White paper
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Cisco NCS 5500/5700 Fixed Platforms Architecture

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NCS 5500 and NCS 5700 Family Introduction

The Network Convergence System (NCS) 5500 and 5700 Series are specifically designed to be a scalable, low-power consumption, and cost-optimized 100G routing platform with a path to 400G. The platform family offers industry-leading density of 1/10/25/40/50/100/400G ports for high-scale networks with efficient forwarding performance, low jitter, and the lowest power consumption per gigabits/sec at a very cost-effective price point.

The NCS 5500 and NCS 5700 product family is built to meet the massive bandwidth and operational needs of data centers, large enterprise, web and service provider's WAN, and aggregation networks. These systems provide functionality vital to the spine and leaf roles common to modern architectures as well as traditional core, aggregation access architectures.

The NCS 5500 and NCS 5700 leverage the industry-leading IOS XR operating system with a full suite of standard layer-2 and layer-3 protocols, plus new features and functions such as:

- Large label stack support
- Segment Routing, SRv6, and EVPN
- Comprehensive end-to-end OAM functionalities – including BFD, Ethernet OAM, Y.1731, Y.1564, TWAMP, and Ethernet loopback
- Application hosting
- Programmability
- Enhanced automation
- Machine-to-Machine (M2M) interface
- Telemetry
- Flexible package delivery

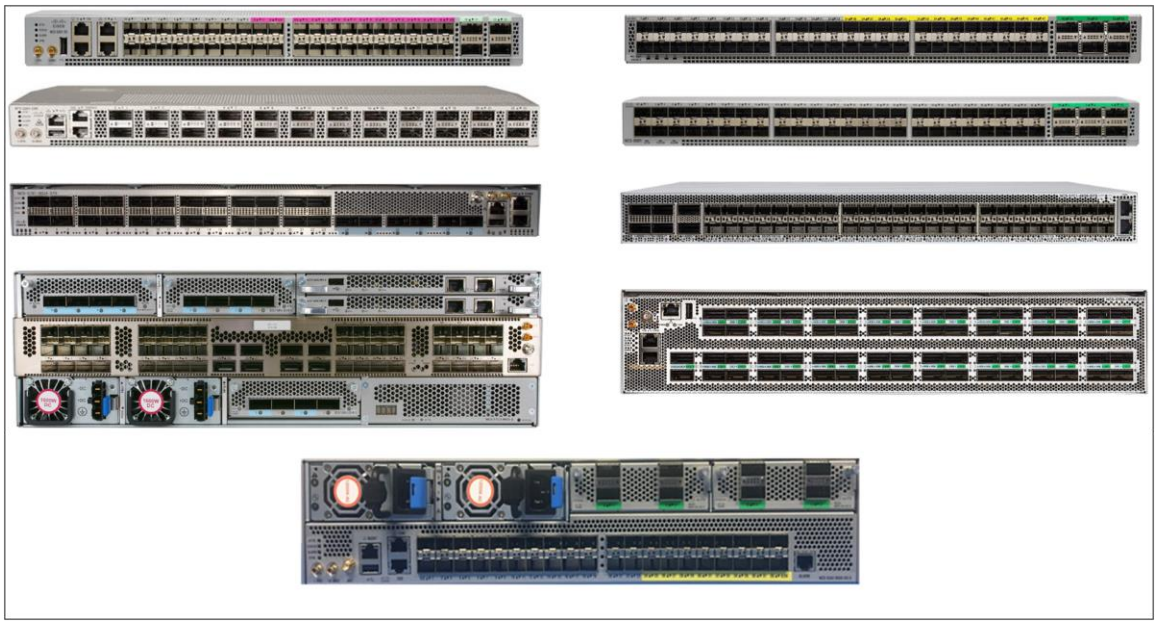


Figure 1.
NCS 5500/5700 fixed platform family

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Since its introduction, the product portfolio has expanded and now offers multiple fixed and modular form factors, giving more consumption flexibility to the customers. The first generation of fixed form factor platforms was based on Qumran-MX and Jericho ASICs. It offered performance and scale with port speeds of 1/10/40/100G. Building on the success of first-generation platforms, the second generation of NCS 5500 fixed form factors utilized higher-bandwidth Jericho+ ASICs, bringing in more port density options supporting 1/10/25/40/100G ports and capabilities such as line rate MACsec, DWDM, and timing. The latest introduction in the portfolio, the third generation has been named NCS 5700 to reflect the use of a new forwarding ASIC: Jericho2/J2C/Q2C/J2C+.

This whitepaper focuses on the hardware architecture, characteristics, and packet forwarding of the three generations of NCS 5500 and NCS 5700 fixed form factor platforms.

Below is the naming convention for the fixed platform, and the table summarizes the available models.

NCS 5xyz(-SE)(-S):

x = 5 → Products based on Q-MX and J/J+

x = 7 → Products based on J2/J2C/J2C+/Q2C

y = 0 → First generation

y = A → Second generation

y = B/C/D → Third generation

z = # of rack units

-SE: Scale platform with external TCAM (eTCAM) for higher scale

-S: MACsec-capable platform

Table 1. NCS 5500/5700 fixed platforms summary

Hardware	RU	Forwarding Capacity	Port Density	MACsec	DWDM	Timing
NCS-5501(-SE)	1	800 Gbps	Base: 48x 1/10G SFP + 6x 40/100G QSFP Scale : 40x 1/10G SFP + 4x 40/100G QSFP	N	Scale*	Scale Only
NCS-55A1-36H(-SE)-S	1	3.6 Tbps	36x 40/100G QSFP	Y	N	Y
NCS-55A1-24H	1	1.8 Tbps	24x 40/100G QSFP	N	N	Y
NCS-55A1-24Q6H-S **NCS-55A1-24Q6H-SS**	1	900 Gbps	24x 1/10G SFP + 24x 1/10/25G SFP + 6x 40/100G QSFP	Y	N	Y
NCS-55A1-48Q6H	1	1.8 Tbps	48x 1/10/25G SFP + 6x 40/100G QSFP	Y	N	Y

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Hardware	RU	Forwarding Capacity	Port Density	MACsec	DWDM	Timing
NCS-55A2-MOD-S	2	900 Gbps	24x 1/10G SFP + 16x 1/10/25G SFP+ 2x 400G MPAs MPA 4x 100G QSFP MPA 2x 100/200G DWDM CFP2 MPA 2x 100G QSFP + 1x 100/200G DWDM CFP2 MPA 12x 1/10G SFP	Y	Y	Y
NCS-57B1-6D24H-S **NCS-57B1-5D24H-SE**	1	4.8 Tbps	24x 100G QDD + 6x or 5x 400G QDD	Y	ZR/ZR+	Y
NCS-57C1-48Q6D-S	1	2.4 Tbps	32x SFP28 + 16x SFP56 + 2x QSFP-DD (4x 100G) + 4x QSFP-DD (400G)	Y	ZR/ZR+	Y
NCS-57C3-MOD-S **NCS-57C3-MOD-SE-S**	3	2.4 Tbps	48x 1/10/25G + 8x or 4x port 40/100G + MPAs: 2x 400G or 4x 100G MPA MPA 4x 100G QSFP MPA 2x 100/200G DWDM CFP2 MPA 2x 100G QSFP + 1x 100/200G DWDM CFP2 MPA 12x 1/10G SFP	Y	ZR/ZR+	Y
NCS-57D2-18DD-S	2	7.2 Tbps	66 Ports: 2x 400G QSFP-DD + 16x 400GQSFP-DD/64x 100G QSFP-DD	Y (*Post FCS)	ZR/ZR+	Y

The above table captures the summary of fixed platforms, capacity, port density, and hardware capabilities.

Details of each platform are covered after the “Base vs. Scale Platforms” section.

* DWDM support on NCS 5501 (non-SE) is limited to the R-Phy optics. Other DWDM and ZR 10G optics are only supported on the NCS 5501-SE (on ports identified by a purple mark on the front plate).

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Base vs. Scale Platforms

In the NCS5500/5700 portfolio, there are two types of systems: those without external-TCAM, relying only on the on-chip resources available for feature scale, and those equipped with external-TCAM used to provide extended scale in addition to the on-chip scale.

The following table covers the FIB scale for NCS 5500 and NCS 5700 fixed form factor platforms for both Base and Scale systems.

Table 2. Base (-S) vs. Scale (-SE) platforms

Hardware	LEM	LPM/KAPS	External-TCAM	Combined pfx scale
NCS-5501 **NCS-55A1-36H-S** **NCS-55A2-MOD-S** **NCS-55A1-24Q6H-S**	786k entries shared between MPLS labels, MAC addresses, IPv4 /32 (default), IPv6 /48	256-350k entries shared between IPv4 and IPv6 pfx, Multicast Groups	-	~1.1M pfx entries
NCS-55A1-24H **NCS-55A1-24Q6H-SS** **NCS-55A1-48Q6H**	786k entries shared between MPLS labels, MAC addresses, IPv4 /32 and IPv6 /48	1M-1.5M entries shared between IPv4 and IPv6 pfx, Multicast Groups	-	~2.2M pfx entries
NCS-5501-SE	786k entries shared between MPLS labels, MAC addresses, IPv4 /32 and IPv6 /48	256k-350k entries shared between IPv6 pfx, Multicast Groups	Up to 2M entries shared between IPv4 pfx and Hybrid ACL	~2.75M pfx entries
NCS-55A1-36H-SE-S **NCS-55A2-MOD-SE-S**	786k entries shared between MPLS labels, MAC addresses	Multicast Groups	4M entries shared between IPv4 pfx, IPv6 pfx Hybrid ACL is stored in e-TCAM but does share 4M entries	~4M pfx entries
NCS-57B1-6D24H-S	MPLS labels and MAC addresses	2.3M IPv4 routes or 1.7 IPv6 routes	-	2.3M pfx entries
NCS-57B1-5D24H-SE	MPLS labels and MAC addresses	Multicast Groups	5M IPv4 entries or 3M IPv6 entries	5M pfx entries
NCS-57C1-48Q6D-S	MPLS labels and MAC addresses	2.3M IPv4 routes or 1.7 IPv6 routes	-	~2.3M pfx entries
NCS-57C3-MOD-S	MPLS labels and MAC addresses	1.8M IPv4 routes or 1M IPv6 routes	-	2.3M pfx entries
NCS-57C3-MOD-SE-S	MPLS labels and MAC addresses	Multicast Groups	4M IPv4 entries or 3M IPv6 entries	4M pfx entries
NCS-57D2-18DD-S	MPLS labels and MAC addresses	2.3M IPv4 routes or 1.7 IPv6 routes		~2.3M pfx entries

Note: the NCS 5700 family introduces the concept of Modular Database (MDB), offering more flexibility in the definition of the LEM/LPM-KAPS database. Numbers will change depending on release and profiles configured. For more details on MDB please follow the link.

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Additional features

The NCS 5500/5700 Series also supports the Cisco DDoS Edge Protection solution.

Add leading DDoS protection directly to the NCS 5500/5700 Series to detect and block DDoS attacks on-box cost-effectively at aggregation and peering locations.

Cisco DDoS Edge Protection is supported on the following platforms:

- NCS-55A1-48Q6H
- NCS-55A1-48Q6H-SE
- NCS-55A1-48Q-DTC
- NCS-57D2-18DD-S
- NCS-57C3-MOD-S
- NCS-57C3-MOD-SE-S
- NCS-55A1-36H-SE-S
- NCS-55A1-36H-DTC
- NCS-55A1-36H-GLE
- NCS-55A1-36H-S
- NCS-55A2-MOD-SE-S
- NCS-55A2-MOD-HD-S
- NCS-55A2-MOD-SYS
- NCS-55A2-MOD-HX-S
- NCS-55A2-MOD-SE-H-S
- NCS-55A1-24H
- NCS-57B1-6D24H-S
- NCS-57B1-5D24H-SE
- NCS-5501
- NCS-5501-SE
- NCS-55A1-24Q6H-S
- NCS-55A1-24Q-DTCR
- NCS-55A1-24Q-RPHY
- NCS-55A1-24Q6H-SS
- NCS-57C1-48Q6D-S
- NCS-5502-SE
- NCS-5502-U100

Learn more about Cisco DDoS Edge Protection.

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NCS 5501(-SE) Platform

The NCS 5501 and NCS 5501-SE are a 1 RU fixed form factor routing platform supporting SFP and QSFP ports. The SFP ports can be used as 1G or 10G ports while the QSFP form factor ports can be used for either 40G, 4x 10G ports in breakout mode or 100G speeds. NCS 5501(-SE) is based on Qumran-MX System-on-Chip (SoC) single Forwarding ASIC that delivers up to 800 Gbps and up to 720 Million Packets Per Second (MPPS) of throughput.

There are two variants available for the NCS 5501 platform, which are as follows:

NCS-5501 Base



Figure 2.
NCS-5501 Base platform

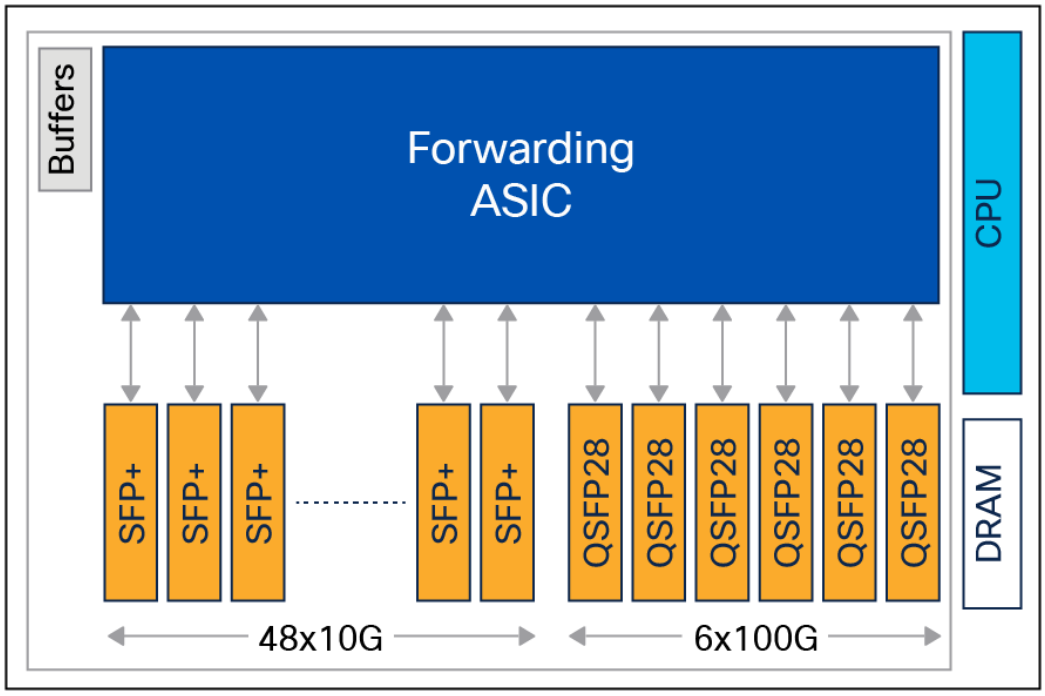


Figure 3.
NCS 5501 Base version front view platform architecture

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NCS-5501-SE Scale



Figure 4.
NCS-5501-SE Scale platform

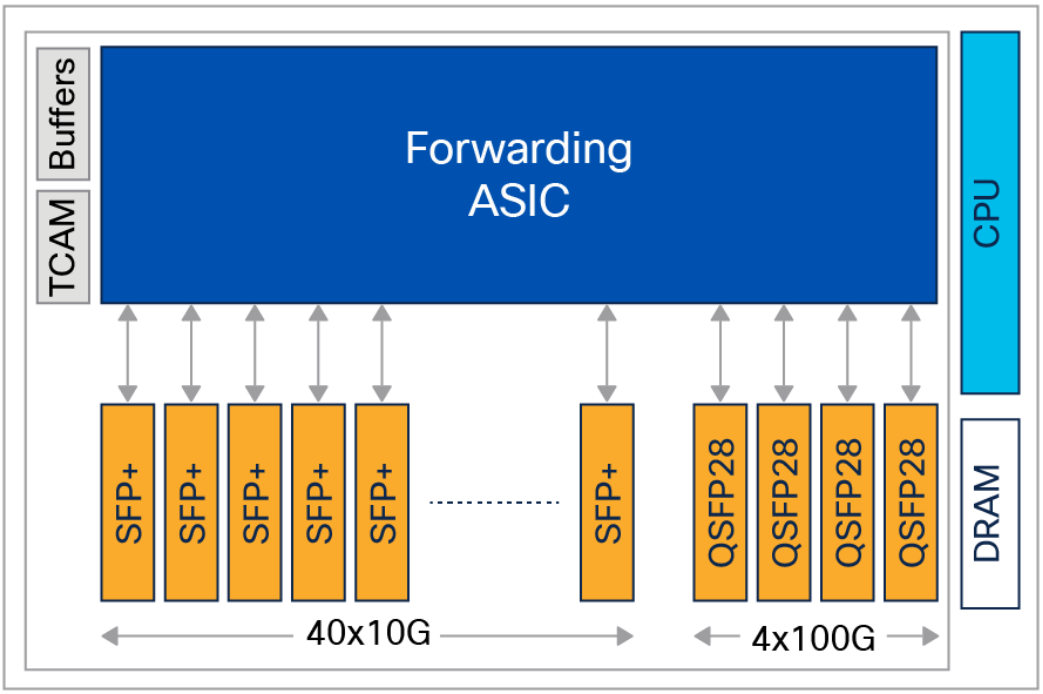


Figure 5.
NCS 5501-SE Scale version front view platform architecture

NCS 5501-SE has the capability to support 1G and 10G ZR/DWDM optics. ZR and DWDM support is only available on ports 16 through 39, which are highlighted in pink on the chassis. NCS 5501-SE also supports timing via the timing ports available at the front of the chassis.

Table 3. NCS 5501/5501-SE platform specifications

	NCS 5501 Base	NCS 5501 Scale
Chassis Height	1 Rack Unit	
Chassis Dimensions	21.70 x 17.40 x 1.72 inches 55.12 x 44.20 x 4.37 cm	
Ports	48x 1/10-Gbps SFP 6x 40/100-Gbps QSFP 24x 10G SFP via Breakout	40x 1/10-Gbps SFP 4x 40/100-Gbps QSFP 16x 10G SFP via Breakout
Forwarding ASICs	800-Gbps Single Forwarding ASIC	

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	NCS 5501 Base	NCS 5501 Scale
Packet Forwarding Rate	720 MPPS	600 MPPS
Max System Bandwidth	800 Gbps	
Buffers	16-MB On-Chip Buffers 4-GB Off-Chip Buffers	
Latency	2 to 8 usec	
Processor	Intel 6-Core Processor @ 2.0 GHz	Intel 8-Core Processor @ 2.0 GHz
System Memory	32 GB DRAM	
Flash Storage	64 GB Flash SSD Storage	

NCS-55A1-36H(-SE)-S Platform

The NCS 55A1-36H(-SE)-S is a 1 RU routing platform based on Jericho+ ASICs. It provides 36 QSFP ports with full line rate MACsec support. All the ports support 100G and 40G QSFP28/QSFP+ optics as well as 4x 25G and 4x 10G breakout. They are designed for base and high-scale configuration needs with two variants: with and without external TCAM.

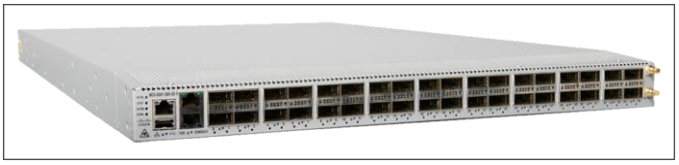


Figure 6.
NCS 55A1-36H(-SE)-S platform

Both the NCS 55A1-36H(-SE)-S variants are capable of delivering up to 3340 MPPS and up to 3.6 Tbps of line rate forwarding. There are four 900-Gbps ASICs connected to one fabric ASIC called FE3600 SFE. The forwarding ASICs and SFEs perform cell-based forwarding with line rate performance on all data ports. NCS 55A1-36H(-SE)-S supports timing via the specific ports available at the front of the chassis.

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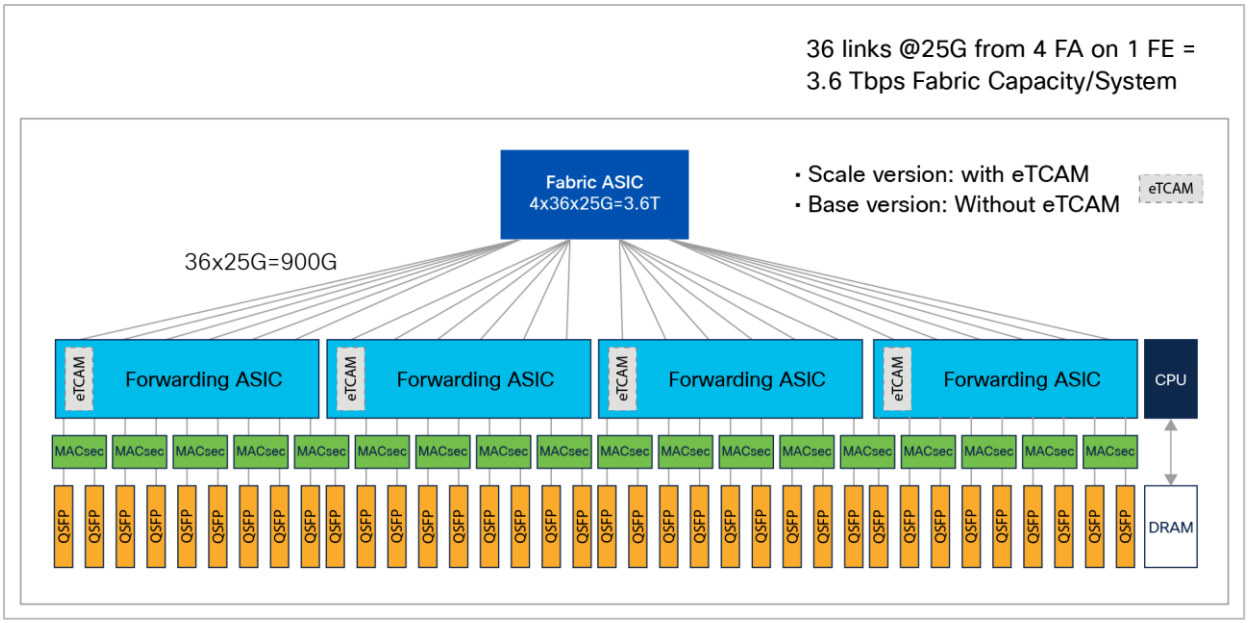


Figure 7.
NCS 55A1-36H(-SE)-S platform architecture

The NCS 55A1-36H platform also has a nonexternal-TCAM and an external-TCAM variant. Port count, capabilities, and dimensions are identical between the two variants.

Table 4. NCS 55A1-36H(-SE)-S platform specifications

	NCS 55A1-36H-S	NCS 55A1-36H-SE-S
Chassis Height	1 Rack Unit	
Chassis Dimensions	30 x 17.30 x 1.72 inches 76.20 x 43.94 x 4.36 cm	
Ports	36x 40/100-Gbps QSFP Ports 144x 10/25G SFP Ports via Breakout	
Forwarding ASICs	4 Forwarding ASICs (900-Gbps Bandwidth Each)	
Packet Forwarding Rate	3340 MPPS (4 x 835 MPPS)	
Max System Bandwidth	3.6 Tbps	
Buffers for each ASIC	16-MB On-Chip Buffers 4-GB Off-Chip Buffers	
Latency	2 to 8 usec	
Processor	Intel 8-Core Processor @ 1.6 GHz	
System Memory	32 GB DRAM	
Flash Storage	128 GB Flash SSD Storage	

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NCS-55A1-24H Platform

The NCS 55A1-24H is a 1 RU routing platform based on Jericho+ ASICs. It has 24x QSFP ports and provides 1.8-Tbps forwarding capability. All the ports support 100G and 40G QSFP28/QSFP+ optics as well as 4x 25G and 4x 10G breakout. NCS 55A1-24H has two forwarding ASICs, each forwarding at 900 Gbps with up to 835 MPPS of throughput. There are 12x 100G ports connected to each 900-Gbps ASIC, making this system oversubscribed. The platform delivers up to 1670 MPPS and up to 1.8 Tbps of data forwarding. The two forwarding ASICs are connected back to back without any SFEs.



Figure 8.
NCS 55A1-24H platform

The NCS 55A1-24H platform has only a nonexternal-TCAM version. It is based on the Jericho+ ASIC variant that has a larger LPM memory table. The LPM memory can program 1M to 1.5M prefixes depending on prefix distribution. Globally the platform can support up to approximately 2.2M prefixes, providing higher scale to program full internet table with capacity for future growth.

The NCS 55A1-24H supports timing via ports available at the front of the chassis.

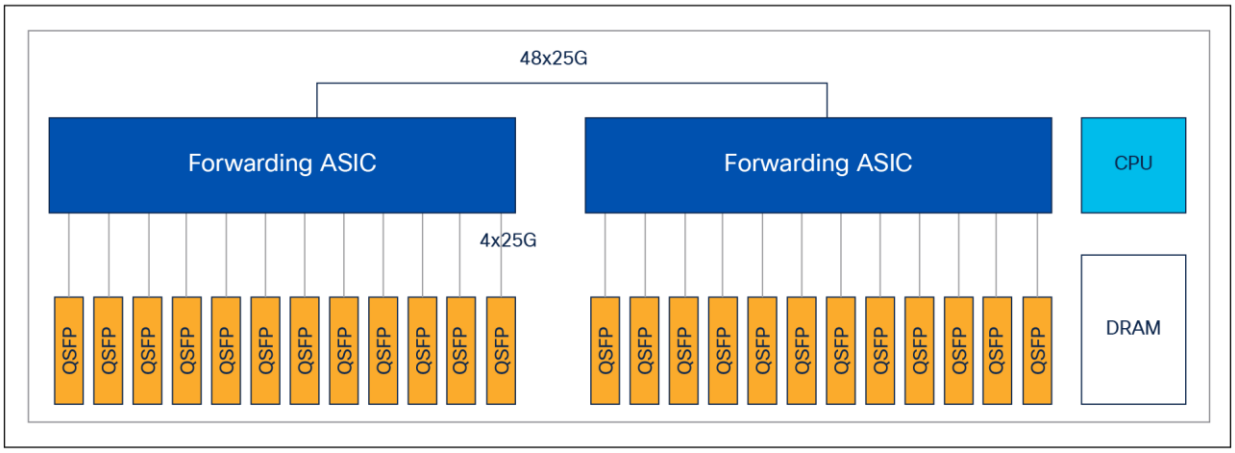


Figure 9.
NCS 55A1-24H platform architecture

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Table 5. NCS 55A1-24H platform specifications

	NCS 55A1-24H
Chassis Height	1 Rack Unit
Chassis Dimensions	21.7 x 17.30 x 1.72 inches 55.12 x 43.94 x 4.36 cm
Ports	24x 40/100-Gbps QSFP 96x 10/25G SFP via Breakout
Forwarding ASICs	2 Forwarding ASICs x (900-Gbps Bandwidth Each)
Packet Forwarding Rate	1670 MPPS (2x 835 MPPS)
Max System Bandwidth	1.8 Tbps
Buffers	16-MB On-Chip Buffers 4-GB Off-Chip Buffers
Latency	2 to 8 usec
Processor	Intel 8-Core Processor @ 1.6 GHz
System Memory	32 GB DRAM
Flash Storage	128 GB Flash SSD Storage

NCS-55A2-MOD Platforms

The NCS 55A2-MOD platforms are designed to provide cost-effective delivery of next-generation services requiring high capacity, compact form factors, lower power consumption with MACsec, DWDM, and timing support. These routers provide flexible options of different port types using modular port adaptors (MPAs) along with fixed ports. There are 40x SFP fixed ports and two modular bays for 400-Gbps MPAs.

The first 24x fixed SFP ports can be used at 1/10-Gbps speeds, and the rest of the 16x fixed SFP ports can be used at 1/10/25-Gbps speeds.

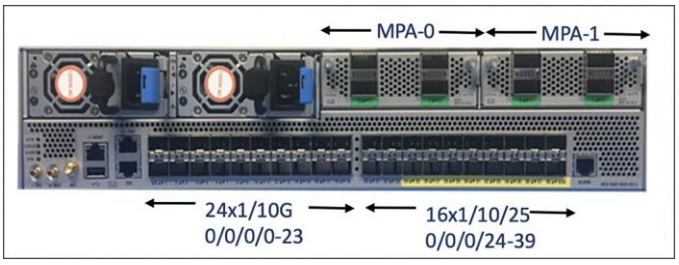


Figure 10.
NCS-55A2-MOD platforms

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By default, all the 16x 1/10/25-Gbps ports are configured as 25G ports. These ports can either operate as 25G ports or can be configured as 1/10G ports per quad. A quad is group of four ports with common speeds, 1G/10G or 25G. Ports speeds for a quad can be configured by the “hw-module quad” command. Below are the four quads for ports 0/0/0/24 to 0/0/0/39.

Quad 0: Ports 0/0/0/24 to 0/0/0/27

Quad 1: Ports 0/0/0/28 to 0/0/0/31

Quad 2: Ports 0/0/0/32 to 0/0/0/35

Quad 3: Ports 0/0/0/36 to 0/0/0/39

NCS-55A2-MOD supports various MPAs cater to different port type needs. The same or different type(s) of MPAs can be used in the two modular bays of the NCS-55A2-MOD platform. The picture below shows the different variants of MPAs available.

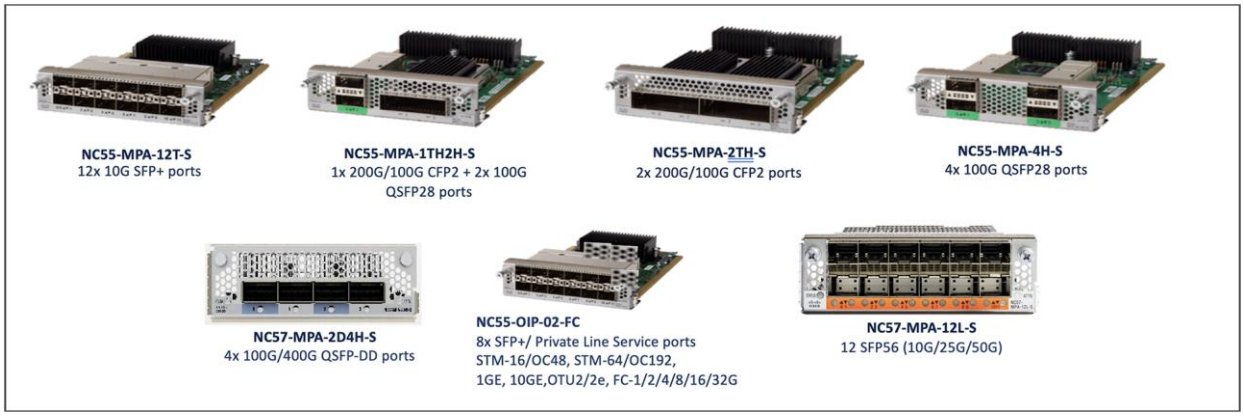


Figure 11.
NCS-55A2 MPAs

The NCS-55A2-MOD router is based on a single 900Gbps Jericho+ ASIC providing 835 MPPS throughput in a 2 RU chassis. The NCS 55A2-MOD platform has different variants available:

- Base (without external-TCAM and Stats FPGA)
- Scale (with external-TCAM and Stats FPGA)
- Temperature hardened and also with conformal coating

Port count, capabilities, and dimensions are similar between the variants.

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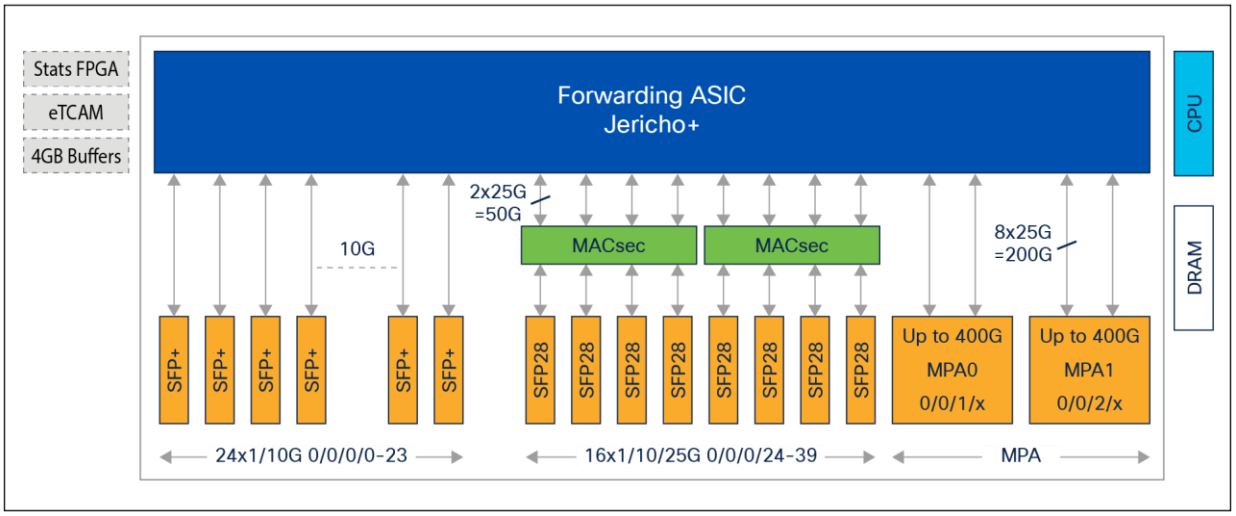


Figure 12.
NCS-55A2-MOD platform architecture

The NCS 55A2-MOD supports line-rate MACsec forwarding on all ports of MPAs and on the16x SFP28 ports from 0/0/0/24 to 0/0/0/39. 100G/200G DWDM support is available via MPA using CFP2-DCO optics. The platform also supports timing via the timing ports at the front of the chassis.

Table 6. NCS 55A2-MOD platform specifications

	NCS-55A2-MOD
Chassis Height	2 Rack Unit
Chassis Dimensions	28 x 43.94 x 8.8 cm
Ports	24x 1/10-Gbps SFP+ Ports + 16x 1/10/25-Gbps SFP28 Ports 2x MPA with Flexible Port Type Options
Forwarding ASICs	1 Forwarding ASIC x 900 Gbps
Packet Forwarding Rate	835 MPPS
Max System Bandwidth	900 Gbps
Buffers	16-MB On-Chip Buffers 4-GB Off-Chip Buffers
Latency	2 to 8 usec
Processor	NCS 55A2-MOD-S : Intel 6-Core Processor @ 2 GHz NCS 55A2-MOD-SE-S, NCS 55A2-MOD-SE-H-S : Intel 8-Core Processor @ 2 GHz
System Memory	32 GB DRAM
Flash Storage	128 GB Flash SSD Storage

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NCS-55A1-24Q6H-S/-SS Platforms

The NCS-55A1-24Q6H-S and NCS 55A1-24Q6H-SS provide dense 1GE/10GE/25GE/100GE functionality in a 1 RU with line-rate MACsec and timing support. It is based on a single Jericho+ ASIC functioning as a System-on-Chip (SoC) with 900-Gbps forwarding and 835 MPPS of throughput.

It has 48x SFP and 6x QSFP ports. Out of 48x SFP, 24 can operate at 1G/10G/25G speeds, while the rest of the 24 ports operate as 1G/10G speeds only.

On NCS-55A1-24Q6H-S, MACsec is supported on all the QSFP ports and on 16 out of 24 SFP28 ports.

On NCS-55A1-24Q6H-SS, MACsec supported on all ports – all 6 QSFP ports, 24x 25G ports, and 24x 10G ports.

NCS-55A1-24Q6H-SS is equipped with a large LPM version of the Jericho+ ASIC, supporting a full internet view. The NCS 55A1-24Q6H-S is using the normal Jericho+ and therefore is not fit for internet peering roles.

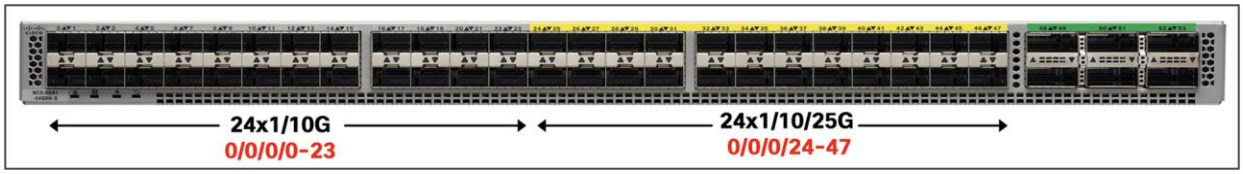


Figure 13.
NCS-55A1-24Q6H-S platform

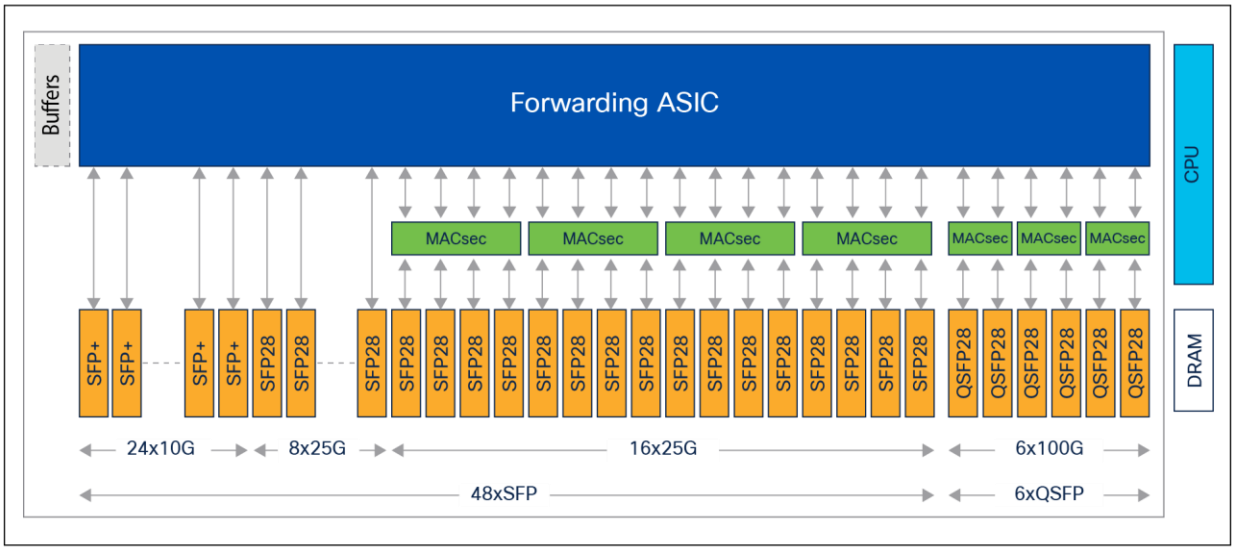


Figure 14.
NCS-55A1-24Q6H-S platform architecture

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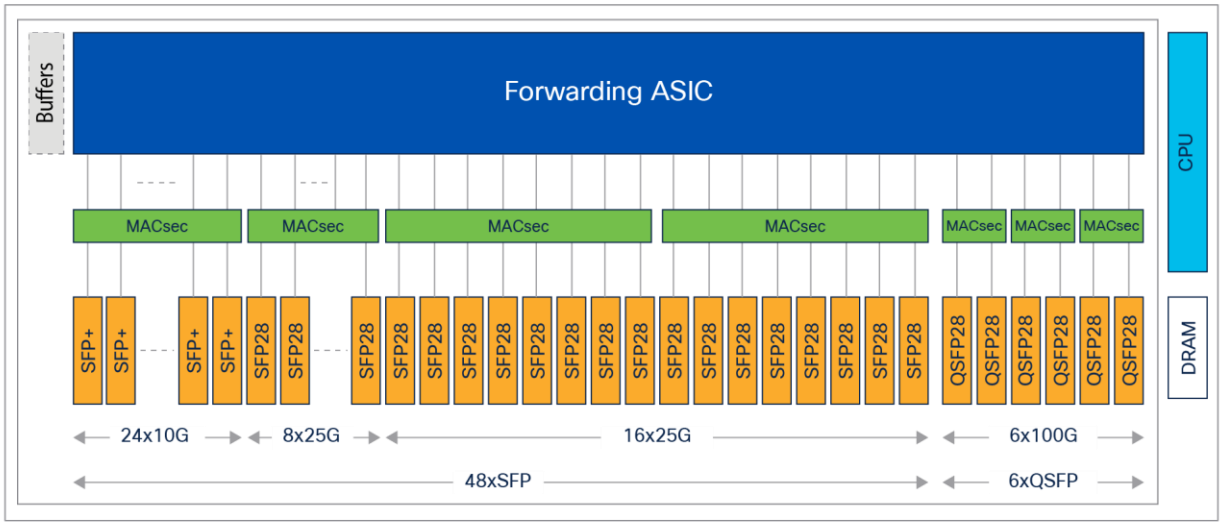


Figure 15.
NCS-55A1-24Q6H-SS platform architecture

NCS 55A1-24Q6H-S/-SS platforms have only a nonexternal-TCAM version, but the -SS one is equipped with a larger LPM version of the Jericho+.

Table 7. NCS-55A1-24Q6H-S/-SS platform specifications

	NCS-55A1-24Q6H-S	NCS-55A1-24Q6H-SS
Chassis Height	1 Rack Unit	
Chassis Dimensions	21.7 x 17.40 x 1.73 inches 55.12 x 44.20 x 4.40 cm	
Ports	24x 1/10-Gbps + 24x 1/10/25-Gbps + 6x 40/100-Gbps QSFP Ports 24x 10/25G SFP Ports via Breakout	
Forwarding ASICs	Single 900-Gbps Forwarding ASIC	
Packet Forwarding Rate	835 MPPS	
Max System Bandwidth	900 Gbps	
Buffers	16-MB On-Chip Buffers 4-GB Off-Chip Buffers	
Latency	2 to 8 usec	
Processor	Intel 6-Core Processor @ 1.9 GHz	
System Memory	32 GB DRAM	
Flash Storage	128 GB Flash SSD Storage	

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NCS-55A1-48Q6H Platform

The NCS 55A1-48Q6H is designed to support a high density of 25G ports in a 1 RU form factor. It is based on 2x 900-Gbps Jericho+ ASICs providing 1.8 Tbps forwarding with 1670-MPPS system throughput. The two forwarding ASICs are connected back to back without any SFEs. It has 48x SFP28 ports that can be configured at 1/10/25G speeds and also has 6x 40/100G QSFP ports that can also be broken out into 4x 10/25G ports.

By default, all the ports are configured as 25G ports; these can be used as either 25G ports or can be configured as 1/10G ports per quad. A quad is a group of four ports with common speeds, 1G/10G or 25G. Port speeds for a quad can be configured by the “hw-module quad” command.



Figure 16.
NCS-55A1-48Q6H platform

The NCS 55A1-48Q6H is based on the Jericho+ ASIC variant that has a larger LPM memory table. The LPM memory can program 1M to 1.5M prefixes depending on prefix distribution. Globally the platform can support up to approximately 2.2M prefixes, providing higher scale to program full internet table with capacity for future growth.

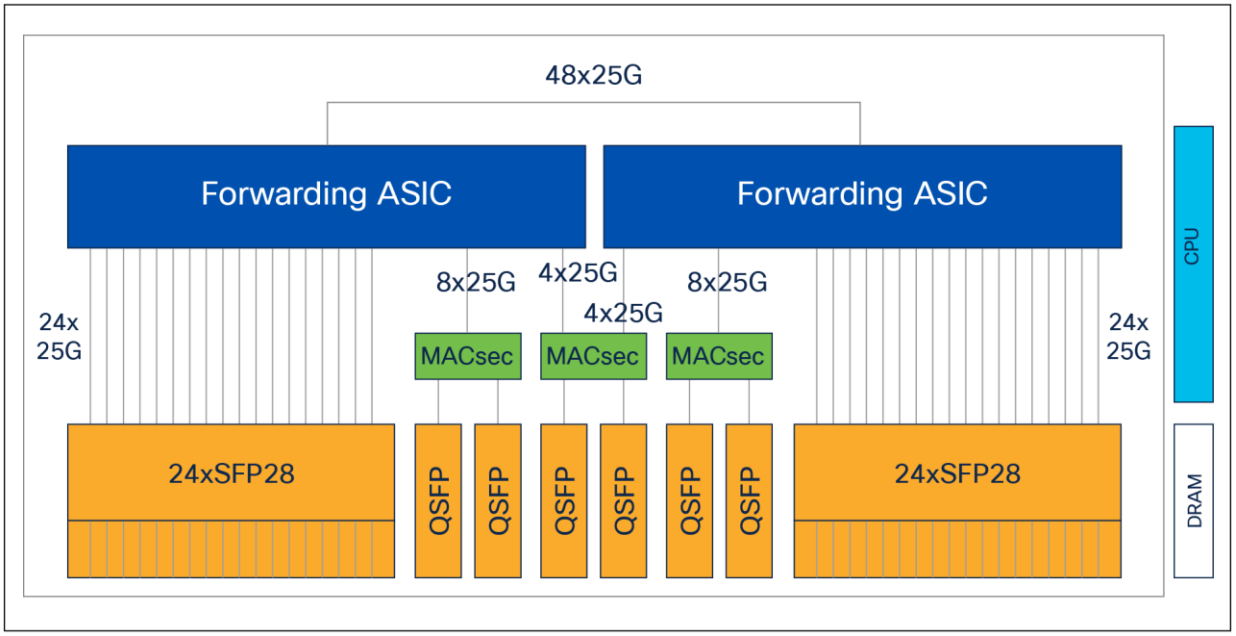


Figure 17.
NCS-55A1-48Q6H platform architecture

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NCS-55A1-48Q6H supports line-rate MACsec forwarding on 6x QSFP. It also has timing support via the timing ports at the back of the chassis.

The NCS-55A1-48Q6H platform has only a nonexternal-TCAM version.

Table 8. NCS-55A1-48Q6H platform specifications

	NCS-55A1-48Q6H
Chassis Height	1 Rack Unit
Chassis Dimensions	26.84 x 17.30 x 1.72 inches 68.19 x 43.94 x 4.37 cm
Ports	48x 1/10/25-Gbps SFP Ports + 6x 40/100-Gbps QSFP Ports 24x 10/25G SFP Ports via Breakout
Forwarding ASICs	2 Forwarding ASICs (900-Gbps bandwidth each)
Packet Forwarding Rate	1670 MPPS (2 x 835 MPPS)
Max System Bandwidth	1.8 Tbps
Buffers per ASIC	16-MB On-Chip Buffers 4-GB Off-Chip Buffers
Latency	2 to 8 usec
Processor	Intel 6-Core Processor @ 1.9 GHz
System Memory	32 GB DRAM
Flash Storage	128 GB Flash SSD Storage

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NCS-57B1-6D24H-S / NCS-57B1-5D24H-SE Platforms

The NCS-57B1-6D24H-S and NCS-5D24H-SE are designed to support a high density of 100G and 400G ports in a 1 RU form factor.

It is based on a single 4.8-Tbps Jericho 2 ASIC with 2-BPPS system throughput. It has 24x QSFP-DD ports on the left that can be configured at 40G or 100G speed and also has 6x QSFP-DD ports or 5x QSFP-DD ports (for the 5DSE version) on the right, which can also be used at 400G or 100G speed. The 400G-capable ports are identified with a blue label in the front panel.

Breakout of the 100G-capable ports to 4x 25 (or 4x 10) is possible on the top row ports. Such configuration on port N disables the bottom port N+1.

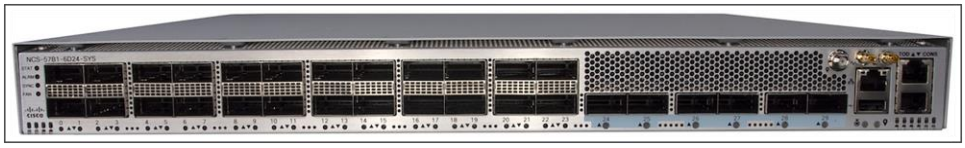


Figure 18.
NCS-57B1-6D24H-S platform



Figure 19.
NCS-57B1-5D24H-SE platform

NCS-57B1-6D24H-S is tested for 2.35M prefixes, and the NCS-57B1-5D24H-SE, equipped with an external TCAM, supports 5M routes.

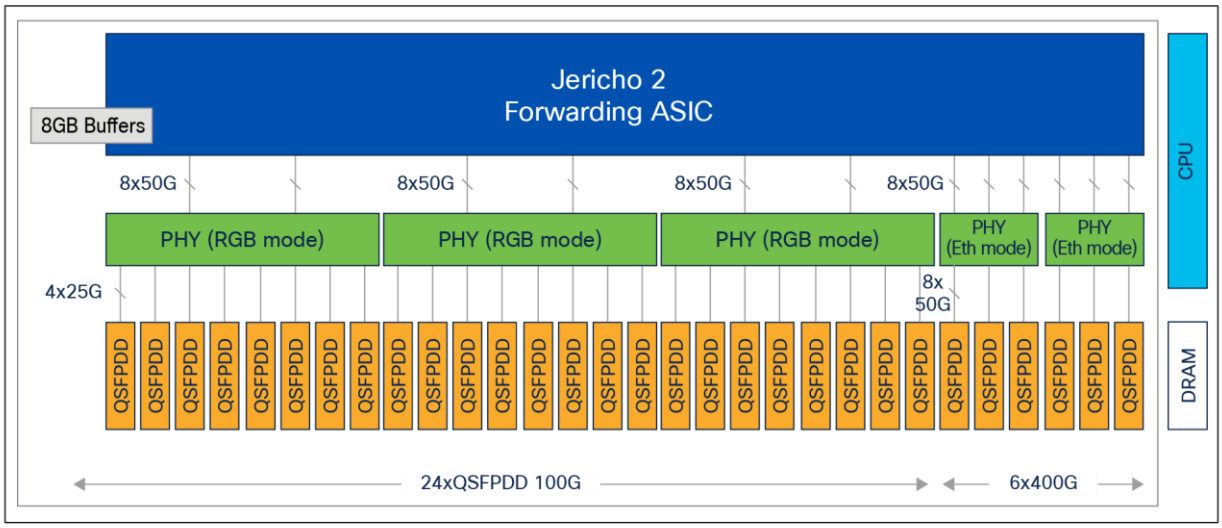


Figure 20.
NCS-57B1-6D24H-S platform architecture

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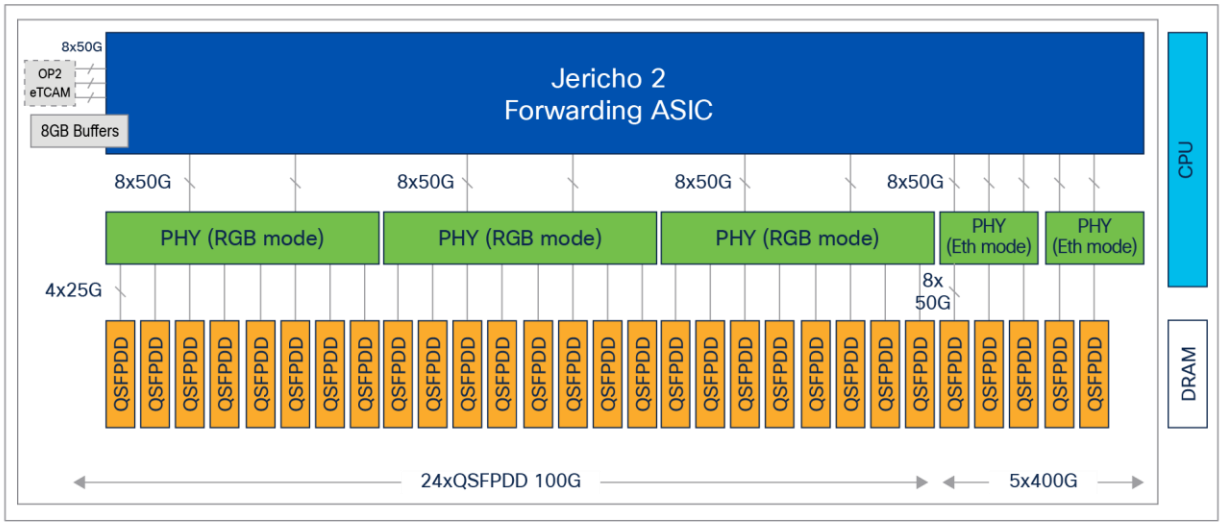


Figure 21.
NCS-57B1-5D24H-SE platform architecture

Both NCS-57B1-6D24H-SYS and NCS-57B1-5D24H-SE support line-rate MACsec forwarding on all ports. It also has timing support via the timing ports at the front of the chassis.

Table 9. NCS 57B1-6D24-SYS / NCS 57B1-5DSE-SYS platform specifications

	NCS-57B1-6D24H-S / NCS-57B1-5D24H-SE
Chassis Height	1 Rack Unit
Chassis Dimensions	Height: 1RU 1.72 inches (4.3 cm) Width: 17.3 inches (43.9 cm) Depth: 23.6 inches (60.0 cm)
Ports	24x 40G/100G + (6 or 5)x 400G/200G
Forwarding ASICs	1x Forwarding ASICs (4.8-Tbps Bandwidth)
Packet Forwarding Rate	2000 MPPS
Max System Bandwidth	4.8 Tbps
Buffers per ASIC	32-MB On-Chip Buffers 8-GB Off-Chip Buffers (HBM)
Latency	2-10 usec
Processor	Intel 8-Core Processor @ 2 GHz
System Memory	32 GB DRAM
Flash Storage	128 GB Flash SSD Storage

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NCS-57C1-48Q6D-S Platform

The NCS 57C1-48Q6D-S is a fixed chassis that combines low port densities of 1GE/10GE/25GE with higher port densities of 50GE/100GE/400GE and QSFP-DD optics, deep packet buffering, MACsec, Class C 1588 Precision Time Protocol (PTP), and Synchronous Ethernet (SyncE) in an extremely power-efficient, 1-rack-unit package.

It is based on a single 2.4-Tbps Qumran2c ASIC with 1-BPPS system throughput. It has 32x SFP28 ports that can be configured at 1G/10G/25G speed. It has 16x SFP56 ports that can be configured at 1G/10G/25G/50G speed. The 400G-capable ports are identified with a blue label in the front panel. It also has a 4x QSFP-DD port in the left that can be configured as (400G/4x 100G/2x 100G/40G) + 2xQSFP-DD (4x 100G/2x 100G/40G). Breakout of the 400G-capable ports to 4x 100G is possible on all the QSFP-DD ports. Other breakout options like 4x 10G/4x 25G are also possible.



Figure 22.
NCS-57C1-48Q6D-S platform

The NCS 57C1-48Q6D-S is tested for 2.32M prefixes. This platform is available only in the base version. It is not available in the scale version (i.e., with external TCAM).

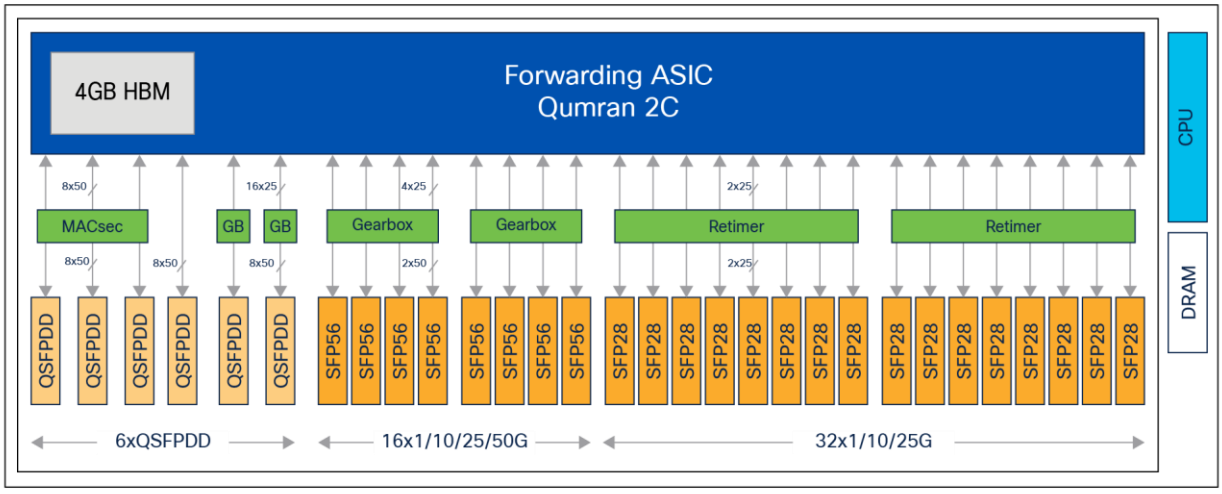


Figure 23.
NCS-57C1-48Q6D-S platform architecture

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The NCS-57C1-48Q6D-S supports line-rate MACsec only on ports 0, 2, and 4. It also has timing support via the timing ports at the rear of the chassis.



Figure 24.
NCS-57C1-48Q6D-S rear view platform

Table 10. NCS 57C1-48Q6D-S

	NCS-57C1-48Q6D-S
Chassis Height	1 Rack Unit
Chassis Dimensions	Height: 1RU 1.72 inches (4.30 cm) Width: 17.3 inches (43.9 cm) Depth: 19.70 inches (60.0 cm)
Ports	32x SFP28 + 16x SFP56 + 2x QSFP-DD (4x 100G) + 4x QSFP-DD (400G)
Forwarding ASICs	1x Forwarding ASICs (2.4-Tbps Bandwidth)
Packet Forwarding Rate	1000 MPPS
Max System Bandwidth	2.4 Tbps
Buffers per ASIC	16-MB On-Chip Buffers per Core 4-GB Off-Chip Buffers (HBM)
Latency	2-10 usec
Processor	6-Core Intel Hewitt Lake
System Memory	32 GB DRAM
Flash Storage	480 GB M.2 SSD Storage

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NCS-57C3-MOD-S / NCS-57C3-MOD-SE-S Platforms

The NCS 57C3-MOD router is based on a single 2.4-Tbps J2C ASIC providing 1-BPPS throughput in a 3 RU chassis. The NCS 57C3-MOD platform has different variants available:

Base (without external-TCAM)



Figure 25.
NCS-57C3-MOD-S (Base platform)

Scale (with external-TCAM)

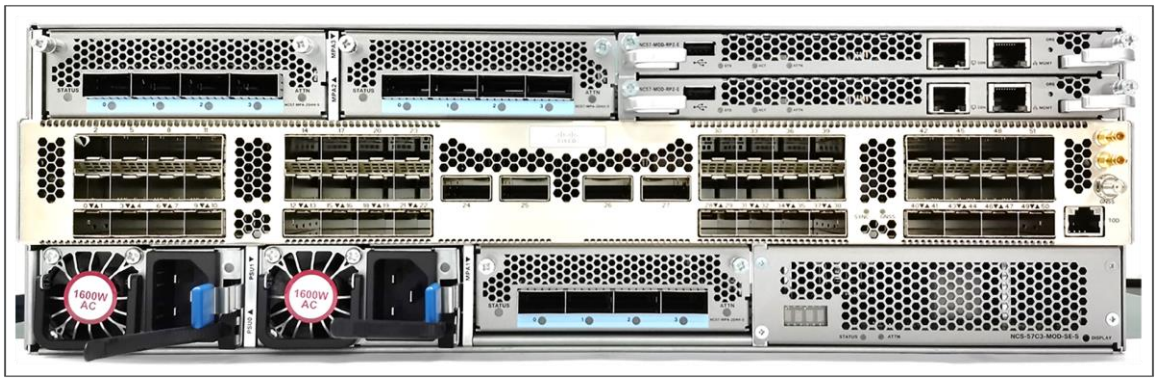


Figure 26.
NCS-57C3-MOD-SE-S (Scale platform)

It provides a great flexibility of network interfaces from 1G to 400G, making it an ideal choice for high-density environments, such as 5G mobile backhaul and aggregation for fixed line and business services, and for peering/core roles in compact form factors with lower power consumption with MACsec.

There are 48x SFP28 fixed ports 10G/25G and 8x QSFP28 (40G/100G) fixed ports in the base model and 4x QSFP28 (40G/100G) ports in the scale model. The SFP28 ports also support 1Gig optics (optical). Much like the NCS55A2, this router also provides numerous port types that are extensible using Modular Port Adaptors (MPAs) along with fixed ports.

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There are three modular bays for MPAs:

- Two of them have up to 800 Gbps and can support the new-generation MPAs that are capable of QSFP-DD.
- There is also a third additional MPA bay (up to 400 Gbps).
- All MPA slots are also backward compatible with older MPAs: NC55-MPA-12T-S, NC55-MPA-2TH-S, NC55-MPA-1TH2TH-S, and NC55-MPA-4H-S.
- Apart from the above MPAs, the chassis also supports the following MPAs: NC55-OIP-02, NC57-MPA-2D4H-S, NC57-MPA-1FH1D-S, and NC57-MPA-12L-S-FC.

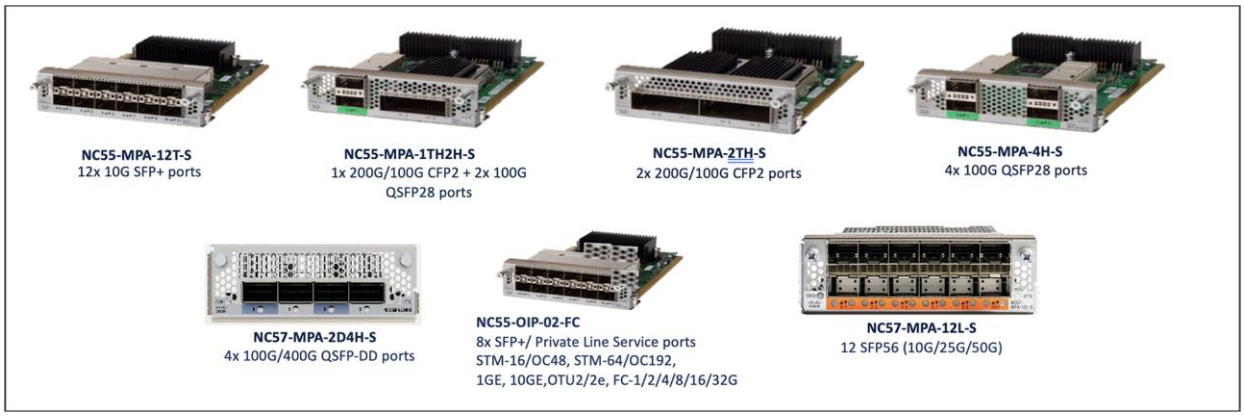


Figure 27.
NCS-57C3 MPA support

The chassis is also built with plenty of high availability features:

- Dual route processors offering control plane redundancy
- 5+1 redundant fan trays
- Dual/redundant power supplies

MACsec is supported on 24x SFP28 fixed ports that can be used at 10G/25G speeds. MACsec is also supported on all MPA ports, legacy and new-generation MPAs (NC57-MPA-2D4H-S) except NC57-MPA-1FH1D-S.

On timing: Class C is supported on all fixed ports without MACsec and new-generation MPAs; Class B will be supported on fixed ports with MACsec and older MPAs except NC57-MPA-1FH1D-S.

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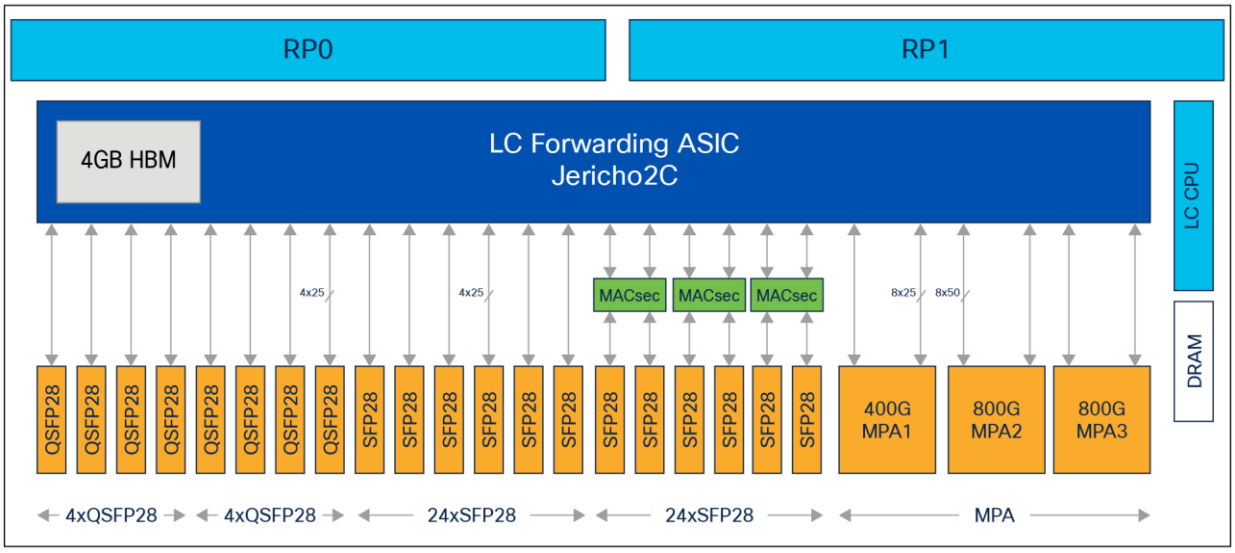


Figure 28.
NCS 57C3-MOD-S Base platform architecture

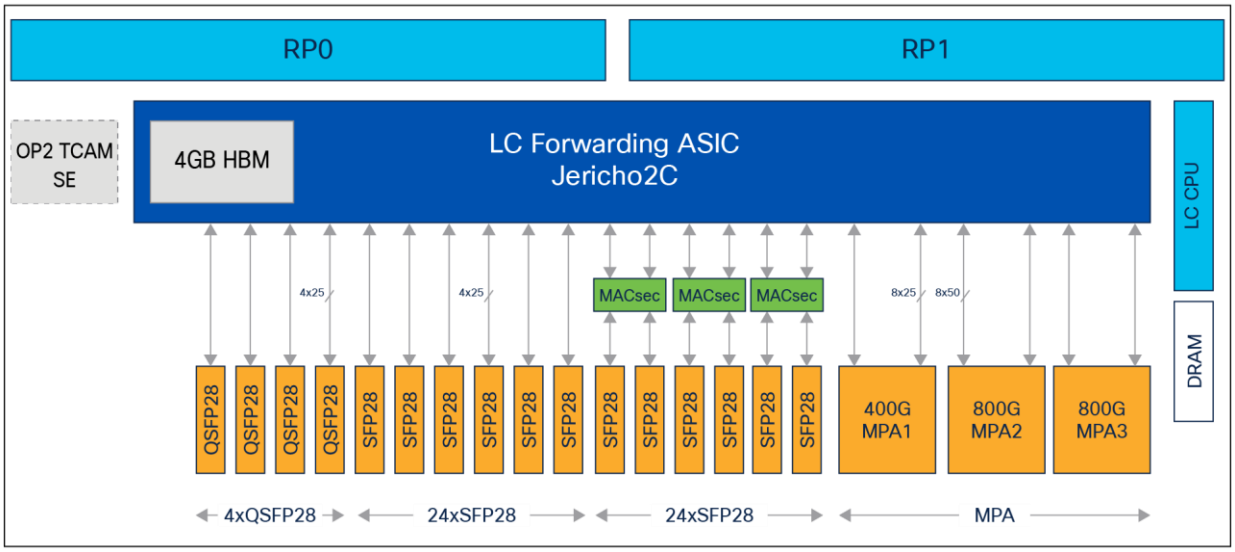


Figure 29.
NCS-57C3-MOD-SE-S Scale platform architecture

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Table 11. NCS 57C3-MOD-S/NCS 57C3 MOD-SE-S platform specifications

	NCS-57C3-MOD-S/NCS-57C3-MOD-SE-S
Chassis Height	3 Rack Unit
Chassis Dimensions	28.4 x 43.8 x 13.05 cm
Ports	Base: 48-Port 1/10/25G and 8-Port 100G Scale: 48-Port 1/10/25G and 4-Port 100G 3x MPA with Flexible Port Type Options
Forwarding ASICs	1 Forwarding ASIC x 2.4 Tbps
Packet Forwarding Rate	1 BPPS
Max System Bandwidth	2.4 Tbps
Buffers	16-MB On-Chip Buffers 4-GB Off-Chip Buffers
Latency	2 to 10 usec
Processor	8-Core Processor @ 2 GHz
System Memory	32 GB DRAM
Flash Storage	256 GB Flash SSD Storage

Route Processor NC57-MOD-RP2-E

This router has dual route processors offering control plane redundancy on a fixed form factor.

Table 12. NC57-MOD-RP2-E specifications

	NC57-MOD-RP2-E specifications
CPU Core	8 Cores at 2 GHz
Memory	32 GB DRAM
Storage	256 GB Flash
USB	1 USB
Management	Console
	Management Ethernet

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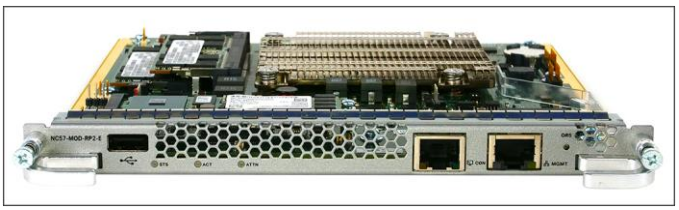


Figure 30.
NC57-MOD-RP2-E platform

There are no separate system controllers and fabric cards on this system. The route processors directly connect to the ethernet switch on the line card CPU.

- Ethernet Out-of-Bound Channel (EOBC) for interprocess communication and device management. All system management communication takes place through the EOBC channel.
- Ethernet Protocol Channel (EPC) is for data plane communication such as sending control plane packets between the LC CPU and route processor.

There are separate channels for EOBC (Red) and EPC (Blue) communications as shown below.

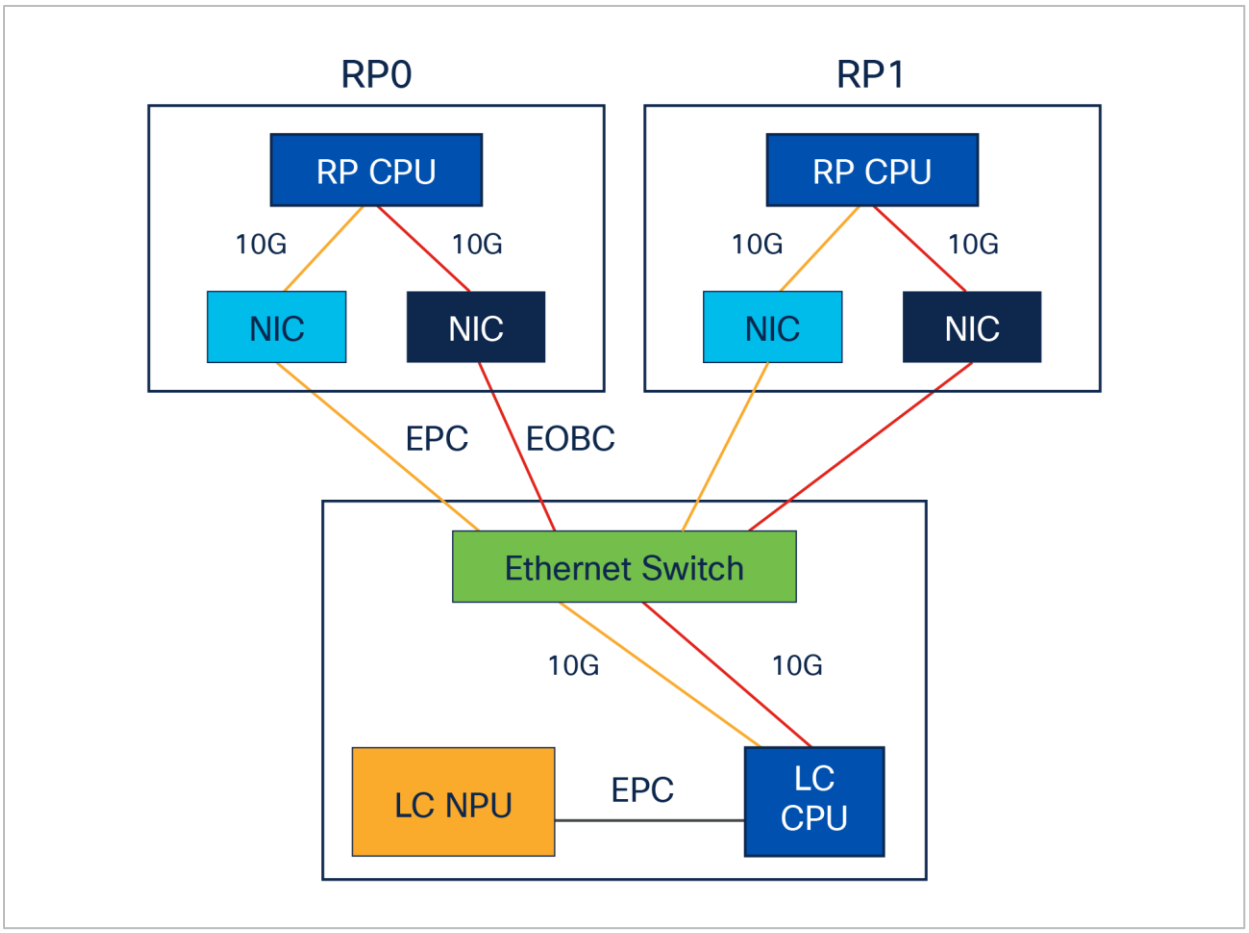


Figure 31.
EOBC and EPC network

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NCS-57D2-18DD-S Platform

The NCS 57D2-18DD-S is a fixed chassis combining 7.2 Terabits forwarding capacity with dense QSFP-DD 400GE and 100GE. It is equipped with deep packet buffering, MACsec*, IPSec* (*post FCS), Class C 1588 Precision Time Protocol (PTP), and Synchronous Ethernet (SyncE) in a power-efficient 2-rack-unit package. It is based on J2C+ ASIC with 2.8 BPPS. It has 66 ports of dense 100G QSFPDD, 18 ports of 400G, or a combination of 400G and 100G ports. For low-speed ports, it supports 4x 10G and 4x 25G breakout options.

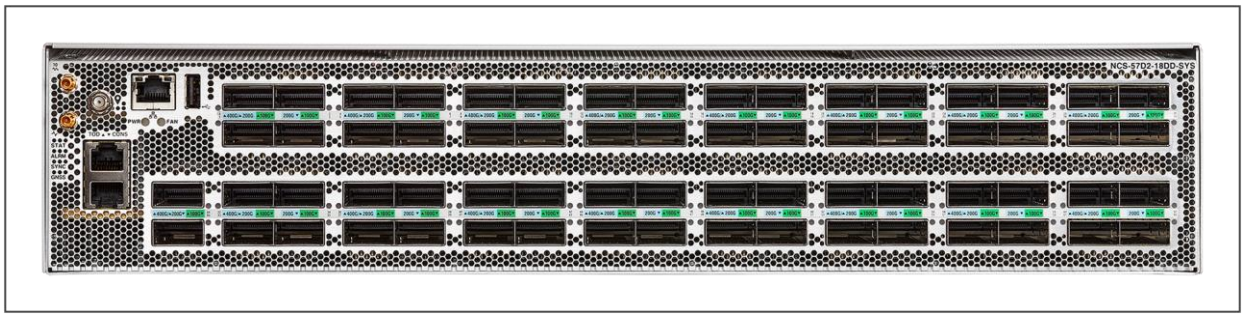


Figure 32.
NCS-57D2-18DD-S platform

It is tested for 2.32M prefixes. This platform is available only in the base version. It is not available in the scale version (i.e., with external TCAM).

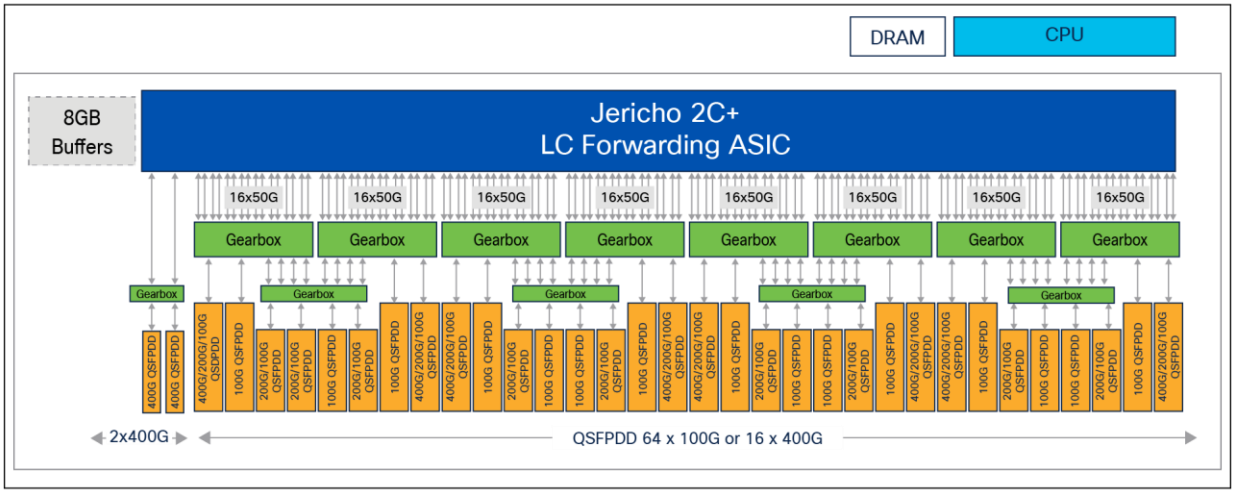


Figure 33.
NCS-57D2-18DD-S platform architecture

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Figure 34.
NCS-57D2-18DD-S rear view platform

Table 13. NCS-57D2-18DD-S platform specifications

	NCS-57D2-18DD-S
Chassis Height	2 Rack Unit
Chassis Dimensions	Height: 3.45 inches (8.76 cm) Width: 17.3 inches (43.9 cm) Depth: 23.62 inches (60.0 cm)
Ports	66 Ports: 2x 400G QSFP-DD + 16x 400GQSFP-DD/64x 100G QSFP-DD
Forwarding ASICs	1x Forwarding ASICs (7.2-Tbps Bandwidth)
Packet Forwarding Rate	2.8 BPPS
Max System Bandwidth	7.2 Tbps
Buffers per ASIC	32-MB On-Chip Buffers per Core 8-GB Off-Chip Buffers (HBM)
Latency	2-10us
Processor	Intel Hewitt Lake @ 2.5 GHz
System Memory	32G
Flash Storage	480G

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Fan Trays and Power Supplies

Fan Trays:

NCS 5500 fixed form factor platforms are based on redundant hot-swappable fan trays. The fan trays provide front-to-back or back-to-front airflow choices to adapt to any hot-aisle and cold-aisle configuration. The routers can be installed with ports facing the rear or with the ports facing the front of the rack based on the desired airflow. The tabs of the fan tray can be either red or blue; these colors indicate the front-to-back or back-to-front air flow.

Power Supplies:

The power supply modules of NCS 5500 fixed form factor platforms deliver fault tolerance, high efficiency, load sharing, and hot-swappable features to the platform. The fixed platforms have options for AC or DC power supply with redundancy. The power supplies provide internal component-level monitoring, temperature sensors, and intelligent remote-management capabilities. AC and DC power supplies are platinum rated, offering highest efficiency.

Table 14. NCS 5500 / NCS 5700 fixed platform fan and power supply specifications

	5501	55A1-36H	55A1-24H	55A2-MOD	55A1-24Q6H	55A1-48Q6H
Power Supply	2x 1100W AC/DC	2x 2000W AC/DC	2x 1100W AC/DC	2x 1100W AC/DC	2x 1100W AC/DC	2x 1100W AC/DC
Redundancy	1 + 1	1 + 1	1 + 1	1 + 1	1 + 1	1 + 1
Typical Power	240W 260W (-SE)	1110W 1300W (-SE)	600W	270W* 320W (-SE)*	330W	460W
Fan Trays Redundancy	1 + 1	N + 1	N + 1	N + 1	1 + 1	1 + 1
Air Flow	F2B/B2F	F2B/B2F	F2B/B2F	F2B	F2B/B2F	F2B/B2F

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	57B1-6D24H-S 57B1-5D24H-SE	NCS 57C1-48Q6D-S	57C3-MOD-S/ 57C3-MOD-SE-S	57D2-18DD-S
Power Supply	2x 2000W AC/DC	2x1100W AC/DC	2x1600W AC/DC	2x 2000W AC/DC
Redundancy	1 + 1	1 + 1	1+1	1+1
Typical Power	500W 520W **	340W	445W 485W	500W **
Fan Trays Redundancy	N+1	N+1	N+1	N+1
Air Flow	F2B	F2B	F2B	F2B/B2F

*__Note:__ Power consumption of chassis at 25C without MPA and optics.

**__Note:__ Line level power redundancy limited above 1000W.

MACsec

MACsec is a Layer 2 IEEE 802.1AE standard for encrypting packets between two MACsec-capable routers.

MACsec secures data on physical media at line rate.

Below is the list of NCS 5500 routers with the interfaces that support MACsec encryption.

Table 15. NCS 5500 and NCS 5700 fixed platform MACsec support

55A1-36H	55A2-MOD	55A1-24Q6H-S	55A1-24Q6H-SS	55A1-48Q6H
40G/100G Ports	All MPA ports	All 40G/100G Ports	All 40G/100G Ports	All 40G/100G Ports
Breakout 4x 10G	Breakout 4x 10G	Breakout 4x 10G	Breakout 4x 10G	Breakout 4x 10G
Breakout 4x 25G	Breakout 4x 25G	Breakout 4x 25G	Breakout 4x 25G	Breakout 4x 25G
QSA-10G	16x 10G/25G Fixed Ports	16x 10G/25G Ports	All 10G/25G Ports	

57B1-6D24-SYS 57B1-5DSE-SYS	NCS 57C-48Q6D-S	57C3-MOD-SYS 57C3-MODS-SYS	57D2-18DD-SYS
All Ports	Ports 0/2/4	All MPA ports	All Ports (SW Support Post FCS)
		Fixed Ports 24x (10G/25G)	
		All Breakouts	

Note: MACsec on 1G interfaces is not supported.

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Conclusion

The NCS 5500 and NCS 5700 Series fixed form factor platforms are designed to provide the highest performance and scale in 1 RU, 2 RU, and 3 RU configurations. The fixed platforms offer 1/10/25/40/50/100/400G port speeds with low-latency forwarding and ultra-low power consumption.

The NCS 5500 and NCS 5700 fixed platforms support front-to-back and back-to-front airflows. The fixed platforms have options for AC or DC power supply. Both the AC and DC power supplies are platinum rated, offering high efficiency, so less power is dissipated as heat and more power is available for the system to use than with typical power supplies.

Some of the NCS 5500 and NCS 5700 fixed platforms have Base and Scale models, giving network operators the flexibility to choose based on port speed, scale, and cost needs. The NCS 5500 Base models support more than a million routes, while the Scale models support around 2.75M and 4M routes to cater to the requirements of multimillion routes and large ACLs. The NCS 5700 is based on a new forwarding ASIC generation offering larger routing scale. In addition to that, all the fixed platforms have on-chip/off-chip buffers to provide deep queuing in case of network congestion.

NCS 5500 and NCS 5700 platforms run on the Cisco IOS XR operating system. IOS XR is a 64-bit Linux kernel-based, highly modular, and fully distributed operating system that provides a virtualized environment to independently run system administration and routing functions on separate virtual containers. The IOS XR software also offers features that enable innovations such as automation, telemetry, application hosting, and programmability.

Based on the hardware/software attributes and capabilities, the NCS 5500 and NCS 5700 are ideal platforms to position in data centers, large enterprise, web, and service provider networks to achieve efficient performance and scale for growth.

Appendix

End-of-Sale Platforms

Table 16. NCS5500 EoS PIDs

PID	Description
NCS-5502	NCS5502 48x100G Base Chassis
NCS-5502-SE	NCS5502 48x100G Scale Chassis

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