# Release Notes for Cisco NCS 560 Series Routers, Cisco IOS XR Release 7.8.1

**First Published:** 2022-11-30

## What's New in Cisco IOS XR Release 7.8.1

Cisco IOS XR Release 7.8.1 is a new feature release for Cisco NCS 560 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.

| Feature | Description |
|---|---|
| **L2VPN and Ethernet Services** | |
| Storm Control Configuration for Subinterfaces | Storm control helps prevent LAN ports from being disrupted by a broadcast, multicast, or unicast traffic storm. |
| | You can now configure different storm control rates for each subinterface on a physical port. This will give you control at a granular level and prevent flooding of excess traffic at the subinterface level. |
| | In earlier releases, storm control could be configured only at the physical port level or only on one subinterface under a main interface. |
| | This feature modifies the **hw-module storm-control-combine-policer-bw enable** command to enable per subinterface configuration support for storm control. |
| Single Tagged VLAN Range Support for Double Tagged Frames | From this release, L2 subinterface configuration with single tagged VLAN range can be matched with the double tagged frames. Previously, the packet matching was done only with single VLAN ID and the double tagged packets were dropped. |
| | With single tagged VLAN range support for double tagged frames, the traffic can reach the VLAN destination safely. |
| MAC Address Limit configuration for Static Addresses | You can now configure the MAC address limit for bridge domains to learn only static MAC addresses and to drop traffic from unknown sources. |
| | Malicious attackers can spoof a Layer 2 MAC address to change dynamic entries in the MAC table. However, with this functionality enabling you to configure the MAC address limit for bridge domains to learn only static MAC addresses, the dynamic MAC addresses are blocked. In addition, a static entry always overrules dynamic entries. This functionality thus prevents the interception of your data by unauthorized users and improves your network security. |
| Enhanced EVPN-VPWS Multihop | The EVPN-VPWS multihop scale value of 1000 per router, is now enhanced to 2000 for EVPN Port-Active mode. With this Port-Active mode enhancement, only the PE which is in the active mode sends and receives additional traffic. |
| **Segment Routing** | |
| EVPN VPWS and EVPN ELAN ODN over SRv6-TE policy | This feature enables support for On-Demand Next-Hop over SRv6-TE policy. |
| | When SRv6-TE is configured, the ODN policy uses SRv6-TE tunnels, thus improving traffic performance. |

| Feature | Description |
|---|---|
| Configure SR-TE Head-end Explicit Path with TI-LFA | An SRv6 segment using an IPv6 prefix enables validation of all SIDs in the segment list. Segments in the topology database are validated, providing for improved traffic flow. |
| Circuit-Style SR-TE Policies | This solution allows Segment Routing to meet the requirements of a connection-oriented transport network, which was historically delivered over circuit-switched SONET/SDH networks.<br><br>Circuit-style SR-TE policies allow a common network infrastructure to be used for both connection-oriented services and classic IP-based transport. This eliminates the need for multiple parallel networks, which greatly reduces both capital expenditures (CapEx) and operating expenditures (OpEx). |
| SR ISIS Enhancements: max-metric and data plane updates | The new **anomaly** optional keyword is introduced to **affinity flex-algo** command. This keyword helps to advertise the flex-algo affinity when the performance measurement signals a link anomaly, such as an excessive delay on a link. You could use the anomaly option to exclude the link from flex-algo path computations.<br><br>**affinity flex-algo** |
| IS-IS Unreachable Prefix Announcement | The Unreachable Prefix Announcement (UPA) notifies the loss of prefix reachability between areas or domains, for prefixes that are covered by the summary address range during inter-area or inter-domain summarization.<br><br>This feature helps in identifying the routers that are facing prefix unreachability issues faster and fix it.<br><br>The new commands introduced for this feature are:<br><br>• summary-prefix<br><br>• prefix-unreachable |
| Full-Replace Migration to SRv6 Micro-SID | This feature enables migration of existing SRv6 SID format1 to SRv6 Micro-SIDs (f3216) formats.<br><br>Earlier, only one format was supported at a time, and you had to choose either format1 or Micro-SID format for the deployment of services. Migration from Full-length SIDs to SRv6 Micro-SIDs was not possible.<br><br>The **hw-module profile segment-routing srv6 mode base-and-micro-segment-f3216** subcommand is introduced under **hw-module profile segment-routing srv6 mode**. |
| **Network Synchronization** | |

| Feature | Description |
|---|---|
| Enhanced SyncE and extended ESMC | ITU-T G.8262.1 recommendation defines the requirements for timing devices used in synchronizing network equipment. For example, bandwidth, frequency accuracy, holdover, and noise generation. With eESMC and eSyncE support, the NCS 560 routers are capable of handling the following SyncE clocks on the network:<br><br>• Enhanced ethernet equipment clock (eEEC)<br><br>• Enhanced primary reference clock (ePRC)<br><br>• Enhanced primary reference timing clock (ePRTC) |
| **Routing** | |
| Configure flex-algo IS-IS maximum-path | This feature introduces the new **algorithm 0** command and provides information on the updated **flex-algo** command.<br><br>These updates enable individual granularity for flex-algo and regular SPF algorithms. |
| **System Management** | |
| Smart Licensing Per Port for Segment Routing-Traffic Engineering | Cisco Smart Licensing is a cloud-based, flexible software licensing model that enables you to activate and manage Cisco software licenses across your organization. Under the flexible, automated software licensing model, we have Advantage licenses which are required on top of Essential Licenses for ports that use advanced features like L3VPN.<br><br>This release allows you to allocate the Advantage licenses to the Segment Routing Traffic Engineering (SR-TE) based on the active ports under MPLS or SRV6. Before this release, when you configured SR-TE, all the ports used to consume Advantage licenses. This allows you to manage advantage licenses for SR-TE. |

# 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.<br><br>This release introduces the following new optics:<br>• Cisco Quad Small Form-Factor Pluggable (QSFP) modules<br>   • QSFP-100G-FR-S<br>   • QSFP-100G-LR-S<br>   • QSFP-100G-DR-S |
| Support of QSFP-DD 100G ZF1 optics on the N560-IMA-2C-DD interface module | The QSFP-DD 100G ZF1 optics are now supported on 2-port 100-Gigabit Ethernet interface module (N560-IMA-2C-DD) used in the Cisco NCS 560-4 and Cisco NCS560-7 routers.<br><br>The ZF1 optics module supports high-capacity data transport with improved frequency range. |

# Restrictions and Limitations

- The standby RP may get into '`NOT READY`' state intermittently due to some network churn, though the corresponding VM is up and running. But this is a transient state and shows that some data aren't in sync between active and standby due to the network churn. After both active and standby are in sync with respect to all the parameters, then the standby RP comes into '`READY`' state.

# Caveats

There are no caveats for this release.

# Release Package

This following 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 7.8.1 Packages for Cisco NCS 560 Series Router*

| Composite Package | | |
|---|---|---|
| **Feature Set** | **Filename** | **Description** |
| Cisco IOS XR IP Unicast Routing Core Bundle | ncs560-mini-x-7.8.1.iso | Contains base image contents that includes: <ul><li>Host operating system</li><li>System Admin boot image</li><li>IOS XR boot image</li><li>BGP packages</li><li>OS</li><li>Admin</li><li>Base</li><li>Forwarding</li><li>Modular Services Card</li><li>Routing</li><li>SNMP Agent</li><li>Alarm Correlation</li></ul> |
| Cisco IOS XR Manageability Package | ncs560-mgbl-1.0.0.0-r781.x86_64.rpm | Telemetry, Extensible Markup Language (XML), Parser, and HTTP server packages, NETCONF, YANG Models, gRPC. |
| Cisco IOS XR OSPF package | ncs560-ospf-1.0.0.0-r781.x86_64.rpm | Supports OSPF |
| Cisco IOS XR Security Package | ncs560-k9sec-1.0.0.0-r781.x86_64.rpm | k9sec is needed for IPsec or MACsec and Dot1x and for basic crypto services such as Decryption, Secure Shell (SSH), Secure Socket Layer (SSL), and Public-key infrastructure (PKI). |
| Multicast Package | ncs560-mcast-1.0.0.0-r781.x86_64.rpm | Supports Multicast<br><br>Supports Automatic Multicast Tunneling (AMT), IGMP Multicast Listener Discovery (MLD), Multicast Label Distribution Protocol (MLDP), Multicast Source Discovery Protocol (MSDP) and PIM. |

| Composite Package | | |
|---|---|---|
| **Feature Set** | **Filename** | **Description** |
| Cisco IOS XR ISIS package | ncs560-isis-1.0.0.0-r781.x86_64.rpm | Supports Intermediate System to Intermediate System (IS-IS). |
| Cisco IOS XR USB Boot Package | ncs560-usb_boot-7.8.1.zip | Supports Cisco IOS XR USB Boot Package |
| Cisco IOS XR MPLS Package | ncs560-mpls-1.0.0.0-r781.x86_64.rpm <br><br> ncs560-mpls-te-rsvp-1.0.0.0-r781.x86_64.rpm | Supports MPLS and MPLS Traffic Engineering (MPLS-TE) RPM. Label Distribution Protocol (LDP), MPLS Forwarding, MPLS Operations, Administration, and Maintenance (OAM), Link Manager Protocol (LMP), Optical User Network Interface (OUNI) and Layer-3 VPN. <br><br> Cisco IOS XR MPLS-TE and RSVP Package <br><br> MPLS Traffic Engineering (MPLS-TE) and Resource Reservation Protocol (RSVP). |
| Cisco IOS XR LI Package | ncs560-li-1.0.0.0-r781.x86_64.rpm | Lawful Intercept |
| Cisco IOS XR EIGRP Package | ncs560-eigrp-1.0.0.0-r781.x86_64.rpm | (Optional) Includes EIGRP protocol support software |

# Determine Software Version

Log in to the router and enter the **show version** command.

```
RP/0/RP0/CPU0:NCS560#show version
Cisco IOS XR Software, Version 7.8.1
Copyright (c) 2013-2022 by Cisco Systems, Inc.

Build Information:
 Built By     : ingunawa
 Built On     : Wed Nov 30 07:39:35 PST 2022
 Built Host   : iox-ucs-071
 Workspace    : /auto/srcarchive13/prod/7.8.1/ncs560/ws
 Version      : 7.8.1
 Location     : /opt/cisco/XR/packages/
 Label        : 7.8.1

cisco NCS-560 () processor
System uptime is 30 minutes
```

# Determine Firmware Support

Log in to the router and enter the **show fpd package** command to know the release image.

```
RP/0/RP0/CPU0:R3_PE3_RSP4#show fpd package
============================== ==================================================
                                       Field Programmable Device Package
                               ==================================================
                                  Req    SW      Min Req  Min Req
Card Type          FPD Description         Reload Ver     SW Ver   Board Ver
================== ======================= ====== ======= ======== =========
------------------------------------------------------------------------------
A900-IMA-8Z-L-CC   IMFPGA                  YES    1.50     1.50     0.0
------------------------------------------------------------------------------
A900-IMA8CS1Z-CC   IMFPGA                  YES    1.113    1.113    0.0
------------------------------------------------------------------------------
A900-IMA8CS1Z-M    IMFPGA                  YES    1.113    1.113    0.0
------------------------------------------------------------------------------
A900-IMA8Z         IMFPGA                  YES    17.05    17.05    0.0
------------------------------------------------------------------------------
A900-IMA8Z-CC      IMFPGA                  YES    17.05    17.05    0.0
------------------------------------------------------------------------------
A900-IMA8Z-L       IMFPGA                  YES    1.50     1.50     0.0
------------------------------------------------------------------------------
A900-PWR1200-A     DCA-PriMCU(A)           NO     0.11     0.11     0.0
                   DCA-SecMCU(A)           NO     1.04     1.04     0.0
------------------------------------------------------------------------------
A900-PWR1200-D     LIT-PriMCU(A)           NO     2.04     0.04     0.0
                   LIT-SecMCU(A)           NO     1.23     1.23     0.0
------------------------------------------------------------------------------
A907-FAN-E         PSOC(A)                 NO     1.65     1.65     0.0
                   PSOC(A)                 NO     1.66     1.66     0.4
------------------------------------------------------------------------------
N560-4-FAN-H       PSOC(A)                 NO     177.02   177.02   0.0
------------------------------------------------------------------------------
N560-4-FAN-H-CC    PSOC(A)                 NO     177.02   177.02   0.0
------------------------------------------------------------------------------
N560-4-FAN-H-R     PSOC(A)                 NO     177.02   177.02   0.0
------------------------------------------------------------------------------
N560-4-PWR-FAN     PSOC(A)                 NO     177.08   177.08   0.0
------------------------------------------------------------------------------
N560-4-PWR-FAN-CC  PSOC(A)                 NO     177.08   177.08   0.0
------------------------------------------------------------------------------
N560-4-PWR-FAN-R   PSOC(A)                 NO     177.08   177.08   0.0
------------------------------------------------------------------------------
N560-4-RSP4        ADM(A)                  NO     1.06     1.06     0.0
                   IOFPGA(A)               YES    0.67     0.67     0.0
                   PRIMARY-BIOS(A)         YES    0.21     0.21     0.0
                   SATA(A)                 NO     2.10     2.10     0.0
                   SATA_MAR(A)             NO     1.30     1.30     0.0
------------------------------------------------------------------------------
N560-4-RSP4-CC     ADM(A)                  NO     1.06     1.06     0.0
                   IOFPGA(A)               YES    0.67     0.67     0.0
                   PRIMARY-BIOS(A)         YES    0.21     0.21     0.0
                   SATA(A)                 NO     2.10     2.10     0.0
                   SATA_MAR(A)             NO     1.30     1.30     0.0
------------------------------------------------------------------------------
N560-4-RSP4E       ADM(A)                  NO     1.06     1.06     0.0
                   IOFPGA(A)               YES    0.67     0.67     0.0
                   PRIMARY-BIOS(A)         YES    0.21     0.21     0.0
                   SATA(A)                 NO     2.10     2.10     0.0
                   SATA_MAR(A)             NO     1.30     1.30     0.0
```

```
--------------------------------------------------------------------------------
N560-4-RSP4E-CC      ADM(A)                   NO   1.06      1.06      0.0
                     IOFPGA(A)                YES  0.67      0.67      0.0
                     PRIMARY-BIOS(A)          YES  0.21      0.21      0.0
                     SATA(A)                  NO   2.10      2.10      0.0
                     SATA_MAR(A)              NO   1.30      1.30      0.0
--------------------------------------------------------------------------------
N560-FAN-H           PSOC(A)                  NO   2.02      2.02      0.0
--------------------------------------------------------------------------------
N560-IMA-8Q/4L       IMFPGA                   YES  1.27      1.27      0.0
--------------------------------------------------------------------------------
N560-IMA1W           CFP2-D-DCO               NO   38.27397  38.27397  0.0
                     CFP2-DE-DCO              NO   38.27397  38.27397  0.0
                     CFP2-DET-DCO             NO   38.27397  38.27397  0.0
                     CFP2-DETS-DCO            NO   38.27397  38.27397  0.0
                     CFP2-DS-DCO              NO   38.27397  38.27397  0.0
                     CFP2-DS100-DCO           NO   38.27397  38.27397  0.0
                     IMFPGA                   YES  1.28      1.28      0.0
--------------------------------------------------------------------------------
N560-IMA2C           IMFPGA                   YES  6.06      6.06      0.0
--------------------------------------------------------------------------------
N560-IMA2C-CC        IMFPGA                   YES  6.06      6.06      0.0
--------------------------------------------------------------------------------
N560-IMA2C-DD        IMFPGA                   YES  1.28      1.28      0.0
                     QDD_100_FW_P0            NO   61.23     61.23     0.0
                     QDD_100_FW_P1            NO   61.23     61.23     0.0
--------------------------------------------------------------------------------
N560-IMA2C-L         IMFPGA                   YES  1.28      1.28      0.0
--------------------------------------------------------------------------------
N560-PWR1200-D-E     QCS-PriMCU(A)            NO   1.82      1.82      0.0
                     QCS-SecMCU(A)            NO   1.84      1.84      0.0
--------------------------------------------------------------------------------
N560-RSP4            ADM(A)                   NO   1.06      1.06      0.0
                     IOFPGA(A)                YES  0.78      0.78      0.0
                     PRIMARY-BIOS(A)          YES  0.21      0.21      0.0
                     SATA(A)                  NO   2.10      2.10      0.0
                     SATA_MAR(A)              NO   1.30      1.30      0.0
--------------------------------------------------------------------------------
N560-RSP4-E          ADM(A)                   NO   1.06      1.06      0.0
                     IOFPGA(A)                YES  0.78      0.78      0.0
                     PRIMARY-BIOS(A)          YES  0.21      0.21      0.0
                     SATA(A)                  NO   2.10      2.10      0.0
                     SATA_MAR(A)              NO   1.30      1.30      0.0
--------------------------------------------------------------------------------
NCS4200-1T16G-PS     IMFPGA                   YES  1.113     1.113     0.0
--------------------------------------------------------------------------------
NCS4200-2H-PQ        IMFPGA                   YES  6.06      6.06      0.0
--------------------------------------------------------------------------------
NCS4200-8T-PS        IMFPGA                   YES  17.05     17.05     0.0
```

Log in to the router and enter the **show hw-module fpd** command to know the current version.

```
RP/0/RP0/CPU0:NCS560#show hw-module fpd

Auto-upgrade:Enabled

                                                               FPD Versions
                                                               ===============
Location   Card type          HWver FPD device   ATR Status    Running   Programd
--------------------------------------------------------------------------------
0/2        A900-IMA8CS1Z-M    0.0   IMFPGA            CURRENT   1.113     1.113
0/3        A900-IMA8CS1Z-M    0.0   IMFPGA            CURRENT   1.113     1.113
0/4        A900-IMA8Z         0.0   IMFPGA            CURRENT   17.05     17.05
0/5        A900-IMA8Z         0.0   IMFPGA            CURRENT   17.05     17.05
0/RP0      N560-4-RSP4        0.0   ADM               CURRENT   1.06      1.06
```

```
0/RP0     N560-4-RSP4       0.0    IOFPGA          CURRENT    0.67      0.55
0/RP0     N560-4-RSP4       0.0    PRIMARY-BIOS    CURRENT    0.21      0.21
0/RP0     N560-4-RSP4       0.0    SATA_MAR        CURRENT    1.30      1.30
0/RP1     N560-4-RSP4       0.0    ADM             CURRENT    1.06      1.06
0/RP1     N560-4-RSP4       0.0    IOFPGA          CURRENT    0.67      0.55
0/RP1     N560-4-RSP4       0.0    PRIMARY-BIOS    CURRENT    0.21      0.21
0/RP1     N560-4-RSP4       0.0    SATA_MAR        CURRENT    1.30      1.30
0/FT0     N560-4-PWR-FAN-R  1.0    PSOC            CURRENT  177.08    177.08
0/FT1     N560-4-FAN-H-R    1.0    PSOC            CURRENT  177.02    177.02
0/FT2     N560-4-FAN-H-R    1.0    PSOC            CURRENT  177.02    177.02
```

# Important Notes

## Supported Transceiver Modules

For more information on the supported transceiver modules, see Transceiver Module Group (TMG) Compatibility Matrix. In the **Begin your Search** search box, enter the keyword NCS560 and click **Enter**.

## 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).

The upgrade document for Cisco NCS 560 router is available along with the software image in NCS560_Upgrade_MOP_7.8.1.tar file.

## 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.

## Related Documentation

The most current Cisco NCS 560 router documentation is located at the following URL:

https://www.cisco.com/c/en/us/td/docs/iosxr/ncs-560-series-routers.html