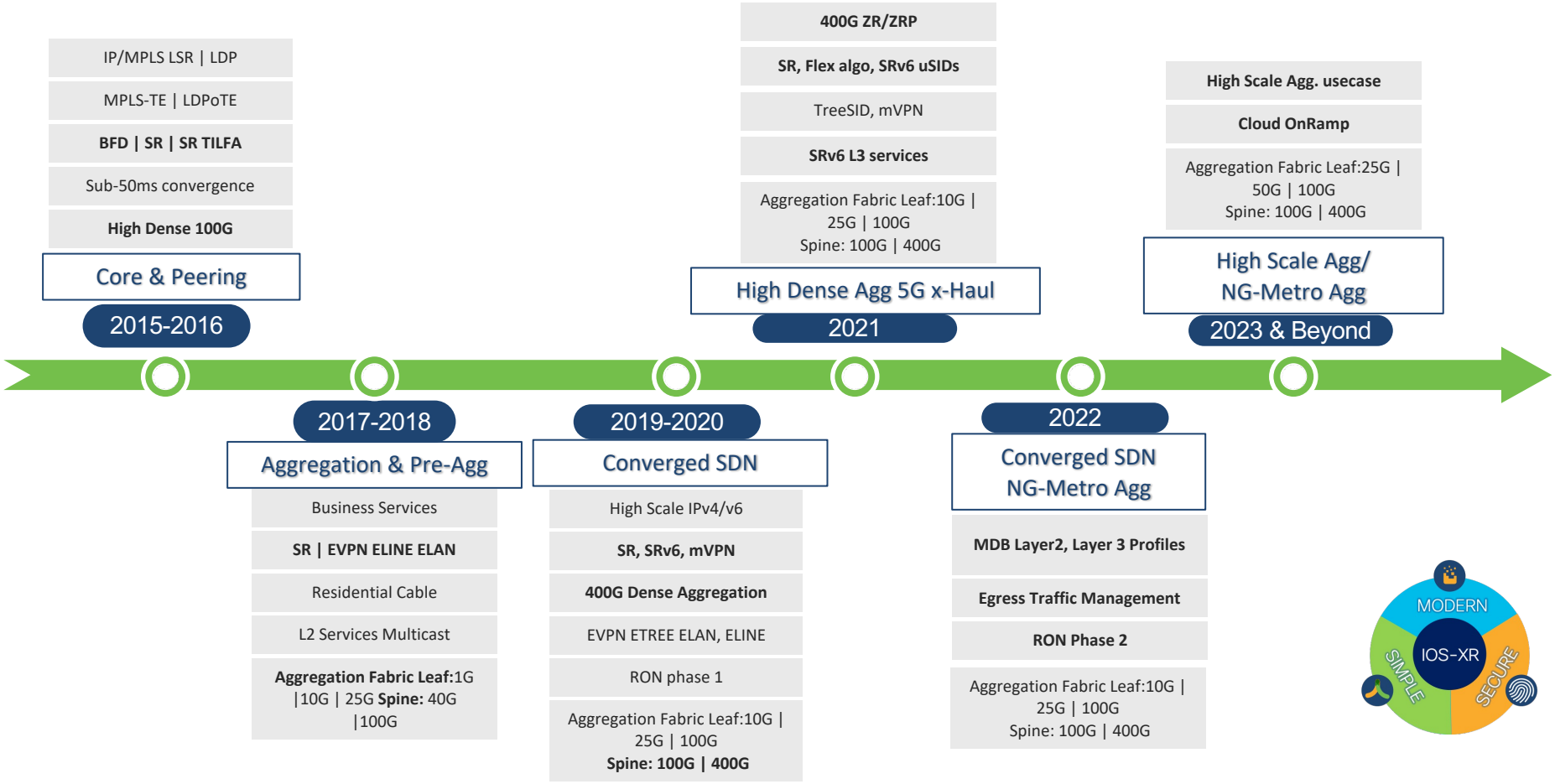
- 400G ZR/ZRP enablement
- High scale dense Aggregation
- 5G Metro Aggregation
- RON (CFP2)

2022

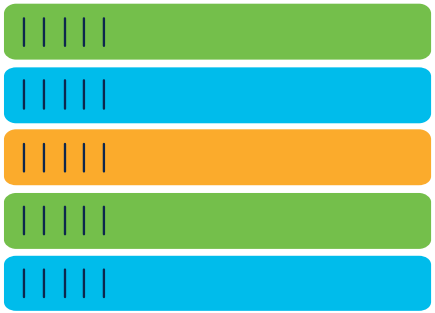
- Modular Database Enhanced L2/L3 use cases
- Egress Traffic Manager
- RON (PLE, ZR/ZR+)

ASICS
Jericho
Jericho+
Jericho2
Jericho2c/ Qumran2c

NCS 5500/5700 Ongoing Innovation



NCS 5700
Fixed Routers



Coming in
7.8.1

NCS 5700 – Dense 100G/400G Metro Spine

NEW!

- **NCS-57D2-18DD-SYS**
- **Ideal for Use cases** : High-Scale Aggregation, 5G xHaul, Core & Peering Fabric, Converged SDN Transport and Cloud
- Compact 2RU, 600mm depth, F2B/B2F Air-flow, Dual PSU, 4x fan trays
- Enhanced 7.2T scale
- 66 Total flexible ports 10/25/100GE interfaces; Up to 18 ports of 400GE
- Hardware capable Full line rate MACSec & IPSec on all ports. *SW support post FCS
- 400G ZR/ZRP, 100G ZR, and Breakout Supported
- Class C timing

Quick Facts

Capacity	Base: 7.2T
NPU	1x DNX (7.2T)
Memory	32GB DDR4
Port Configuration	66 QSFP-DD Ports: 2x 400G + 16x 400G / 64x 100G
Estimated Typical Power Consumption	800W (without Optics)
Planned Release(s)	7.8.1
Hardware capabilities	ASIC Based: MACSEC/IPSec, Class C Timing, Built-in GNSS

**Power consumption can vary based on optics used, frame type and line rate.*

NCS 5700 - 100G to 400G Metro Leaf/Spine

- **NCS-57B1-6D24-SYS/NCS-57B1-5DSE-SYS**
- Compact 1RU, 600mm depth, F2B air-flow, dual PSU, 6x fan trays
- Available OP2 External TCAM version for augmented FIB, Stats, Counters and feature scale.
- Recommended network use cases : 5G xHaul, Core and Peering Fabric, Converged SDN Transport and Cloud
- Flexible with multiple interfaces support : 10G - 400G
- Full line rate MACSec Support on all ports
- 400G ZR/ZRP, 100G ZR, and Breakout Supported
- Class C timing

Quick Facts

Capacity	Base: 4.8T | Scale: 4.4T
NPU	1x Jericho2 (4.8T)
Port Configuration	Base: 6x QSFP-DD (400G) + 24x QSFP-DD (100G) Scale: 5x QSFP-DD (400G) + 24x QSFP-DD (100G)
Power* (Worst case)	Base: 610W (without Optics) Scale: 630W (without Optics)
Release(s)	7.3.1, Shipping
Hardware capabilities	MACSEC, Class C Timing, Built-in GNSS,

**Power consumption can vary based on optics used, frame type and line rate.*

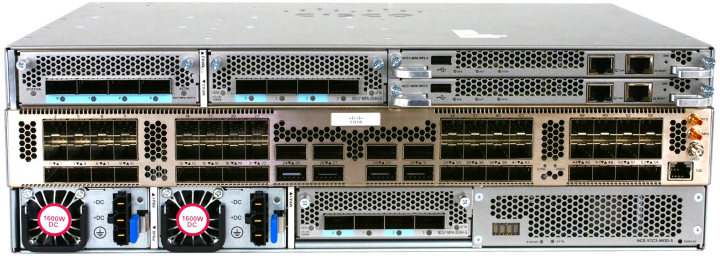
For more information, please refer to NCS 5500 data sheet.

NCS 5700 - Flexible Centralized Pre-Agg/Agg

- **NCS-57C3-MOD-SYS**
- Compact 3RU, 284mm depth, F2B air-flow, dual RP, dual PSU, 6x fan trays
- Flexible with multiple interfaces support : 1G - 400G
- Ideal for network use cases such as Mobile backhaul, Core/LSR, Peering etc.
- Platform will also support RON, PLE
- 400G ZR/ZRP, CFP2-DCO support via MPA

MPA's supported:

4x QSFP-DD	12x SFP56	1xCFP2 + 1xQSFP-DD
7.4.1	7.5.1	7.8.1
PLE	**All existing 400G MPA's**	
7.71	7.4.1	



Quick Facts

Capacity	Base: 4.0T | Scale: 3.6T (Oversubscribed)
NPU	1x Jericho2C (2.4 T)
Port Configuration	2x MPAs (800G) + 1x MPA (400G) + 48x SFP28 + 8/4x QSFP28
Power* (Worst case)	Base: 975W (with 3XMPA) Scale: 1035W (with 3XMPA)
Temperature Support** (at 1800m)	0 - 55 °C (With 400G MPAs & low-powered optics) 0 - 50 °C (With 800G MPA & low-powered optics) 0 - 40 °C (With 800G MPA & high-powered optics)
Release	7.4.1, Shipping
Hardware capabilities	MACSEC, Class C Timing, Built-in GNSS, Redundant RP

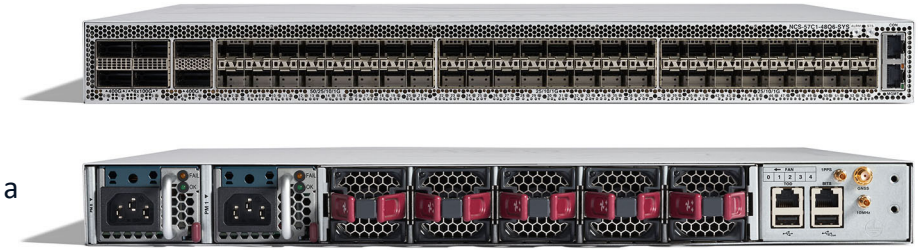
**Power consumption can vary based on optics used, frame type and line rate.*

***Temperature to be confirmed after final testing*

For more information, please refer to NCS 5500 data sheet.

NCS 5700 - Dense SFP+ Metro Leaf

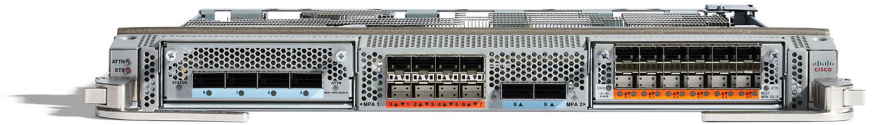
- **NCS-57C1-48Q6D-S**
- Built for the evolving requirements of modern 5G xHaul networks to provide connectivity for RU and CU elements to a 400G spine
- 1RU, Depth ~500mm
- Flexible Port config that supports from 1G to 400G
- Ideal for network use cases like pre-Agg / Agg, vDU pooling, TOR, CIN / PON Agg
- Native 25G and 50G support required for 5G xHaul
- 4x100G/2x100G breakout support possible on all QSFP-DD 400G ports
- 400G ZR/ZRP support on 3X400G ports at FCS



Quick Facts	
Capacity	4.0 T (Oversubscribed)
NPU	1x Qumran2c (2.4 T)
Port Configuration	32x SFP28 + 16x SFP56 + 2x QSFP-DD(4x100G) + 4x QSFP-DD (400G)
Power (w/o optics)	Typical: 340W Max: 488W
Temperature Support (at 1800 m)	0-40°C
Planned Release(s)	7.5.2, Shipping
Hardware capabilities	MACSEC, Class C Timing, Built-in GNSS receiver

NCS 5700 Modular Routers & Linecards

Flexible Line Card



- **NC57-MOD-S**
- J2 successor of famous NC55-MOD-A-S line card
- Applicable for use cases such as xHaul, Aggregation, IPoEoF, Metro DCI and Longhaul DWDM applications
- Native 25G and 50G support required for 5G xHaul
- Class C timing is new de facto standard to support 5G xHaul
- 400G-ZR/ZRP supported on both QDD ports

Quick Facts

Capacity	4.8Tbs Full-Duplex
NPU	1x J2
Port Configuration	2x MPAs (800G) + 8x SFP56 + 2x QSFP-DD
Power (Worst case)	580 W (without MPAs)
Release	7.6.1, Shipping
Hardware capabilities @ FCS	MACSEC, Class C Timing Supports all available MPAs , but no 1G support QDD-400G-ZR/ZRP support

NCS5700 – Dense 400GE Line Cards

NC57-24DD (Base)

Quick Facts

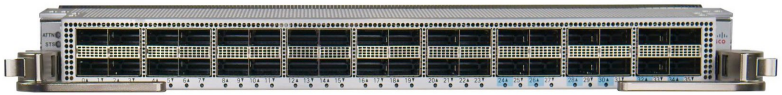
Ideal Use case	**Ideal for Core/LSR, DCI & Aggregation**
Capacity	9.6T (Base)
NPU	2 x J2
Port Configuration	24 x 400 GE Base Line Card
Power	Line card with no transceivers: • Typical (27°C): 880W • Maximum (40°C): 890W
Hardware capabilities	• Class B timing support on all ports • Flexible ports enabling 40GE, 100GE, 200GE, 400GE • On-chip Ternary Content-Addressable Memory (TCAM) for network ACLs and QoS

NC57-18DD-SE (Scale)

Quick Facts

Ideal Use case	**Ideal for Peering & High Scale Aggregation**
Capacity	7.2T (Scale)
NPU	2 x J2
Port Configuration	18 x 400 GE or 30 x 200GE/100GE Scale Line Card
Power	Line card with no transceivers: • Typical (27°C): 800W • Maximum (40°C): 900W
Hardware capabilities	• Class B timing support on all ports • Flexible ports enabling 40GE, 100GE, 200GE, 400GE • On-chip Ternary Content-Addressable Memory (TCAM) for network ACLs and QoS

NCS5700 – Dense 100GE Line Cards



NC57-36H6D-S (Base)

Quick Facts

Ideal Use case	**Ideal for Core/LSR, DCI & Aggregation**
Capacity	4.8T (Base)
NPU	1x J2
Port Configuration	• 36 ports 100 GE • 24 port 100 GE + 12 port 200 GE • 24 port 100 Gigabit Ethernet + 6 port 400 GE
Power (Worst case)	Line card with no transceivers: • Typical (27°C): 676W • Maximum (40°C): 873W
Hardware capabilities @ FCS	• Class C timing and MACsec support on all ports • Flexible ports enabling 10GE, 40GE, 100GE, 200GE, 400GE including ZR/ZRP • On-chip Ternary Content-Addressable Memory (TCAM) for network ACLs and QoS

NC57-36H-SE (Scale)

Quick Facts

Ideal Use case	**Ideal for Peering & High Scale Aggregation**
Capacity	3.2T (Scale)
NPU	1x J2
Port Configuration	36 x 100GE ports Scale Line Card
Power (Worst case)	Line card with no transceivers: • Typical (27°C): 676W • Maximum (40°C): 873W
Hardware capabilities @ FCS	• Class B timing support on all ports • Flexible ports enabling 10GE, 40GE, 100GE including ZR/ZRP • On-chip Ternary Content-Addressable Memory (TCAM) for network ACLs and QoS

Sustainable concepts implemented in NCS-57D2-18DD

Materials

- Post-consumer resins with 75% recycled content
- Shorter Lighting pipes
- Minimal plastic labels
- Less heat sinks due to better thermal management

Standardization

- Reused power supply and modular fan assay
- Common FT housing, shudder design
- Common Fasteners

Smart Energy

- Platinum Efficiency PSU
- Default power off on unused ports
- Automatic voltage scaling

Reuse and Repair

- Common fastening hardware
- Accessible and replaceable batteries
- Better plastic recovery at end of life

Packing and Accountability

- HRC foam packaging instead of virgin PU
- Fully corrugated packaging to eliminate foam

Modular Port Adaptors

(Insert into NCS-55A2, NCS-57C3,NC55-MOD, NC57-MOD)

Shipping

Modular Port Adapters

NC55-MPA-12T-S

12x 10G SFP+ ports

NC55-MPA-1TH2H-S

1x 200G/100G CFP2 + 2x 100G QSFP28 ports

400G

NC55-MPA-4H-S

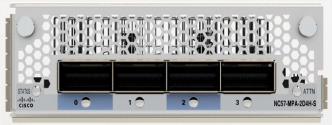
4x 100G QSFP28 ports

NC55-MPA-2TH-S

2x 200G/100G CFP2 ports

For more information, please refer to 400G MPAs: NCS 55A2 MOD data sheet

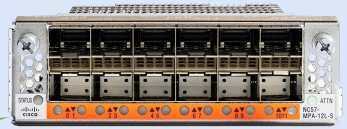
Modular Port Adapters



Shipping

NC57-MPA-2D4H-S

- 4x QSFP-DD ports
- Supports operable modes of 400G, 100G and breakouts of 25G, 10G
- QSFP DD ZR/ZRP support in 7.5.1



Shipping

NC57-MPA-12L-S

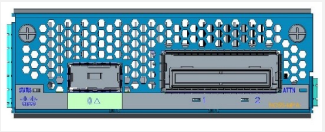
- 12 SFP56 (10G/25G/50G)
- Class B and limited to 400G when used on NCS-55A2 & NC55-MOD

800G

Shipping

Private Line Emulation (PLE)

- 8x SFP+/ Private Line Service ports STM-16/OC48, STM-64/OC192, 1GE, 10GE,OTU2/2e, FC-1/2/4/8/16/32G
- Release 7.7.1 2H 2022



NC57-MPA-1FH1D-S

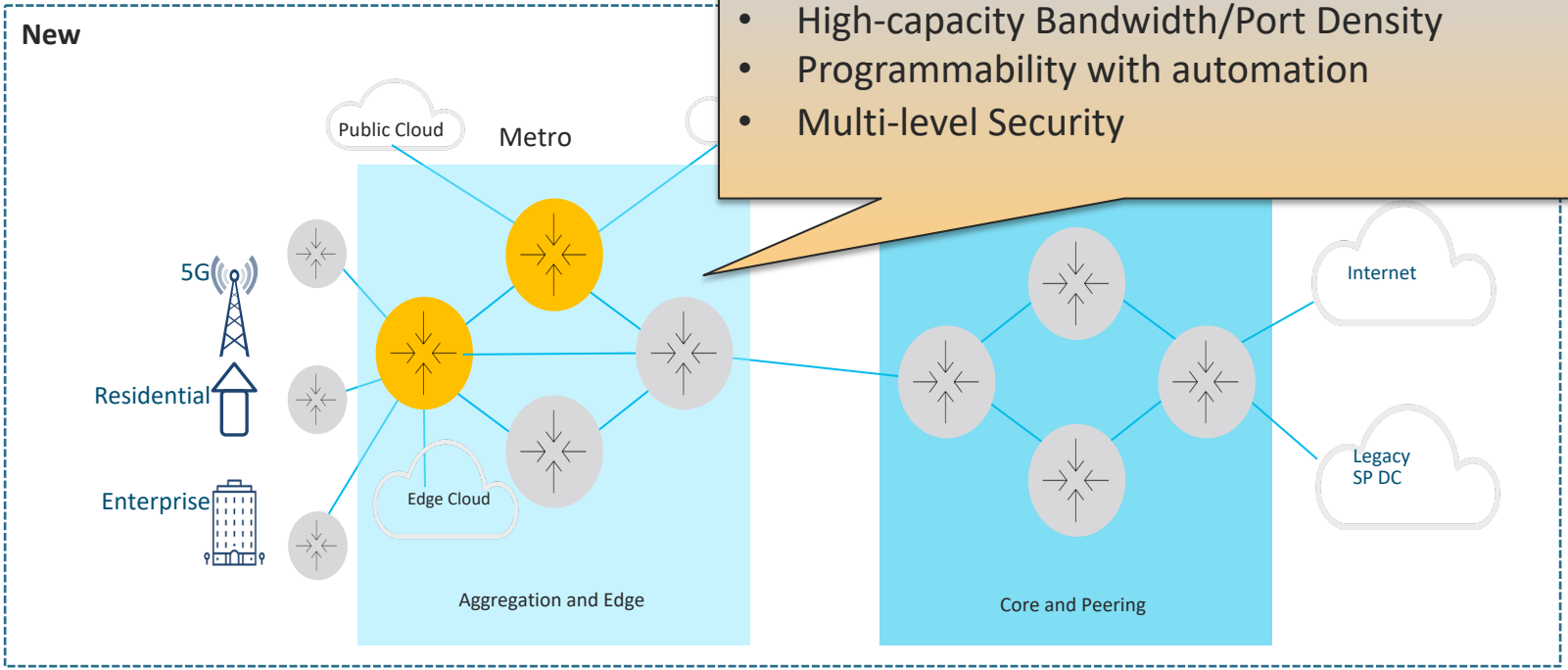
- 1x CFP2 DCO + 1x QSFP-DD ports
- Supports CFP2 modules with high optical output power as needed to interface with legacy DWDM systems
- Target release 7.8.1 Q1 2023

For more information, please refer to 800G MPAs: [NCS 5700 MPA data sheet]

Metro Architecture Evolution

Metro Evolution : Requirements !

- Converged & Scalable architecture
- High-capacity Bandwidth/Port Density
- Programmability with automation
- Multi-level Security



Converged & Scalable Metro with NCS5700

NCS5700 caters well for “Metro Evolution”

- **RON Architecture :Converged Metro with simplified IP/Optical convergence**

✓ Support for ZR/ZRP 400G optics with high 400 QDD port density. (more optics supporting RON architecture in pipeline)

✓ PLE(Private Line Emulation) is ready to go with new MPA and Circuit-style SR

✓ Smart SFP support for TDM to IP

- **Highly Scalable feature rich platform (Software and hardware innovations)**

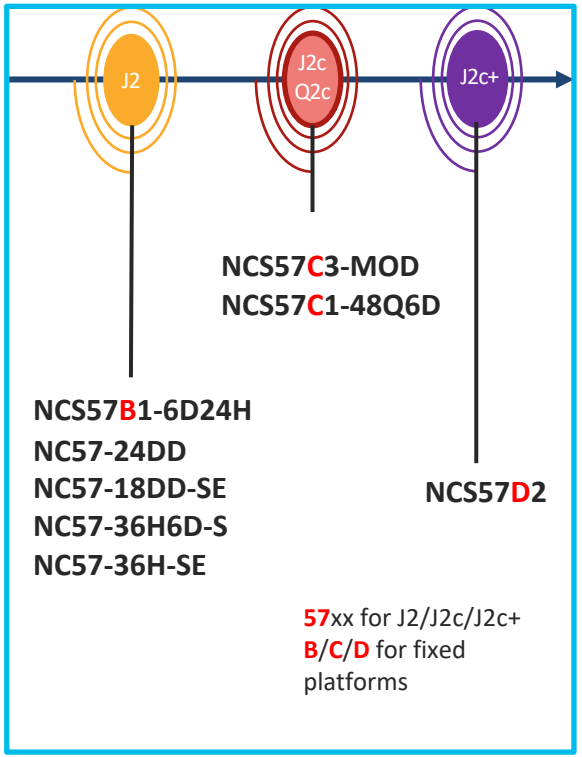
✓ Modular Databases (MDB) for flexible resource carving

✓ Higher on-chip resource scale on the ASIC (J2, J2C, J2C+)

✓ Effective usage of eTCAM on the SE variants for higher scale

✓ High Queuing scale with stats along with software innovations like ETM

✓ SW feature innovations mainly with SR/SRv6 to tailor to the high scale Customer requirements

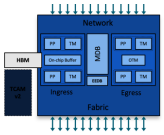


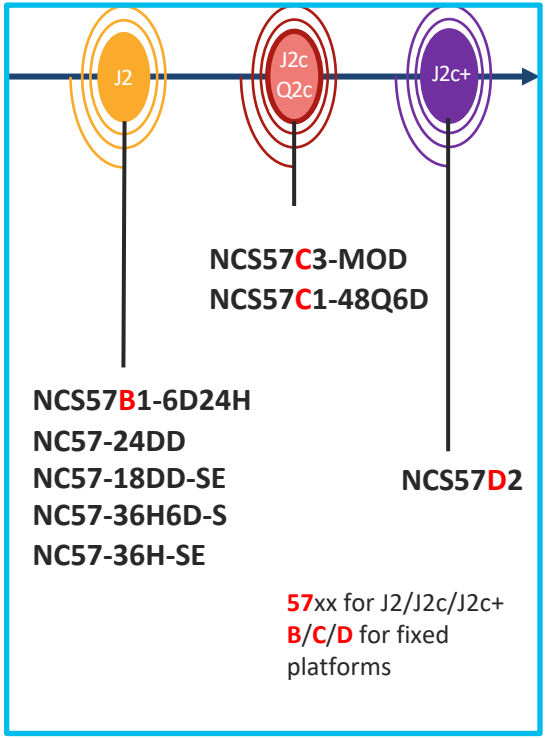
High Capacity with NCS5700

NCS5700 caters well for "Metro Evolution"

NCS5700 Forwarding ASIC for high bandwidth requirements

- ✓ Capable of doing 2.4Tbps to 7.2 Tbps per NPU (1B to 2.83B pps)
- ✓ Support for variable port speeds (native/BO) 1G, 10G, 25G, 40G, 50G, 100G, 400G
- ✓ HBM provides deep packet buffering while congestion
- ✓ On-chip buffers 32MB for queueing (including better counters/stats with VoQ scale on J2C/J2C+)
- ✓ Elastic Pipeline which can parse (upto 144B) and handle some of the complex application traffic in single pass (Large label stack – 10 labels, egress ACLv6 etc)
- ✓ SRv6 native implementation- Can impose 26 uSIDs in a single pass. **"NCS5700 is the only platform capable to do this Today. Bell-Canada was able successfully validate this."**





NCS 5700 For Converged SDN | Metro | 5G xHaul

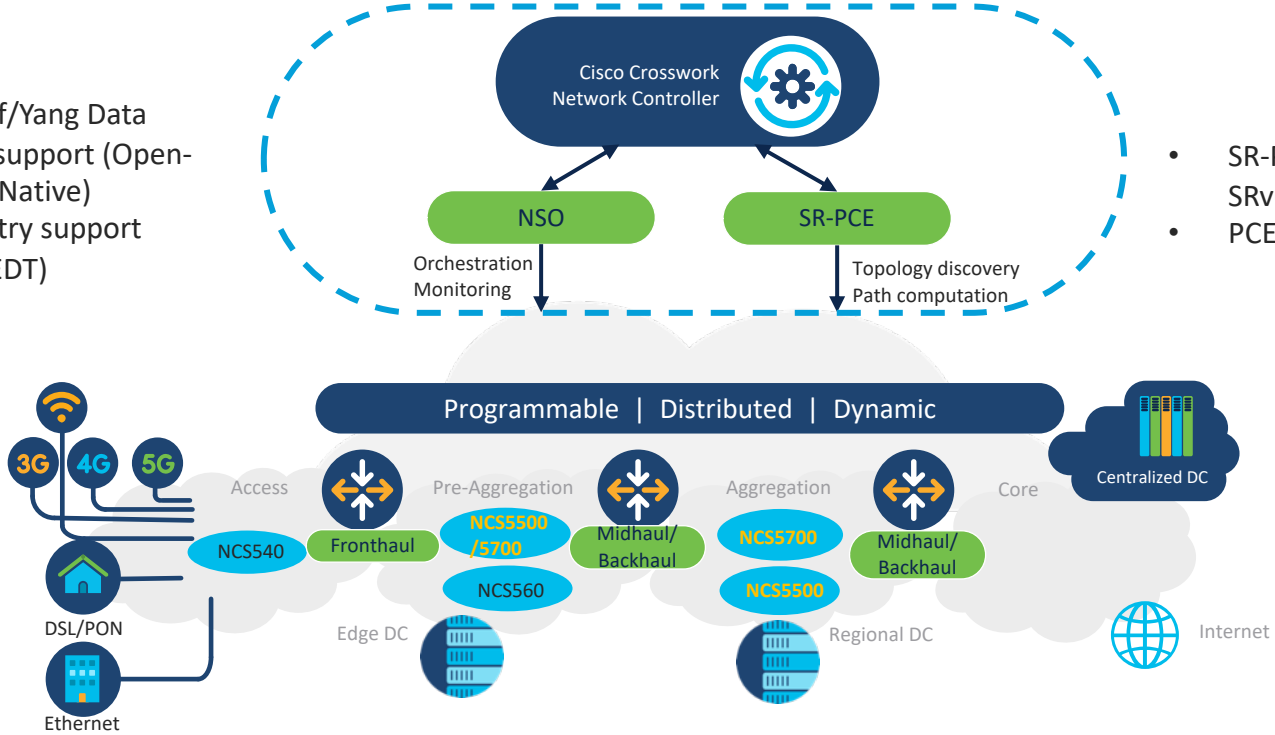
Industry leading feature parity with IOS-XR to cater to SP/DC/Web positioning

- ✓ Extensive SR-EVPN feature parity
- ✓ Pioneer in driving SRv6 adaption in the industry
- ✓ Full fledged Routing, MPLS, QoS , ACL, Security, OAM, Metro feature support
- ✓ Native class-C timing support (J2C/J2C+) systems
- ✓ Encryption support

		NCS5500 (J/J+)	NCS5700 (J2/J2C/Q2C)
SEGMENT ROUTING	SR Transport/LSR	✓	✓
	SR TILFA| FlexAlgo | TE	✓	✓
	SR L3 Services	✓	✓
	SR L2 Services	✓	✓
SRv6 uSID	SRv6 Transport/LSR	✓	✓
	SRv6 TILFA| FlexAlgo | TE	✓	✓
	SRv6 L3 Services	✓	✓
	SRv6 L2 Service	✓	✓

Network Automation & Programmability on NCS5700

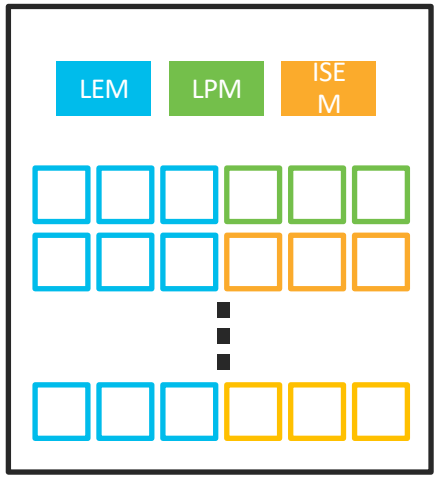
- Netconf/Yang Data model support (Open-config, Native)
- Telemetry support (MDT, EDT)

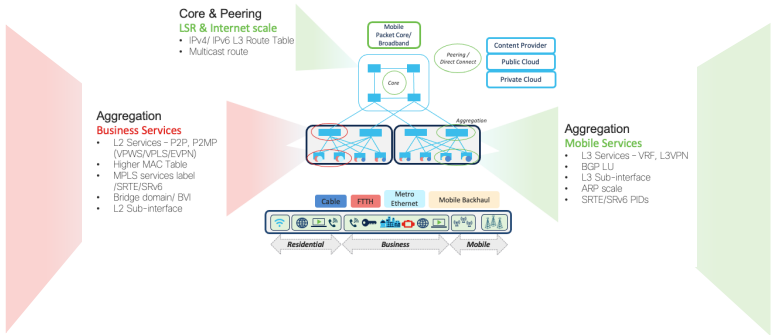


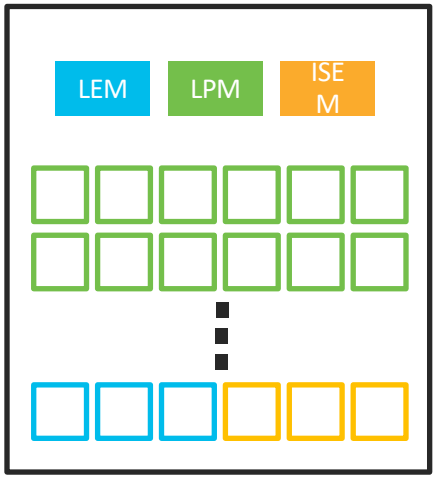
- SR-PCE for SRTE & SRv6
- PCEP, BGP-LS

Cisco NCS5700 MDB Profiles

MDB Profile resource carving







L2 Profile

- Higher or Lower database based on usecase
- Total Database is still same
- If LPM reduced by X amount, then LEM need not be increased same amount

L3 Profile

NCS 5700: Scale Improvements (L3)

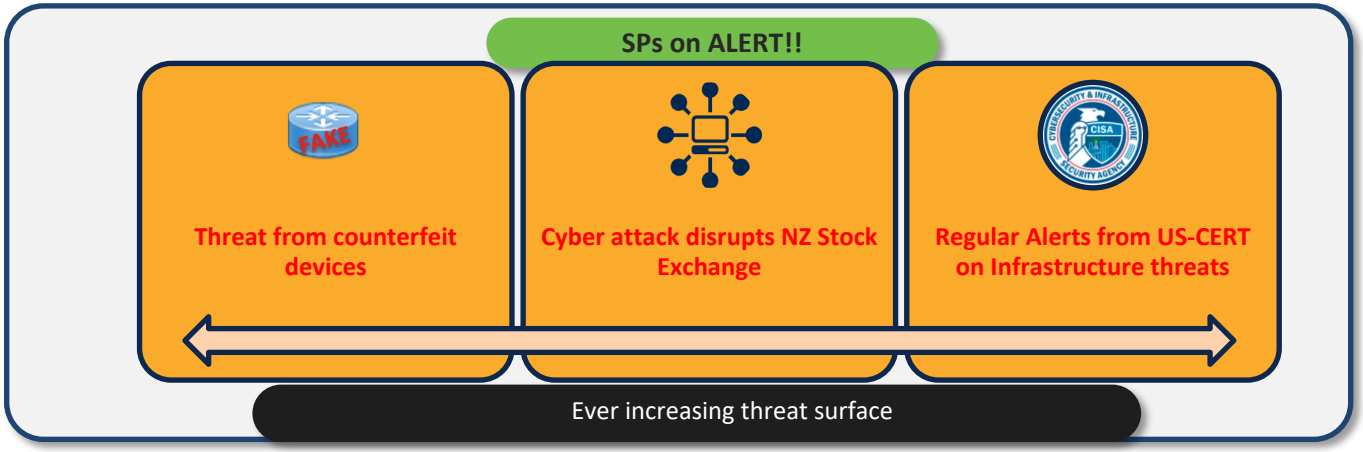
Feature	Existing industry solution	NCSS5700 (Latest XR release) Enhancement Up-to
L3 interfaces without QoS	X	4X
IPv4 Route	X	1.25X
IPv6 Route	X	23X
BFD (Single Path + Multi Path)/LC	X	8X
BGP Sessions	X	2.4X
BGP FS	X	10X
Number of L2/L3 interface Egress QoS without ETM (8 queue per system)	X	3X
Number of L2/L3 interface Egress QoS with ETM (8 queue per system)	NA	NEW

NCS 5700: Scale Improvements (L2)

Feature	Existing industry solution	NCSS5700 (Latest XR release) Enhancement Up to
ARP	X	2X
ND	X	5X
L2 sub-interface without QoS	X	2X
L2 service PW (Xconnect/VPWS)	X	2X
BD	X	4X
BVI	X	5X
MACs per System	X	4X
CFM MEP	X	4X
AC's	X	11X

Secure Metro with NCS 5700

Why Secure Metro Aggregation?



Secure Metro Aggregation with Trustworthy Platforms

Hardware Integrity

Provides counterfeit hardware protection and provides Hardware Root of Trust

Boot Integrity

Ensures integrity of the boot process with Cisco Secure boot anchored in Hardware

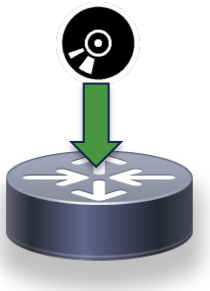
Runtime Integrity

Ensures integrity of the IOS-XR runtime

Trust Visibility

Provides visualization of Trust with Crosswork Trust Insights

Security Features Built on Foundations of Trust



Secure ZTP

RFC8572 compliant secure zero touch provisioning of routers

Disk Encryption

Provides data-at-rest protection for configuration data

Packet Encryption

Transport security for 5G deployments

Re-Image Protection

Provides re-image protection for routers to deter thefts

Trust Validation with Crosswork

Trust and Assured Inventory data accessible via API to enable Closed-Loop Automation

Key Takeaways

- Most Feature-rich + Dense 100G/400G Platform
- Trustworthy Vendor and Pervasive Security
- Future Proof design with versatile Hardware and Flexible Pricing Models
- Converged Services, 5G and RON solutions