Release Notes for Cisco NCS 5500 Series Routers, IOS XR Release 24.2.11

Revised: July 5, 2024

Network Convergence System 5500 Series Routers

What's New in Cisco IOS XR Release 24.2.11

Cisco IOS XR Release 24.2.11 is a new feature release for Cisco NCS 5700 Fixed Port Series routers.

For more details on the Cisco IOS XR release model and associated support, see Software Lifecycle Support Statement - IOS XR.

New in Documentation

Feature	Description
Cisco IOS XR Feature Finder	We have launched this interactive tool that assists you in locating features introduced across Cisco IOS XR releases and platforms. This tool empowers you to explore, discover, and utilize the full potential of our platforms. As we continue to enhance the tool, we would love to hear your feedback. You are welcome to drop us a note here.

Software Features Enhanced and Introduced

To learn about features introduced in other Cisco IOS XR releases, select the release from the Documentation Landing Page.

Feature	Description
System Setup and Software Installation	
Install Owner and Partner RPMs Using IOS XR Install Infrastructure	You can now use the existing IOS XR install infrastructure to install your proprietary Owner and Partner RPMs. This enhancement streamlines the process of integrating third-party software seamlessly into the IOS XR environment, including bundling the owner and partner RPMs into a GISO. In previous releases, you could only install Owner and Partner applications using the Application Manager interface. This feature introduces the keyword **skip-implicit-owner-packages-checks** in the following install commands: • **install package add** • **install replace** • **install replace reimage**
Routing	

Feature	Description
Multi-area Loopback Interface for OSPF	Introduced in this release on: ; NCS 5700 fixed port routers You can save IP addresses and resources, prevent the use of multiple node SIDs for labels associated with loopback interfaces, and save time configuring multiple loopback interfaces for an Area Border Router (ABR) in a network. These improvements are possible as you can now configure a single loopback interface for multiple areas. With this feature, an ABR can use a single loopback interface for all areas it connects to, eliminating the need for separate loopback interfaces for each area. Previously, each loopback interface was linked to only one area. The feature introduces these changes: **CLI:** The **multi-area-interface** command is extended to support loopback interfaces.
Protect IS-IS Processes in OOR Conditions	Introduced in this release on:NCS 5700 fixed port routers This feature enables prompt alerts for out-of-resource (OOR) conditions in IS-IS processes that could otherwise cause network instability and disruption due to memory leaks and excessive link-state packets (LSPs). That, in addition, they can disable the overload bit status flag that's included in the router's LSP to prevent setting of the overload-bit, but it's not recommended without Cisco consultation Previously, during OOR conditions, IS-IS processes restarted themselves, but the OOR conditions could persist. This ability to protect IS-IS processes in OOR conditions is enabled by default and you can't disable it. The feature introduces these changes: **CLI:** • The feature introduces fields that indicate the memory state of the IS-IS protocol in the **show isis protocol** command. • **oor-set-overload-bit disable** command. **YANG Data Model** • New XPaths for `Cisco-IOS-XR-clns-isis-cfg` • `Cisco-IOS-XR-um-router-isis-cfg` (see GitHub, YANG Data Models Navigator)

Feature	Description
Seamless Bidirectional Forwarding Detection	Introduced in this release on: NCS 5700 fixed port routers This feature introduces support for NCS 5500 routers as a Seamless BFD (S-BFD) reflector. Seamless BFD simplifies the negotiation and state establishment aspects of BFD by predetermining session discriminators and maintaining session state only at the headend. This approach ensures quicker connectivity tests and reduces complexity in session establishment. Previously, support for Seamless BFD reflector was not available. The feature introduces these changes: **CLI:** This feature introduces the **sbfd** command.
Segment Routing	
Data Plane Validation for SR-MPLS IPv6-based Controller Instantiated LSPs	Introduced in this release on: NCS 5700 fixed port routers You can now verify the network configuration and paths and policies set up, without interrupting or potentially disrupting live network traffic, for SR-MPLS (Segment Routing over Multiprotocol Label Switching) IPv6-based Label Switched Paths (LSPs). With this feature, you can validate controller instantiated LSPs programmed directly into the forwarding hardware. Previously, SR data plane validation was possible over IPv4-based LSPs. The feature introduces these changes: **CLI:** The **dataplane-only** keyword is introduced in the **traceroute sr-mpls** and **ping sr-mpls** commands. **YANG Data Models:** • `Cisco-IOS-XR-mpls-traceroute-act.yang` • `Cisco-IOS-XR-mpls-ping-act.yang` See (GitHub, Yang Data Models Navigator)

Feature	Description
Display Neighbor Router Capabilities in OSPF Networks	Introduced in this release on: NCS 5700 fixed port routers You can now improve the user experience, understand the features and functionalities supported by neighboring routers, reduce operational work hours and human errors by gaining better visibility into the routing capabilities of directly connected neighboring routers in an OSPF network. These improvements are now possible when you enable Segment Routing on a neighboring connected router. Previously, there was no straightforward method to display the segment routing and other capabilities of neighboring routers in an OSPF network. The feature introduces these changes: **CLI:** • The **capabilities** keyword is introduced in the **show ospf neighbor** command. **YANG Data Models:** • `Cisco-IOS-XR-ipv4-ospf-oper.yang` See (GitHub, Yang Data Models Navigator)
MPLS OAM support for SR-TE Policies using MPLS IPv6-based LSPs	Introduced in this release on: NCS 5700 fixed port routers You can now verify the network configuration and paths and SR-TE policies set up, without interrupting or potentially disrupting live network traffic, for SR-MPLS (Segment Routing over Multiprotocol Label Switching) IPv6-based Label Switched Paths (LSPs). Previously, MPLS OAM support was only for IPv4-based LSPs. The feature introduces these changes: **CLI:** The **traceroute sr-mpls** and **ping sr-mpls** commands are extended to support IPv6 nexthop addresses. **YANG Data Models:** • `Cisco-IOS-XR-mpls-traceroute-act.yang` • `Cisco-IOS-XR-mpls-ping-act.yang` See (GitHub, Yang Data Models Navigator)

Feature	Description
User-Defined Generic Metric Support for IS-IS Flex Algo	Introduced in this release on: NCS 5700 fixed port routers This feature adds support for user-defined generic metric as a metric type for IS-IS Flexible Algorithm. You can now have more control over traffic flows using user-defined generic metrics. You can define a family of user-defined generic metrics that can advertise different types of administrative metrics such as jitter, reliability, and fiscal cost depending on the traffic class for Flexible Algorithms. You can selectively define and assign semantics of these metrics as per the network requirement. The feature introduces the following changes: **CLI**: • The feature introduces the **generic-metric flex-algo** and **metric-type generic** commands. **YANG Data Models:** • `Cisco-IOS-XR-um-router-isis-cfg.yang`
BGP	
Increased Maximum Limit for BGP Additional Paths	Introduced in this release on: NCS 5700 fixed port routers You can now configure a maximum of 96 BGP additional paths instead of 32, which enhances network resiliency, and provides an improved load balancing capability. This feature introduces these changes: **CLI:** • The **advertise-limit** keyword is introduced in the **additional-paths** command. **YANG Data Model:** • `Cisco-IOS-XR-um-router-bgp-cfg.yang` (see GitHub, YANG Data Models Navigator)
Interface and Hardware Component	
Carrier Delay on Physical Interfaces	Introduced in this release on: NCS 5700 fixed port routers With the carrier-delay timer functionality, the Ethernet interface state remains stable for the configured delay duration, even if the hardware link state fluctuates. This prevents interface flapping and improves network reliability. If you haven't configured the timer, the default carrier delay automatically delays the hardware link-up notifications by 200 ms. This time delay ensures that a stable hardware link state is established. If you want to change the delay of the interface state change notification, you can use the **carrier-delay** command to set a different value. The feature introduces these changes: **CLI:** • **carrier-delay** • The default value of **up** keyword is implemented as 200 ms in the **carrier-delay** command.

Feature	Description
IP Addresses and Services	
TCP Dump File Converter	Introduced in this release on: NCS 5700 fixed port routers You can now convert an entire TCP dump of packet traces in binary files into readable formats such as text or cap, which makes it easier to analyze them for troubleshooting using third-party or open-source tools. This feature saves time and effort by preventing the need to examine each packet for failure. This feature introduces the **tcp dump-file convert** command.
L2VPN and Ethernet Services	
Layer 2 Fast Reroute on Cisco NCS 5700 series routers and line cards	Introduced in this release on Cisco NCS 5700 fixed port routers Layer 2 Fast Reroute is now supported on the Cisco NCS 5700 series routers and line cards.
L3VPN	
L3VPN over GRE Tunnels	Introduced in this release on Cisco NCS 5700 fixed port routers Generic Routing Encapsulation (GRE) allows you to configure point-to-point and multiple traffic types connections to send the various types of network traffic. GRE supports L3VPN by encapsulating various network layer protocols, allowing IPv4 and IPv6 protocols to transport within the same GRE tunnel.
MPLS Layer 3 VPNs CLI enhancements	You can now verify that MPLS labels are correctly programmed in the control plane (or software) and the data plane (hardware forwarding tables) using the **show mpls forwarding labels** command. Previously the command only showed the MPLS label information for software, additional steps were required to verify the label status in the hardware, by checking in the SDK.
Modular QoS	
Set VXLAN Outer IP Header DSCP Value to 0	Introduced in this release on: NCS 5700 fixed port routers When a PE device transports IP traffic over a VXLAN tunnel that originates on the device, it automatically sets the DSCP value in the VXLAN outer IP header to 0 (CS0).
Netflow	
Monitor GTP-U Traffic in 5G Network	Introduced in this release on: NCS 5700 fixed port routers You now get a comprehensive view of your 5G network's performance and gain detailed insights into slice utilization, deployed QoS policies, and their impact on traffic. This includes verifying deployed QoS policies, assessing 5G slice mechanisms, and tracking GTP-U endpoints for specific applications. This feature specifically applies to 5G network slicing when the GTP User Plane carries data within the core network and to the radio access network. This is achieved by exporting GTP-U related Information Elements using Netflow and IPFIX records to collectors for analysis. This feature introduces these changes: **CLI:** • The **gtp** keyword is introduced in the **record ipv4** and **record ipv6** commands.

Feature	Description
System Management	
Isolate Foreign Masters Causing Packet Timing Signal Fail	Introduced in this release on:NCS 5700 fixed port routers This feature permits the flexible selection of timing sources by filtering out Foreign Master (FM) clocks that exhibit unstable timing. This filtering causes the secondary clocks to produce a signal deemed Packet Timing Signal Fail (PTSF)-unusable, from consideration within the Best Master Clock Algorithm (BMCA). The system continuously monitors these clocks for timing stabilization, and upon detecting enhanced stability, it may reevaluate and possibly reintegrate them as suitable time sources. This feature introduces these changes: **CLI:** • **detect-ptsf-unusable** • The **show ptp foreign-masters** command output is enhanced to include phase difference values and servo status. **YANG Data Models:** The following data models are enhanced: • `Cisco-IOS-XR-ptp-cfg.yang` • `Cisco-IOS-XR-um-ptp-cfg.yang`
PTP Phase Difference Threshold Between Passive and Secondary Ports	Introduced in this release on:NCS 5700 fixed port routers Passive ports can now be included in the Delay Request-Response Mechanism (DRRM), which allows for the monitoring of PTP phase differences between a passive port and a secondary port. If these PTP phase differences surpass a predefined limit, system logs are triggered. This feature enables you to detect potential errors such as fiber asymmetry or a clock failure in the PTP network. This feature introduces these changes: **CLI:** • **phase-difference-threshold-breach** • The **show ptp foreign-masters** command output is enhanced to include phase difference values and servo status. **YANG Data Models:** The following data models are enhanced: • `Cisco-IOS-XR-ptp-cfg.yang` • `Cisco-IOS-XR-um-ptp-cfg.yang`
System Security	

Feature	Description
Layer 2 Untagged Sub-interface configuration in IEEE 802.1X Port-based Authentication	Introduced in this release on: NCS 5700 fixed port routers This feature enhances network security by extending the 802.1X port-based authentication to Layer 2 untagged sub-interfaces. It ensures that data transmission is only possible from authenticated devices, including those on interfaces without VLAN tags. Consequently, this reinforces access control policies across all devices attempting to connect to the network.
System Monitoring	
Traffic Statistics with Packet Drop Location	Introduced in this release on: NCS 5700 fixed port routers. We help you save debugging time to locate packet drops by automatically detecting nonzero traffic drops from the commands running in the background and giving you the exact location of the packet drop. In earlier releases, you used multiple show commands with their respective locations to detect packet drops. This feature introduces the **show drops all** command.

YANG Data Models Introduced and Enhanced

This release introduces or enhances the following data models. For detailed information about the supported and unsupported sensor paths of all the data models, see the Github repository. To get a comprehensive list of the data models supported in a release, navigate to the Available-Content.md file for the release in the Github repository. The unsupported sensor paths are documented as deviations. For example, openconfig-acl.yang provides details about the supported sensor paths, whereas cisco-xr-openconfig-acl-deviations.yang provides the unsupported sensor paths for openconfig-acl.yang on Cisco IOS XR routers.

You can also view the data model definitions using the YANG Data Models Navigator tool. This GUI-based and easy-to-use tool helps you explore the nuances of the data model and view the dependencies between various containers in the model. You can view the list of models supported across Cisco IOS XR releases and platforms, locate a specific model, view the containers and their respective lists, leaves, and leaf lists presentedvisually in a tree structure.

Feature	Description
Programmability	
openconfig-interface.yang Version 2.5.0	The OpenConfig data model version 2.5.0 enables you to: • record the precise time in milliseconds at which the counters such as in-octets, in-pkts, out-octets, out-pkts are retrieved from the hardware through an augmented model using last-read-time leaf.In the augmented model, the last-read-time field which is wrapped around user specific container (name Cisco) shows the latest hardware counter update time. • fetch the L2 interface counters on OC-interface.

Feature	Description
openconfig-local-routing.yang Version 2.0.1	The OpenConfig data model, which is part of the openconfig-network-instance.yang data model is revised from version 1.2.0 to 2.0.1. This revision enables you to configure the preference for the order selection when multiple sources, such as protocols and static routes, contribute to the same prefix entry. A lower number signifies a better preference. When the preference value is not specified, default preference value is considered which is one. This data model supports event-driven and Model-driven telemetry.
Cisco-IOS-XR-infra-statsd-oper.yang	The native yang data model streams cached counters using a TARGET_DEFINED subscription. It enables you to fetch interface statistics, such as bytes-received, packets-received and other details, from a cache which is periodically updated from hardware using generic-counters container. The hardware-timestamp field indicates the timestamp of the most recent hardware counter readings. If hardware-timestamp field is 0, the last-data-time field indicates the timestamp of the most recent counter readings, which could be either from hardware or software. This data model supports event-driven telemetry.
Cisco-IOS-XR-healthcheck-cfg.yang	The latest update to the Cisco-IOS-XR-healthcheck-cfg.yang native data model includes the following additions: The tolerance container - This is a new container in the packet-drop container to configure the NPU packet loss tolerance. The tolerance-level-low, tolerance-level-medium and tolerance-level-high leaves - These new leaves are added to the tolerance container. These leaves enable you to configure different NPU packet loss tolerance values for low, medium and high tolerance NPU traps
openconfig-if-ip.yang Version 3.5.0	This OpenConfig data model is revised from version 3.0.0 to 3.5.0. This update introduces the ability to configure both global unicast and link-local IP addresses using the config/type leaf.
Cisco-IOS-XR-ipv4-ospf-oper.yang	This native data model is enhanced with new leaves *sr-capable, ri-capabilities-tlv, te-capable, gr-capable, grh-capable*, and *host-name* in the *OSPF-SH-NEIGHBOR-DETAIL* and *OSPF-SH-NEIGHBOR* groupings to display neighbor router capabilities in OSPF networks.
Cisco-IOS-XR-mpls-traceroute-act.yang	This unified data model is enhanced with a new container, *ipv6*, and leaves such as *next-hop*, *lsp-endpoint*, and *force-ipv6-explicit-null* in the *type-ipv6-next-hop* interface to extend support to Segment Routing OAM to verify network configuration for SR-MPLS IPv6-based LSPs.

Feature	Description
Cisco-IOS-XR-mpls-ping-act.yang	This unified data model is enhanced with a new container, *ipv6*, and leaves such as *next-hop*, *lsp-endpoint*, and *force-ipv6-explicit-null* in the *type-ipv6-next-hop* interface to extend support to Segment Routing OAM to verify network configuration for SR-MPLS IPv6-based LSPs.
Cisco-IOS-XR-um-router-isis-cfg	This unified data model is enhanced with new containers *generic-metric*, and *generic-metric-level* to define a family of user-defined generic metrics that can advertise different types of administrative metrics such as jitter, reliability, and fiscal cost depending on the traffic class for Flexible Algorithms.
Cisco-IOS-XR-evpn-oper.yang	This native data model is enhanced to stream event-driven telemetry (EDT) data for the operational state of Layer 2 Ethernet VPN (EVPN) MAC routes using mac container. EDT data is streamed when an on-change event on the MAC route is detected such as adding, deleting or modifying a MAC address.
Cisco-IOS-XR-ptp-cfg.yang	This native yang data model for PTP is enhanced with new leaves - *detect-ptsf-unusable* and *phase-difference-threshold-breach* to allow the exclusion of Foreign Masters (FMs) with unstable timing from Best Master Clock Algorithm (BMCA) and to measure the phase difference between passive port and secondary port.
Cisco-IOS-XR-um-ptp-cfg.yang	This unified data model for PTP is enhanced with new leaves - d*etect-ptsf-unusable* and *phase-difference-threshold-breach* to allow the exclusion of Foreign Masters (FMs) with unstable timing from Best Master Clock Algorithm (BMCA) and to measure the phase difference between passive port and secondary port.
Cisco-IOS-XR-ethernet-sat-oper.yang	This YANG data model is enhanced with new container *frame-delay* to categorize frame delay range for ITU-T Y.1564.
Cisco-IOS-XR-ethernet-sat-cfg.yang	This native data model is enhanced with new container *frame-delay* to categorize frame delay range for ITU-T Y.1564.

Hardware Introduced

Hardware	Description
Optics	**Note**: Optics support varies across devices (routers, line cards, RPs, and so on). To know if an optics is compatible with a specific Cisco device, refer to the Transceiver Module Group (TMG) Compatibility Matrix. This release introduces the following optics: • QSFP-100G-BX20(U/D)4-I

Caveats

There are no caveats in this release.

Behavior Changes

- Starting from Cisco IOS XR Release 24.2.11, the NCS-57C3-MOD router supports 2x100GbE auto-breakout on MPA slots 2 and 3.
- From this release, the **set qos-group** action can be used with the new parameter **policy-map-extend** in the **hw-module profile segment-routing srv6 mode encapsulation traffic class** command. Prior to this release, the **set qos-group** action cannot be used in conjunction with the parameter **policy-map-extend** in the **hw-module profile segment-routing srv6 mode encapsulation traffic class** command.
- From this release, for the **tx-interval** value in **performance-measurement liveness-profile**, the allowed range for CPU sessions is from 15000 to 15000000 micro seconds. The modified range applies to both the **liveness-profile sr-policy default** and **liveness-profile name** commands. Prior to this release, the allowed range for CPU sessions was from 30000 to 15000000 micro seconds
- Cisco IOS XR enforces the existence of the leaves referenced by OpenConfig list key leafrefs. If the referenced leaves do not exist in the OpenConfig datastore, the following error is returned:

  Leaf `name` inside the `config` container must also be set to value `default` to satisfy the leafref constraint on the list key.
- To configure load-balancing parameters, use the **cef load-balancing** command in Global configuration mode.
- When multiple IS-IS instances are configured on a router, by default, **show isis** commands display information from all IS-IS instances. To display information from only one specific IS-IS instance, use the **set default-isis-instance** command in the EXEC mode.

Release Package

This table lists the Cisco IOS XR Software feature set matrix (packages) with associated filenames.

Visit the Cisco Software Download page to download the Cisco IOS XR software images.

Table 1: Release 24.2.11 Packages for Cisco NCS 5700 Series Router

Feature Set	Filename
NCS 5700 IOS XR Software	ncs5700-x64-24.2.11.iso
NCS 5700 IOS XR Software (only k9 RPMs)	ncs5700-k9sec-rpms.24.2.11.tar
NCS 5700 IOS XR Software Optional Package	NCS5700-optional-rpms.24.2.11.tar This TAR file contains the following RPMS: • optional-rpms/cdp/* • optional-rpms/eigrp/* • optional-rpms/telnet/*

Determine Software Version

To verify the software version running on the router, use **show version** command in the EXEC mode.

```
Router# show version
Cisco IOS XR Software, Version 24.2.11 LNT
Copyright (c) 2013-2024 by Cisco Systems, Inc.

Build Information:
 Built By     : sajshah
 Built On     : Wed Jul 03 00:06:14 UTC 2024
 Build Host   : iox-ucs-054
 Workspace    : /auto/srcarchive11/prod/24.2.11/ncs5700/ws/
 Version      : 24.2.11
 Label        : 24.2.11

cisco NCS5700 (D-1633N @ 2.50GHz)
cisco NCS-57C1-48Q6-SYS (D-1633N @ 2.50GHz) processor with 16GB of memory
PE8_57C1 uptime is 1 hour, 15 minutes
NCS 57C1 Base Chassis, Flexible Consumption Need Smart Lic
```

Determine Firmware Support

Use the **show hw-module fpd** command in EXEC and Admin mode to view the hardware components with their current FPD version and status. The status of the hardware must be CURRENT; Running and Programed version must be the same.

You can also use the **show fpd package** command in Admin mode to check the fpd versions.

NCS 5700 Fixed Port Routers

```
Router# show fpd package
================================================================================
                      Field Programmable Device Package
             ================================================
                                          Req      SW       Min Req   Min Req
Card Type            FPD Description      Reload   Ver      SW Ver    Board Ver
================== ========================== ====== ======= ======== =========
--------------------------------------------------------------------------------
NCS-57B1-5DSE-SYS    ADM1_Config               NO      0.50      0.50       0.0
                     ADM2_Config               NO      0.50      0.50       0.0
                     ADM3_Config               NO      0.50      0.50       0.0
                     IoFpga                    YES     0.09      0.09       0.0
                     IoFpgaGolden              YES     0.09      0.08       0.0
                     Primary-BIOS              YES     1.11      1.11       0.0
                     StdbyFpga                 YES     0.24      0.24       0.0
                     StdbyFpgaGolden           YES     0.24      0.24       0.0
                     TamFw                     YES     6.05      6.05       0.0
                     TamFwGolden               YES     6.05      6.05       0.0
--------------------------------------------------------------------------------
NCS-57B1-6D24-SYS    ADM1_Config               NO      0.94      0.94       0.0
                     ADM2_Config               NO      0.94      0.94       0.0
                     ADM3_Config               NO      0.94      0.94       0.0
                     IoFpga                    YES     0.09      0.09       0.0
                     IoFpgaGolden              YES     0.09      0.08       0.0
                     Primary-BIOS              YES     1.11      1.11       0.0
                     SsdIntelS4510             YES    11.20     11.20       0.0
                     SsdMicron5300             YES     0.01      0.01       0.0
                     StdbyFpga                 YES     0.24      0.24       0.0
                     StdbyFpgaGolden           YES     0.24      0.24       0.0
                     TamFw                     YES     6.05      6.05       0.0
```

```
                    TamFwGolden               YES     6.05      6.05      0.0
--------------------------------------------------------------------------------
NCS-57C1-48Q6-SYS   ADM1_Config               YES     0.07      0.07      0.0
                    ADM2_Config               YES     0.07      0.07      0.0
                    IoFpga                    YES     0.47      0.47      0.0
                    IoFpgaGolden              YES     0.47      0.47      0.0
                    Primary-BIOS              YES     3.07      3.07      0.0
                    SsdIntelS4510             YES    11.32     11.32      0.0
                    SsdMicron5300             YES     0.01      0.01      0.0
                    StdbyFpga                 YES     0.31      0.31      0.0
                    StdbyFpgaGolden           YES     0.31      0.31      0.0
                    TamFw                     YES     7.10      7.10      0.0
                    TamFwGolden               YES     7.10      7.10      0.0
--------------------------------------------------------------------------------
NCS-57D2-18DD-SYS   ADM1-DBConfig             YES     1.92      1.92      0.0
                    ADM2-DBConfig             YES     1.92      1.92      0.0
                    ADM3-DBConfig             YES     1.92      1.92      0.0
                    ADM4-MBConfig             YES     1.92      1.92      0.0
                    ADM5-MBConfig             YES     1.92      1.92      0.0
                    ADM6-MBConfig             YES     1.92      1.92      0.0
                    FtFpga                    NO      0.20      0.20      0.0
                    FtFpgaGolden              NO      0.20      0.00      0.0
                    IoFpga                    YES     0.06      0.06      0.0
                    IoFpgaDB                  YES     0.07      0.07      0.0
                    IoFpgaGolden              YES     0.05      0.05      0.0
                    IoFpgaGoldenDB            YES     0.05      0.05      0.0
                    Primary-BIOS              YES     4.10      4.10      0.0
                    SsdIntelS4510             YES    11.32     11.32      0.0
                    SsdMicron5300             YES     0.01      0.01      0.0
                    StdbyFpga                 YES     0.96      0.96      0.0
                    StdbyFpgaGolden           YES     0.83      0.83      0.0
                    TamFw                     YES     7.09      7.09      0.0
                    TamFwGolden               YES     7.09      7.09      0.0
--------------------------------------------------------------------------------
PSU1100W-ACPI       EM-PrimMCU                NO      1.01      1.01      0.0
                    EM-SecMCU                 NO      1.05      1.05      0.0
--------------------------------------------------------------------------------
PSU2KW-ACPE         PO-PrimMCU                NO     17.56     17.56      0.0
--------------------------------------------------------------------------------
PSU2KW-ACPI         PO-PrimMCU                NO      1.03      1.03      0.0
                    PO-SecMCU                 NO      1.13      1.13      0.0
--------------------------------------------------------------------------------
PSU2KW-DCPE         PO-PrimMCU                NO     17.56     17.56      0.0
--------------------------------------------------------------------------------
PSU2KW-DCPI         PO-PrimMCU                NO      1.07      1.07      0.0
--------------------------------------------------------------------------------
PSU950W-DCPI        EM-PrimMCU                NO      1.00      1.00      0.0
```

This sample output is for **show hw-module fpd** command from the Admin mode:

```
sysadmin-vm:0_RP0# show hw-module fpd
Auto-upgrade:Enabled
Attribute codes: B golden, P protect, S secure, A Anti Theft aware
                                    FPD Versions
                                   ==============
Location   Card type             HWver FPD device       ATR Status   Running Programd  Reload Loc
--------------------------------------------------------------------------------------------------
0/RP0/CPU0 NCS-57C1-48Q6-SYS     0.3   ADM1_Config      S   CURRENT    0.07    0.07          0/RP0
0/RP0/CPU0 NCS-57C1-48Q6-SYS     0.3   ADM2_Config      S   CURRENT    0.07    0.07          0/RP0
0/RP0/CPU0 NCS-57C1-48Q6-SYS     0.3   IoFpga               CURRENT    0.47    0.47          0/RP0
0/RP0/CPU0 NCS-57C1-48Q6-SYS     0.3   IoFPgaGolden     B   CURRENT    0.47    0.47          0/RP0
0/RP0/CPU0 NCS-57C1-48Q6-SYS     0.3   Primary-BIOS     S   CURRENT    3.07    3.07          0/RP0
0/RP0/CPU0 NCS-57C1-48Q6-SYS     0.3   SsdIntelS4510    S   CURRENT   11.32   11.32          0/RP0
0/RP0/CPU0 NCS-57C1-48Q6-SYS     0.3   StdbyFpga        S   CURRENT    0.31    0.31          0/RP0
0/RP0/CPU0 NCS-57C1-48Q6-SYS     0.3   StdbyFpgaGolden  BS  CURRENT            0.31          0/RP0
```

```
0/RP0/CPU0 NCS-57C1-48Q6-SYS     0.3   TamFw            S   CURRENT    7.10    7.10        0/RP0
0/RP0/CPU0 NCS-57C1-48Q6-SYS     0.3   TamFwGolden      BS  CURRENT            7.10        0/RP0
0/PM0      NCS-1100W-ACFW        1.1   EM-PrimMCU           CURRENT    1.01    1.01      NOT REQ
0/PM0      NCS-1100W-ACFW        1.1   EM-SecMCU            CURRENT    1.05    1.05      NOT REQ
0/PM1      NCS-1100W-ACFW        1.1   EM-PrimMCU           CURRENT    1.01    1.01      NOT REQ
0/PM1      NCS-1100W-ACFW        1.1   EM-SecMCU            CURRENT    1.05    1.05      NOT REQ
```

Compatibility Matrix for EPNM and Crosswork with Cisco IOS XR Software

The compatibility matrix lists the version of EPNM and Crosswork that are supported with Cisco IOS XR Release in this release.

Table 2: Compatibility Matrix

Cisco IOS XR	Crosswork	EPNM
Release 24.2.11	Crosswork Optimization Engine 6.0	Evolved Programmable Network Manager 7.1.1

Important Notes

- The total number of bridge-domains (2*BDs) and GRE tunnels put together should not exceed 1518. Here the number 1518 represents the multi-dimensional scale value.
- The offline diagnostics functionality is not supported in NCS 5500 platform. Therefore, the **hw-module service offline location** command will not work. However, you can use the **(sysadmin)# hw-module shutdown location** command to bring down the LC.

Licensing

Starting with Cisco IOS XR Release 24.1.1, Smart Licensing Using Policy (SLP) is the default Licensing model. When you upgrade to the Cisco IOS XR Release 24.1.1 release or later, the Smart Licensing Using Policy is enabled by default.

You can migrate your devices to Smart Licensing with Policy model, see *Migrating from Smart Licensing to Smart Licensing Using Policy*, Smart Licensing Using Policy on Cisco IOS XR Routers.

We recommend that you update to the latest version of SSM On-Prem or Cisco Smart Licensing Utility.

Note SSM On-Prem and CSSM both support SLP devices and SL devices. SLP devices and SL devices can coexist in a network. The Smart Licensing (SL) model is available in releases Cisco IOS XR Release 7.11.1 and earlier.

Supported Transceiver Modules

To determine the transceivers that Cisco hardware device supports, refer to the Transceiver Module Group (TMG) Compatibility Matrix tool.

Upgrading Cisco IOS XR Software

Cisco IOS XR Software is installed and activated from modular packages, allowing specific features or software patches to be installed, upgraded, or downgraded without affecting unrelated processes. Software packages can be upgraded or downgraded on all supported card types, or on a single card (node).

Before starting the software upgrade, use the **show install health** command in the admin mode. This command validates if the statuses of all relevant parameters of the system are ready for the software upgrade without interrupting the system.

Note

- If you use a TAR package to upgrade from a Cisco IOS XR release prior to 7.x, the output of the **show install health** command in admin mode displays the following error messages:

```
sysadmin-vm:0_RSP0# show install health
. . .
ERROR /install_repo/gl/xr -rw-r--r--. 1 8413 floppy 3230320 Mar 14 05:45 <platform>-isis-2.2.0.0-r702.x86_64
ERROR /install_repo/gl/xr -rwxr-x---. 1 8413 165 1485781 Mar 14 06:02 <platform>-k9sec-3.1.0.0-r702.x86_64
ERROR /install_repo/gl/xr -rw-r--r--. 1 8413 floppy 345144 Mar 14 05:45 <platform>-li-1.0.0.0-r702.x86_64
```

You can ignore these messages and proceed with the installation operation.

- Quad configurations will be lost when you perform a software downgrade on a NCS-55A1-48Q6H device from IOS XR Release 7.5.1 onwards to a release prior to IOS XR Release 7.5.1 due to non-backward compatibility change. The lost configuration can be applied manually after the downgrade.

Note A quad is a group of four ports with common speeds, 1G/10G or 25G. You can configure the ports speed for a q by using the **hw-module quad** command.

Production Software Maintenance Updates (SMUs)

A production SMU is a SMU that is formally requested, developed, tested, and released. Production SMUs are intended for use in a live network environment and are formally supported by the Cisco TAC and the relevant development teams. Software bugs identified through software recommendations or Bug Search Tools are not a basis for production SMU requests.

For information on production SMU types, refer the Production SMU Types section of the *IOS XR Software Maintenance Updates (SMUs)* guide.

Cisco IOS XR Error messages

To view, search, compare, and download Cisco IOS XR Error Messages, refer to the Cisco IOS XR Error messages tool.

Cisco IOS XR MIBs

To determine the MIBs supported by platform and release, refer to the Cisco IOS XR MIBs tool.

Related Documentation

The most current Cisco NCS 5500 router documentation is located at the following URL:

https://www.cisco.com/c/en/us/td/docs/iosxr/ios-xr.html

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