Release Notes for Cisco NCS 5500 Series Routers, IOS XR Release 7.6.1

Network Convergence System 5500 Series Routers

What's New in Cisco IOS XR Release 7.6.1

Cisco IOS XR Release 7.6.1 is a new feature release for Cisco NCS 5500 Series routers. For more details on the Cisco IOS XR release model and associated support, see Guidelines for Cisco IOS XR Software.

New in Documentation

This release introduces rich and intuitive ways for you to access YANG data models supported in the Cisco IOS XR software.

Product	Description
Cisco IOS XR Error Messages	Search by release number, error strings, or compare release numbers to view a detailed repository of error messages and descriptions.
Cisco IOS XR MIBs	Select the MIB of your choice from a drop-down to explore an extensive repository of MIB information.
YANG Data Models Navigator	We have launched the tool as an easy reference to view the Data Models (Native, Unified, OpenConfig) supported in IOS XR platforms and releases. You can explore the data model definitions, locate a specific model, and view the containers and their respective lists, leaves, leaf lists, Xpaths, and much more. As we continue to enhance the tool, we would love to hear your feedback. You are welcome to drop us a note here.
Use Case-based Documentation at Learning Labs	You can now quickly explore and experiment on use-cases without setting up any hardware resources with the new Interactive documentation for Cisco 8000 routers on DevNet Learning Labs. Powered by Jupyter, the automated code blocks within the documentation enable you to configure the desired functionality on the routers and retrieve real-time output swiftly. Check out the new interactive documentation here: • End to end 3-stage CLOS Networks for SONiC • Use cases for QoS and Model-driven Telemetry

Software Features Enhanced and Introduced

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

Unless specified the following features are not supported on the Cisco 5700 series fixed port routers and the Cisco NCS 5500 series routers that have the Cisco NC57 line cards installed and operating in the native or compatibility mode.

To enable the native mode on Cisco NCS 5500 series routers having Cisco NC57 line cards, use the **hw-module profile npu native-mode-enable** command in the configuration mode. Ensure that you reload the router after configuring the native mode.

Feature	Description
BGP	

Feature	Description
Scaling BGP Flowspec to 32K Entries	You can now assign 32K BGP Flowspec entries, thus increasing the number of matches and actions covered.
	In earlier releases, you could configure 16K BGP Flowspec entries.
	This feature introduces the following command:
	stats resource-reassign
	The following command is deprecated with this feature:
	hw-module profile stats j2-dynamic-stats
Programmability	
Accounting Records for NETCONF Operations	Depending on the accounting configuration command you use, every NETCONF operation that the router performs is reported to the local server as syslog messages or remote AAA servers like TACACS+ as accounting messages, or both.
Interface and Hardware Component	
CFM and Y1731 on VPLS over BGP Signaling	VPLS over BGP Signaling services supports CFM continuity check, ITU-T Y.1731 compliant Delay Measurement Message (DMM), and Synthetic Loss Measurement (SLM) functions.
	This feature allows you to effectively manage a network with L2VPN services running VPLS using BGP AD.
VLAN Subinterface as Ingress or Egress Source for Traffic Mirroring	You can now configure the VLAN subinterface as an egress or ingress source for traffic mirroring, enabling monitoring of traffic mirrored on either egress or ingress or both directions.
	You could configure mirror functionality only at the main interface level in earlier releases.
CFM Monitoring on EVPN	Ethernet Connectivity Fault Management (CFM) is a service-level OAM protocol that provides tools for monitoring and troubleshooting end-to-end Ethernet services per VLAN. With this release, CFM over EVPN is supported on routers that have Cisco NC57 line cards installed and operate in compatibility mode.
Local LAG hashing with PPPoE traffic	Load Balancing for Link Aggregation (LAG) AC and Equal Cost Multipath (ECMP) for PPPoE traffic is now available on Cisco NCS 5700 series fixed-port routers with Cisco NC57 line cards installed and operating in the native and compatible modes. This load balancing is achieved by distributing PPPoE traffic on all available links.
Accurate Display of Interface Capacity	This enhancement enables you to utilize the correct capacity of the bundle interfaces by using the **show interface** command, thus allowing you to plan for and operate your network bandwidth effectively. In earlier releases, 64 X 100GE interfaces displayed a maximum interface capacity of 4.2 Tbps instead of 6.4 Tbps.
SPAN over PW	Pseudowire-Switched Port Analyzer (PW-SPAN) is now available on Cisco NCS 5500 series modular routers with Cisco NC57 line cards installed or Cisco 5700 series fixed-port routers operating in the native mode.
	You can mirror designated traffic on the source port over a pseudo-wire to a central location with PW-SPAN. This functionality, also known as pseudo-wire traffic mirroring, allows the centralization of expensive network traffic analysis tools.
IP Addresses and Services	

Feature	Description
ACL-Based Policing	You can control the traffic that an access control entry (ACE) allows in the ingress direction by configuring the policing rate for the ACE in an IPv4 or IPv6 Hybrid ACL. This functionality limits packet rates and takes different actions for different packets. The following commands are modified in this feature: • **permit (IPv4)** • **permit (IPv6)** • **show access-lists ipv4** • **show access-lists ipv6**
Enable Ingress Interface Logging on ACE	Using the **log-input** keyword, you can now enable Access Control Entries (ACEs) to generate log messages that help you identify the interface through which a particular traffic stream ingresses the routers. This information aids in optimizing traffic flow across the network. There was no option to enable logging of ingress interfaces with an ACE in earlier releases. This feature introduces an optional keyword **log-input** for the following commands: • **permit (IPv4)** • **permit (IPv6)** • **deny (IPv4)** • **deny (IPv6)**
Increased Ingress ACLs	You can now configure an increased number of either traditional (non-compression) or hybrid (compression) ingress ACLs in shared ACL mode, as listed below: • A maximum of 512 different traditional ingress ACLs per line card. • A maximum of 1000 different hybrid ingress ACLs per line card. Increased ACLs provide you with enhanced traffic filtering capabilities to control how traffic packets move through the network and restrict the access of users and devices to the network. In earlier releases, you could configure up to 127 different traditional ingress ACLs and 255 different hybrid ingress ACLs in shared ACL mode per line card. Apart from *IPv4 ACLs*, this enhancement is also applicable for: • **IPv6 ACLs** • **Chained ACLs**
ACL Chaining with ACL Based Forwarding (ABF)	You can now enable ABF in conjunction with ACL chaining in Common ACL. With this feature, the router can inspect and forward the packets based on the ABF rule in Common ACL. In earlier releases, ABF and ACL chaining with Common ACL were mutually exclusive features.

Feature	Description
Scaling to higher LPTS entries using eTCAM	Implementing LPTS infrastructure using external TCAM (eTCAM) is supported on Cisco NCS 5700 series fixed-port routers and the Cisco NCS 5500 series routers that have the Cisco NC57 line cards installed and operating in the native mode. With this functionality, the LPTS routing packet entries are scaled to 12000. This helps in scaling the other protocol entries up to 1.5 times the current scale.
IPV6-Neighbor Discovery proxy	IPV6-Neighbor Discovery proxy on the interface allows the hosts on the same subnet prefix to communicate, which are separated by the L2 broadcast domain. You can configure it with the **ipv6 nd proxy-nd** command or disable this feature with the **no ipv6 nd proxy-nd** command. This proxy feature provides faster and safer communication between the hosts on the same subnet prefix.
L2VPN and Ethernet Services	
Configurable Recovery Time for EVPN Core Isolation Group	You can now configure the recovery time for the EVPN core isolation group after the core interfaces recover from a network failure. This functionality is important because post-failure recovery, you can provide sufficient time for the EVPN PE nodes to relearn the MAC addresses and BGP routes received from the remote PEs. There's also time to handle delays in exchanging EVPN routes after recovery. This feature introduces the **core-de-isolation** command under the EVPN Timers configuration mode.
MSTP and PVRST	This feature is now supported on routers that have Cisco NC57 line cards installed and operate in native and compatibility modes.
Hierarchical EVPN Access Pseudowire	You can configure EVPN VPWS in the access node under the same bridge domain as EVPN in the core to build a PW to the nearest high-end PE that stitches those access circuits using EVPN. This allows the access nodes to leverage the benefits of EVPN. This feature also allows you to reduce the number of pseudowires (PWs) between the network provider edge (N-PE) devices by replacing PE devices with user provider edge (U-PE) and network provider edge (N-PE) devices. This feature prevents signaling overhead and packet replication.
Enhancement to the **show ethernet cfm** command to include LTR and LTM statistics	This enhancement adds statistics for Linktrace Messages (LTM) and Linktrace Replies (LTR) in the **show ethernet cfm local meps verbose** command output. Using LTM and LTR count, you can trace the source of network failure and track the path to a unicast destination MAC address.
Flow-Label Support on FAT-PW	This enhancement enables the MPLS OAM pings to work between Cisco devices and the third-party devices. Thus, allowing Flow-Aware Transport (FAT) Pseudowires (PW) to provide the load-balance capability across equal-cost multipath (ECMP) routes by adding a new label, called Flow Label, onto the bottom of the label stack.
MPLS	
Enhanced Targeted LDP Session Scale Values	With the unidimensional scale parameter value increased to 1999 on the router, you can now configure more targeted LDP sessions to discover extended neighbors.
Multicast	
Access Pseudowire in VPLS Bridge Domains	You can configure EVPN in the access node under the same bridge domain as EVPN in the core and create a pseudowire (PW) to the nearest PE that binds the access circuits using EVPN. This PW between the access PE and the single-homed PE ensures that the access nodes can leverage the benefits of EVPN.
Modular QoS	

Feature	Description
Egress Traffic Management	The egress traffic management model employs a two-pass model per NPU core to get up to 50% of NPU core bandwidth as recycle bandwidth. VOQ lookup takes place in the second pass to get the outgoing interface or sub-interface VOQ. This lookup at the second pass enhances the egress queuing policy by making the feature-rich ingress pipeline available to the outgoing traffic.
	Also, this functionality is configurable at the port level and not at the global level. This approach limits the usage of VOQ connectors required on all ingress devices to only physical ports or main interfaces, thus enabling scaling of egress QoS policies.
	This functionality introduces the **mode etm** option for the **controller optics** command.
Low Rate Shaper	This functionality allows your hardware to program low shaper bandwidth with accuracy. Earlier, if one of your customers wanted, say, a bandwidth of 500 kbps, the Cisco NC 57 line card ASIC could only program a minimum bandwidth of 3.9 Mbps for a particular traffic class, resulting in unnecessary wastage of bandwidth. With low shaper rates now made possible, you can limit bandwidth for specific subscribers whose requirements don't call for excessive bandwidth. This functionality thus allows you to save on your bandwidth costs.
	This functionality is only available for and automatically enabled in the egress traffic management mode.
MPLS EXP Marking for EVPN Multi-Homed Services	This feature enables you to differentiate traffic in the MPLS forwarding domain and manage traffic from ingress PE to egress PE based on the MPLS EXP bit of the MPLS header for EVPN multi-home scenarios.
Routing	
32 IS-IS Instances	You can now configure up to 32 IS-IS instances, thus enhancing the ability to isolate resources within your router and on the network. This ability enables you to configure more instances consuming network-wide resources at different rates, giving you more flexibility to manage your networks efficiently.
	In earlier releases, you could configure up to16 IS-IS instances.
MPLS TE Preference for Tunnels	You can now configure the MPLS TE traffic for equal-cost multipath (ECMP) such that it flows only through TE tunnels. This is useful in scenarios where the hardware has resource constraints that limit the number of mixed ECMP routes.
	In earlier releases, IS-IS installed multiple ECMPs for a route in the Routing Information Base (RIB) through TE tunnels and physical interfaces by default.
	This feature introduces the following command:
	mpls traffic-eng tunnel preferred

Feature	Description
IGP IP Flexible Algorithm for IS-IS Protocol	With IS-IS protocol extensions supporting Interior Gateway Protocol (IGP) Flexible Algorithm (Flex-Algorithm) on the IP data plane, you can now use the Algorithm to calculate IGP paths in an IP network without running Segment Routing. The IGP Flex-Algorithm allows for user-defined algorithms where the IGP computes paths based on a user-defined combination of metric type and constraints.
	Earlier, you could calculate IGP only using the Shortest Path First (SPF), which meant that you didn't have any choice except to use the default IGPpath calculated based on a native IGP metric.
	The following command is introduced:
	• **data-plane ip**
	The following commands are modified:
	• **ipv4 address**
	• **ipv6 address**
	• **show isis topology**
Segment Routing	
MPLS LSP Ping and Traceroute Nil FEC Target	This feature is supported on Cisco Network Convergence System 5700 Series routers and routers with the Cisco NC57 line cards operating in native mode.
	This feature allows operators to provide the ability to freely test any label stack by allowing them to specify the following:
	• label stack
	• outgoing interface
	• nexthop address
MPLS Ping and Traceroute for BGP and IGP Prefix-SID	This feature is supported on Cisco Network Convergence System 5700 Series routers and routers with the Cisco NC57 line cards operating in native mode.
	The MPLS LSP Ping feature is used to check the connectivity between ingress Label Switch Routers (LSRs) and egress LSRs along an LSP.
Programming Non-Active Candidate Paths of an SR Policy	By programming non-active candidate paths (CPs) in the forwarding plane, you ensure that if the existing active CP is unavailable, the traffic switches quickly to the new CP, thus minimizing loss of traffic flow.
	In earlier releases, instantiating a non-active CP to the forwarding plane after the unavailability of the active CP could take a few seconds, resulting in potential loss of traffic flow.
	This feature introduces the following command:
	• **max-install-standby-cpaths**
SR Performance Measurement: IP Endpoint Delay Measurement and Liveness Monitoring	This feature is supported on Cisco Network Convergence System 5700 Series routers and routers with the Cisco NC57 line cards operating in native mode.
	This feature measures the end-to-end delay and monitors liveness of a specified IP endpoint node, including VRF-aware (awareness of multiple customers belonging to different VRFs).

Feature	Description
SR Performance Measurement: Link Delay Measurement	This feature is supported on Cisco Network Convergence System 5700 Series routers and routers with the Cisco NC57 line cards operating in native mode. This feature provides a way to measure the real-time delay between links.
SR Performance Measurement: Measurement Modes	This feature is supported on Cisco Network Convergence System 5700 Series routers and routers with the Cisco NC57 line cards operating in native mode. This feature supports one-way, two-way, and loopback measurement modes.
SR Performance Measurement: Named Profiles	This feature is supported on Cisco Network Convergence System 5700 Series routers and routers with the Cisco NC57 line cards operating in native mode. You can use this feature to create specific performance measurement delay and liveness profiles, and associate it with an SR policy.
SR Performance Measurement: SR Policy End-to-End Delay Measurement	This feature is supported on Cisco Network Convergence System 5700 Series routers and routers with the Cisco NC57 line cards operating in native mode. This feature provides a way to monitor the end-to-end delay experienced by the traffic sent over an SR policy to ensure that the delay does not exceed the requested "upper-bound" and violate SLAs.
SR Performance Measurement: SR Policy Liveness Monitoring	This feature is supported on Cisco Network Convergence System 5700 Series routers and routers with the Cisco NC57 line cards operating in native mode. This feature allows you to verify end-to-end traffic forwarding over an SR Policy candidate path by periodically sending performance monitoring (PM) packets.
SR Performance Measurement: Static Delay Value on an Interface	This feature is supported on Cisco Network Convergence System 5700 Series routers and routers with the Cisco NC57 line cards operating in native mode. This feature allows you to configure an interface to advertise a static delay value, instead of the measured delay value.
Segment Routing Ping and Traceroute	This feature is supported on Cisco Network Convergence System 5700 Series routers and routers with the Cisco NC57 line cards operating in native mode. Segment routing ping and traceroute features extendsthe MPLS LSP ping and traceroute functionality to perform the connectivity verification on the segment routing control plane.
Segment Routing Ping and Traceroute for Flexible Algorithm	This feature is supported on Cisco Network Convergence System 5700 Series routers and routers with the Cisco NC57 line cards operating in native mode. Flexible Algorithm validation method is based on segment identifier (SID) label and label switched path (LSP) destination, instead of being based on IP address.
System Management	
PTP and SyncE support on NC57-MPA-12L-S	With this release, timing support for IEEE 1588 and SyncE is available on NC57-MPA-12L-S MPA.
Precision Time Protocol on NC57-24DD and NC57-18DD-SE	PTP is now supported on NC57-24DD and NC57-18DD-SE line cards operating in native mode. Based on the IEEE 1588-2008 standard, PTP is a protocol that defines a method to synchronize clocks in a network for networked measurement and control systems.

Feature	Description
PTP Delay Asymmetry on NCS 5700 series routers	You can configure static asymmetry such that any delays on Precision Time Protocol (PTP) paths are accounted for, and the PTP synchronization remains accurate, thus avoiding any impact to clock settings for all devices in a network.
	With this release, support for PTP Delay Asymmetry is extended to NCS 5700 series routers.
Flexible Consumption Model Licensing on the NC-57-MOD-S line card	Flexible Consumption Model (FCM) of licensing provides the capability and flexibility to purchase software capacity as needed.
	Support for FCM licensing is now extended to the NC-57-MOD-S line card.
PTP and Frequency Synchronization on NC-57-MOD-S Line Cards	Based on the IEEE 1588-2008 standard, PTP is a protocol that defines a method to synchronize clocks in a network for networked measurement and control systems.
	With this release, timing support for IEEE 1588-2008 (PTPv2) telecom profiles is extended to the line card NC-57-MOD-S.
System Monitoring	
Bias-Free Terminology in Syslogs	As part of the ongoing efforts by Cisco to use inclusive language in the IOS XR software and documentation, discriminatory words in syslog messages and formats are being removed and replaced with bias-free words. There is also a list of bias-free words that you can enable in your syslog files using the **service cli neutral enable** command.
Verification of EEDB OOR	If the Egress Encapsulation Database (EEDB) resources exceed the Out of Resource (OOR) threshold levels, the resource utilization of EEDB hardware and other system logs on the console can be viewed. With these details, you can take corrective action by freeing up EEDB resources, thereby minimizing traffic loss.
	This feature updates the show output of the following command to display utilization of EEDB hardware resources:
	• show controllers npu resources
System Security	
Lawful Intercept on Cisco NC57 line cards	Lawful intercept is a process that requires service providers to perform surveillance on an individual (or target) as authorized by a judicial or administrative order and share the communication intercepts with law enforcement agencies.
	You can now activate and deactivate the lawful intercept package on routers that have Cisco NC57 line cards installed and operate in the native mode.
MACSec on NCS-57B1 Chassis	MACSec is now supported on the following variants of the NCS-57B1 chassis:
	• NCS-57B1-5DSE-SYS
	• NCS-57B1-6D24-SYS
	This enhancement enables you to leverage features such as 400GE and 100GE optimized forwarding capacity, full line-rate MACSec, scalability, and low power consumption that the NCS-57B1 chassis offers.
System Setup and Software Installation	

Feature	Description
Build Golden ISO (GISO) Using gisobuild.py Tool	This feature allows you to build your GISO image without support from Cisco. You can now select the install files, add your RPMs, repackage them as a custom image, and install the image. In previous releases, you had to contact Cisco to get your GISO built.

Hardware MDB Profiles for Layer 2 Services	You can now configure hardware modular database (MDB) profiles for Layer 2 services, enabling you to achieve higher scales in terms of the number of routers and sessions.
	
	In earlier releases, you could configure hardware MDB profiles for Layer 3 services.
	
	This release adds the following hardware MDB profiles to the **hw-module profile mdb** command:
	
	    • **l2max**
	
	    • **l2max-se**

Secure ZTP - Python3 Support	You can now run the ZTP Helper Python Library script by invoking Python 3.0. In earlier releases, you could only invoke the ZTP Helper Python Library script with Python 2.0.

Hardware Introduced

Cisco IOS XR Release 7.6.1 introduces the following hardware support:

Hardware Feature	Description

NC57-MOD-S line card	The NC57-MOD-S is a modular line card that supports front panel ports through a combination of Modular Port Adapters (MPAs) and fixed optics ports. This line card provides 2.8-Tbps bandwidth through:
	
	    • Two MPA slots, each supporting up to 800GE MPA
	
	    • Two QSFP-DD ports of 400GE
	
	    • Two MPA slots, each supporting up to 800GE MPA
	
	    • Eight SFP56 ports of 50GE
	
	The line card can operate in native mode (all line cards in the chassis are NCS 5700 line cards) and compatible mode (previous generation NCS 5500 series line cards are present in the chassis).
	
	For the compatibility details of Modular Port Adapters (MPAs) on the line cards, see the Cisco Network Convergence System 5700 Series: 400GE and 100GE Line Cards data sheet.

NCS57-MPA-12L-S Modular port adapter	A 12-port 600GE modular port adapter (NCS57-MPA-12L-S) that supports SFP+, SPF28, and SFP56 optical transceiver. This SFP56 MPA can operate in 10GE/25GE/50GE modes. For more information, refer Cisco Network Convergence System 5700 Series: Modular Port Adapters Data Sheet.

Hardware Feature	Description

Optics	**Note** Optics support varies across devices (routers, line cards, RPs, etc.). 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:
	   • Cisco 100GBASE Quad Small Form-Factor Pluggable (QSFP)
	      • QSFP-100G-DR-S
	
	   • Cisco 10GBASE-LR/10GBASE-BR/25GBASE-BR Modules
	      • SFP-10/25G-BXD-I
	      • SFP-10/25G-BXU-I

Features Supported on Cisco NC57 Line Cards and NCS 5700 Fixed Routers

The following table lists the parity features supported on Cisco NC57 line cards in compatibility mode (NC57 line cards with previous generation NC55 line cards in the same modular chassis) and native mode (modular chassis with only NC57 line cards and NCS5700 fixed chassis).

Table 1: Parity Features Supported on Cisco NC57 Line Cards and NCS 5700 fixed routers

Feature	Compatible Mode	Native Mode
MSTP and PVRST	✓	✓
MPLS LSP Ping and Traceroute Nil FEC Target	✗	✓
MPLS Ping and Traceroute for BGP and IGP Prefix-SID	✗	✓
SR Performance Measurement: IP Endpoint Delay Measurement and Liveness Monitoring	✗	✓
SR Performance Measurement: Link Delay Measurement	✗	✓
SR Performance Measurement: Measurement Modes	✗	✓
SR Performance Measurement: Named Profiles	✗	✓
SR Performance Measurement: SR Policy End-to-End Delay Measurement	✗	✓
SR Performance Measurement: SR Policy Liveness Monitoring	✗	✓
SR Performance Measurement: Static Delay Value on an Interface	✗	✓
Segment Routing Ping and Traceroute	✗	✓

Feature	Compatible Mode	Native Mode
Segment Routing Ping and Traceroute for Flexible Algorithm	✕	✓
Lawful Intercept on Cisco NC57 line cards	✕	✓
Precision Time Profile on NC57-24DD and NC57-18DD-SE	✓	✓
CFM Monitoring on EVPN	✓	✕
Local LAG hashing with PPPoE traffic	✓	✓
SPAN over PW	✕	✓

For the complete list of parity features supported on Cisco NC57 line cards until Cisco IOS XR Release 7.6.1, see:

- Release Notes for Cisco NCS 5500 Series Routers, IOS XR Release 7.5.1

- Release Notes for Cisco NCS 5500 Series Routers, IOS XR Release 7.4.2

- Release Notes for Cisco NCS 5500 Series Routers, IOS XR Release 7.4.1

- Release Notes for Cisco NCS 5500 Series Routers, IOS XR Release 7.3.1

- Release Notes for Cisco NCS 5500 Series Routers, IOS XR Release 7.2.2

- Release Notes for Cisco NCS 5500 Series Routers, IOS XR Release 7.2.1

Behavior Changes

- Before Cisco IOS XR release 7.6.1:

    - Locally generated control plane packets, such as IS-IS and BGP, are generated using traffic-class 6.

    - Locally generated BFD over Bundle (IETF) packets, which are generated on the Network Processing Unit (NPU), are generated using traffic-class 6.

- From Cisco IOS XR release 7.6.1 onwards:

    - Locally generated control plane packets, such as IS-IS and BGP, are generated using traffic-class 7.

    - Locally generated BFD over Bundle (IETF) packets, which are generated on the Network Processing Unit (NPU), are generated using traffic-class 7.

Caveats

There are no caveats in this release.

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 2: Release 7.6.1 Packages for Cisco NCS 5500 Series Router

Composite Package		
Feature Set	**Filename**	**Description**
Cisco IOS XR IP Unicast Routing Core Bundle	ncs5500-mini-x.iso	Contains base image contents that includes: • Host operating system • System Admin boot image • IOS XR boot image • BGP packages
Individually-Installable Optional Packages		
Feature Set	**Filename**	**Description**
Cisco IOS XR Manageability Package	ncs5500-mgbl-3.0.0.0-r761.x86_64.rpm	Extensible Markup Language (XML) Parser, Telemetry, Netconf, gRPC and HTTP server packages.
Cisco IOS XR MPLS Package	ncs5500-mpls-2.1.0.0-r761.x86_64.rpm ncs5500-mpls-te-rsvp-2.2.0.0-r761.x86_64.rpm	MPLS and MPLS Traffic Engineering (MPLS-TE) RPM.
Cisco IOS XR Security Package	ncs5500-k9sec-3.1.0.0-r761.x86_64.rpm	Support for Encryption, Decryption, Secure Shell (SSH), Secure Socket Layer (SSL), and Public-key infrastructure (PKI)
Cisco IOS XR ISIS package	ncs5500-isis-1.2.0.0-r761.x86_64.rpm	Support ISIS
Cisco IOS XR OSPF package	ncs5500-ospf-2.0.0.0-r761.x86_64.rpm	Support OSPF
Lawful Intercept (LI) Package	ncs5500-li-1.0.0.0-r761.x86_64.rpm	Includes LI software images
Multicast Package	ncs5500-mcast-1.0.0.0-r761.rpm	Support Multicast

Table 3: Release 7.6.1 TAR files for Cisco NCS 5500 Series Router

Feature Set	**Filename**
NCS 5500 IOS XR Software 3DES	NCS5500-iosxr-k9-7.6.1.tar
NCS 5500 IOS XR Software	NCS5500-iosxr-7.6.1.tar
NCS 5500 IOS XR Software	NCS5500-docs-7.6.1.tar

Table 4: Release 7.6.1 Packages for Cisco NCS 5700 Series Router

Feature Set	**Filename**

NCS 5700 IOS XR Software	ncs5700-x64-7.6.1.iso
NCS 5700 IOS XR Software (only k9 RPMs)	ncs5700-k9sec-rpms.7.6.1.tar

NCS 5700 IOS XR Software Optional Package	NCS5700-optional-rpms.7.6.1.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.

```
RP/0/RP0/CPU0:router# show version
Tue Mar 29 08:47:20.498 PDT
Cisco IOS XR Software, Version 7.6.1
Copyright (c) 2013-2022 by Cisco Systems, Inc.

Build Information:
 Built By     : ingunawa
 Built On     : Sat Mar 26 20:01:52 PDT 2022
 Built Host   : iox-ucs-047
 Workspace    : /auto/srcarchive17/prod/7.6.1/ncs5500/ws
 Version      : 7.6.1
 Location     : /opt/cisco/XR/packages/
 Label        : 7.6.1

cisco NCS-5500 () processor
System uptime is 1 day 8 hours 43 minutes
```

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.

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

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

```
sysadmin-vm:0_RP0# show hw-module fpd
                          FPD Versions
                        ==============
Location  Card type       HWver FPD device      ATR Status    Run    Programd
--------------------------------------------------------------------------------
0/0       NC55-36X100G-A-SE 1.0   Bootloader        CURRENT   0.15   0.15
0/0       NC55-36X100G-A-SE 1.0   DBFPGA            CURRENT   0.14   0.14
0/0       NC55-36X100G-A-SE 1.0   IOFPGA            CURRENT   0.26   0.26
0/0       NC55-36X100G-A-SE 1.0   SATA-M500IT-MU-A  CURRENT   5.00   5.00
0/1       NC55-24X100G-SE   1.1   Bootloader        CURRENT   1.19   1.19
```

```
0/1      NC55-24X100G-SE  1.1   IOFPGA           CURRENT     0.13     0.13
0/1      NC55-24X100G-SE  1.1   SATA-M600-MCT    CURRENT     5.00     5.00
0/3      NC57-18DD-SE     1.1   Bootloader       CURRENT     1.03     1.03
0/3      NC57-18DD-SE     1.1   DBFPGA           CURRENT     0.14     0.14
0/3      NC57-18DD-SE     1.1   IOFPGA           CURRENT     0.22     0.22
0/5      NC57-MOD-S       1.1   Bootloader       CURRENT     2.03     2.03
0/5      NC57-MOD-S       1.1   DBFPGA           CURRENT     0.14     0.14
0/5      NC57-MOD-S       1.1   IOFPGA           CURRENT     0.40     0.40
0/RP0    NC55-RP          2.2   Bootloader       CURRENT     9.31     9.31
0/RP0    NC55-RP          2.2   IOFPGA           CURRENT     0.09     0.09
0/RP0    NC55-RP          2.2   SATA-M600-MU     CURRENT     6.00     6.00
0/RP1    NC55-RP          1.0   Bootloader       CURRENT     9.31     9.31
0/RP1    NC55-RP          1.0   IOFPGA           CURRENT     0.09     0.09
0/RP1    NC55-RP          1.0   SATA-M600-MU     CURRENT     6.00     6.00
0/FC0    NC55-5508-FC2    1.0   Bootloader       CURRENT     1.80     1.80
0/FC0    NC55-5508-FC2    1.0   IOFPGA           CURRENT     0.19     0.19
0/FC0    NC55-5508-FC2    1.0   SATA-M5100       CURRENT    75.00    75.00
0/FC1    NC55-5508-FC2    1.0   Bootloader       CURRENT     1.80     1.80
0/FC1    NC55-5508-FC2    1.0   IOFPGA           CURRENT     0.19     0.19
0/FC1    NC55-5508-FC2    1.0   SATA-M5100       CURRENT    75.00    75.00
0/FC2    NC55-5508-FC2    1.0   Bootloader       CURRENT     1.80     1.80
0/FC2    NC55-5508-FC2    1.0   IOFPGA           CURRENT     0.19     0.19
0/FC2    NC55-5508-FC2    1.0   SATA-M5100       CURRENT    75.00    75.00
0/FC3    NC55-5508-FC2    1.0   Bootloader       CURRENT     1.80     1.80
0/FC3    NC55-5508-FC2    1.0   IOFPGA           CURRENT     0.19     0.19
0/FC3    NC55-5508-FC2    1.0   SATA-M5100       CURRENT    75.00    75.00
0/FC4    NC55-5508-FC2    1.0   Bootloader       CURRENT     1.80     1.80
0/FC4    NC55-5508-FC2    1.0   IOFPGA           CURRENT     0.19     0.19
0/FC4    NC55-5508-FC2    1.0   SATA-M5100       CURRENT    75.00    75.00
0/FC5    NC55-5508-FC2    1.0   Bootloader       CURRENT     1.80     1.80
0/FC5    NC55-5508-FC2    1.0   IOFPGA           CURRENT     0.19     0.19
0/SC0    NC55-SC          1.6   Bootloader       CURRENT     1.74     1.74
0/SC0    NC55-SC          1.6   IOFPGA           CURRENT     0.10     0.10
0/SC1    NC55-SC          1.6   Bootloader       CURRENT     1.74     1.74
0/SC1    NC55-SC          1.6   IOFPGA           CURRENT     0.10     0.10
```

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.

Supported Transceiver Modules

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

Supported Modular Port Adapters

For the compatibility details of Modular Port Adapters (MPAs) on the line cards, see the datasheet of that specific line card.

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 c by using the **hw-module quad** command.

Note Ensure that the system is on Cisco IOS XR Software Release 7.3.x, for a successful upgrade to Cisco IOS XR Software Release 7.6.x.

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.

Use user-class Option 'xr-config' Instead Of 'exr-config' To Provision ZTP

In Cisco IOS XR Release 7.3.1 and earlier, the system accepts the device sending **user-class = "exr-config"**; however starting Cisco IOS XR Release 7.3.2 and later, you must use only **user-class = "xr-config"**.

In Cisco IOS XR Release 7.3.2 and later, use:

```
host cisco-rp0 {
    hardware ethernet e4:c7:22:be:10:ba;
    fixed-address 172.30.12.54;
    if exists user-class and option user-class = "iPXE" {
        filename = "http://172.30.0.22/boot.ipxe";
    } elsif exists user-class and option user-class = "xr-config" {
        filename = "http://172.30.0.22/scripts/cisco-rp0_ztp.sh";
    }
}
```

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