# Release Notes for Cisco NCS 560 Series Routers, Cisco IOS XR Release 24.3.1

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## Network Convergence System 560 Series Routers

## What's New in Cisco IOS XR Release 24.3.1

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

## 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 |
|---------|-------------|
| **Routing** | |
| Shorter minimum interval support for BFD over logical bundle | This feature reduces the minimum interval timer from 300 ms to 100 ms, enabling faster failure detection and quicker identification of system issues. |

| Feature | Description |
|---|---|
| LSP Fast-Flooding on IS-IS Networks | You can now accelerate the rate at which Link State Packets (LSPs) are distributed across an IS-IS network. Faster LSP distribution means faster network convergence. This faster convergence ensures that the most accurate topology information is quickly available across all routers on the network, reducing the chances of routing loops or misrouting.<br><br>The feature introduces these changes:<br><br>**CLI:**<br>    • **lsp-fast-flooding**<br>    • **max-lsp-tx**<br>    • **psnp-interval**<br>    • **remote-psnp-delay**<br><br>**YANG Data Model:**<br>    • `Cisco-IOS-XR-um-router-isis-cfg`<br><br>(see GitHub, YANG Data Models Navigator) |
| **Segment Routing** | |
| Delay Measurement Using Software Timestamp | You can now identify performance issues caused by the network, disk I/O, processing, or other factors using software timestamping on your router by measuring the delay and loss of each network path, even if the existing hardware lacks timestamp support.<br><br>The feature introduces these changes:<br><br>**CLI:**<br>    • The **timestamp-format NTP** keyword is introduced in the **performance-measurement delay-profile** command. |
| **Network Synchronization** | |

| Feature | Description |
|---|---|
| Performance Monitoring | You can now get statistical information with Performance Monitoring in PTP networks, such as clock accuracy, synchronization status, and network delays by defining Performance Monitoring Parameters and Port Specific Parameters. |
| | This feature empowers operators with comprehensive performance monitoring and precise time-stamp analysis, offering enhanced granularity for time synchronization in telecommunication networks. By providing detailed insights, it enables operators to make well-informed decisions and take proactive actions to ensure optimal network performance. |
| | The feature introduces these changes: |
| | **CLI:** |
| | • **performance-monitoring** |
| | • **show ptp platform performance-counters** |
| | • **show ptp dataset performance** |
| | **YANG Data Models:** |
| | • `Cisco-IOS-XR-ptp-cfg.yang` |
| | • `Cisco-IOS-XR-ptp-oper.yang` |
| | • `Cisco-IOS-XR-um-ptp-cfg.yang` |
| | (see GitHub, YANG Data Models Navigator) |
| **L2VPN and Ethernet Services** | |
| Layer 3 Support for ITU-T Y.1564 Service Activation Test | The ITU-T Y.1564 Ethernet Service Activation Test (SAT) is now supported on Layer 3 interfaces, enhancing the capability to conduct thorough testing and performance verification for IP-based network services. This capability ensures that the performance of Ethernet services can be validated with greater accuracy and reliability, guaranteeing that network services meet the required quality standards before deployment. |
| **System Security** | |
| MAC Authentication Bypass | Based on the MAC address of the end device or the client connected to the router port, this feature enables port control functionality for your router. This functionality provides controlled access to network services for end devices that do not support other authentication methods such as IEEE 802.1X port-based authentication. |
| | The feature introduces these changes: |
| | **CLI:** |
| | • New **mab** option for the **dot1x profile** command |
| | • New **mab-retry-time** option for the **authenticator** command |
| | • **clear mab** |
| | • **show mab** |

| Feature | Description |
|---------|-------------|
| **System Management** | |
| Concurrent Configuration Rebase during Commit | The router performs the commit and rebase operations simultaneously, ensuring that the commit operation remains unblocked during the rebase operation. This removes the need to use the **cfs check** command to increase the commit count and the commit file diff size. |

# 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 presented visually in a tree structure.

To get started with using data models, see the *Programmability Configuration Guide for Cisco NCS 560 Series Routers*.

# Hardware Introduced

**Note** Before you install the Cisco router, you must prepare your site for the installation, for more details on site planning and environmental requirements, see Hardware Installation Guide.

| Hardware | Description |
|---|---|
| Optics | This release launches the following new optics on selective hardware within the product portfolio. For details and other new supported transceivers, refer to the [Transceiver Module Group (TMG) Compatibility Matrix](#).<br><br>• Cisco 100BASE-X Small Form-Factor Pluggable Modules<br>    • GLC-FE-100EX<br>    • GLC-FE-100FX<br><br>• Cisco 10GBASE Dense Wavelength-Division Multiplexing SFP+ Modules<br>    • DWDM-SFP10G-C-I (V1)<br><br>• Cisco 100GBASE QSFP-100G Modules<br>    • QSFP-100G-SL4 |

# Behavior Changes

- From this release, the default order of authentication methods for SSH clients on Cisco IOS XR routers running Cisco IOS XR SSH is changed to: **public-key**, **keyboard-interactive**, and **password**.

  Prior to this release, the default order was: **public-key**, **password**, and **keyboard-interactive**.

- Prior to Cisco IOS XR Release 7.2.1, a segment of an explicit segment list can be configured as an IPv4 address (representing a Node or a Link) using the **index** *index***address ipv4** *address* command.

  Starting with Cisco IOS XR Release 7.2.1, an IPv4-based segment (representing a Node or a Link) can also be configured with the new **index** *index* **mpls adjacency***address* command. The configuration is stored in NVRAM in the same CLI format used to create it. There is no conversion from the old CLI to the new CLI.

  Starting with Cisco IOS XR Release 7.9.1, the old CLI has been deprecated. Old configurations stored in NVRAM will be rejected at boot-up.

  As a result, explicit segment lists with IPv4-based segments using the old CLI must be re-configured using the new CLI.

  There are no CLI changes for segments configured as MPLS labels using the **index** *index* **mpls label** *label* command.

- If you are on a release before Cisco IOS XR Release 7.4.1, you can configure SR-ODN with Flexible Algorithm constraints using the **segment-routing traffic-eng on-demand color** *color* **dynamic sid-algorithm** *algorithm-number* command.

  Starting with Cisco IOS XR Release 7.4.1, you can also configure SR-ODN with Flexible Algorithm constraints using the new **segment-routing traffic-eng on-demand color** *color* **constraints segments sid-algorithm** *algorithm-number* command.

From Cisco IOS XR Release 7.9.1, the **segment-routing traffic-eng on-demand color** *color* **dynamic sid-algorithm** *algorithm-number* command is deprecated. Previous configurations stored in NVRAM will be rejected at boot-up. (Performing In-Service Software Upgrade (ISSU) to Cisco IOS XR Release 7.9.1 will also be rejected.)

Hence, for Cisco IOS XR Release 7.9.1, you must reconfigure all SR-ODN configurations with Flexible Algorithm constraints that use the on-demand dynamic sid-algorithm with the on-demand constraints command.

# Restrictions and Limitations

- The statistics collection may time out due to CPU overload during route churn. In such scenarios, statistics collection will resume when the CPU becomes available after the route churn is complete.

- 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

*Table 1: Cisco IOS XR NCS 560 Routers Specific Bugs*

| Bug ID | Headline |
|---|---|
| CSCwk73534 | OC terminal-device target-output-power units/definition interpretation is wrong |
| CSCwk88520 | Observed fia_driver crash in NCS560 node after Active RP reload |

# 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 2: Release 24.3.1 Packages for Cisco NCS 560 Series Router*

| Composite Package | | |
|---|---|---|
| **Feature Set** | **Filename** | **Description** |
| Cisco IOS XR IP Unicast Routing Core Bundle | ncs560-mini-x-24.3.1.iso | Contains base image contents that includes:<br><br>• Host operating system<br><br>• System Admin boot image<br><br>• IOS XR boot image<br><br>• BGP packages<br><br>• OS<br><br>• Admin<br><br>• Base<br><br>• Forwarding<br><br>• Modular Services Card<br><br>• Routing<br><br>• SNMP Agent<br><br>• Alarm Correlation |
| Cisco IOS XR Manageability Package | ncs560-mgbl-1.0.0.0-r2431.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-r2431.x86_64.rpm | Supports OSPF |
| Cisco IOS XR Security Package | ncs560-k9sec-1.0.0.0-r2431.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-r2431.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-r2431.x86_64.rpm | Supports Intermediate System to Intermediate System (IS-IS). |
| Cisco IOS XR USB Boot Package | ncs560-usb_boot-24.3.1.zip | Supports Cisco IOS XR USB Boot Package |
| Cisco IOS XR MPLS Package | ncs560-mpls-1.0.0.0-r2431.x86_64.rpm<br><br>ncs560-mpls-te-rsvp-1.0.0.0-r2431.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-r2431.x86_64.rpm | Lawful Intercept |
| Cisco IOS XR EIGRP Package | ncs560-eigrp-1.0.0.0-r2431.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:Router#show version
Cisco IOS XR Software, Version 24.3.1
Copyright (c) 2013-2024 by Cisco Systems, Inc.

Build Information:
 Built By     : swtools
 Built On     : Sun Sep  1 00:48:40 PDT 2024
 Built Host   : iox-ucs-078
 Workspace    : /auto/srcarchive11/prod/24.3.1/ncs560/ws
 Version      : 24.3.1
 Location     : /opt/cisco/XR/packages/
 Label        : 24.3.1-iso

cisco NCS-560 () processor
System uptime is 33 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:Router#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     1.115   1.115     0.0
------------------------------------------------------------------------------------
A900-IMA8CS1Z-M     IMFPGA                     YES     1.115   1.115     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      1.27    1.27      0.0
                    LIT-SecMCU(A)              NO      1.27    1.27      0.0
------------------------------------------------------------------------------------
A900-PWR900-D2      LIT-PriMCU(A)              NO      1.82    1.82      0.0
                    LIT-SecMCU(A)              NO      1.84    1.84      0.0
------------------------------------------------------------------------------------
A907-FAN-E          PSOC(A)                    NO      1.65    1.65      0.0
                    PSOC(A)                    NO      1.66    1.66      0.4
------------------------------------------------------------------------------------
A907-FAN-H          PSOC(A)                    NO      1.65    1.65      0.0
------------------------------------------------------------------------------------
ASR914-F2B-FAN      PSOC(A)                    NO      44.08   44.08     0.0
------------------------------------------------------------------------------------
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     0.69    0.69      0.0
                    PRIMARY-BIOS(A)            YES     0.24    0.24      0.0
                    SATA(A)                    NO      2.20    2.20      0.0
                    SATA_MAR(A)                NO      1.30    1.30      0.0
                    SATA_MAR_B4(A)             NO      1.10    1.10      0.0
                    SATA_SMI(A)                NO      1.10    1.10      0.0
------------------------------------------------------------------------------------
N560-4-RSP4-CC      ADM(A)                     NO      1.06    1.06      0.0
                    IOFPGA(A)                  YES     0.69    0.69      0.0
```

```
                        PRIMARY-BIOS(A)          YES     0.24      0.24       0.0
                        SATA(A)                  NO      2.20      2.20       0.0
                        SATA_MAR(A)              NO      1.30      1.30       0.0
                        SATA_MAR_B4(A)           NO      1.10      1.10       0.0
                        SATA_SMI(A)              NO      1.10      1.10       0.0
        --------------------------------------------------------------------------------
        N560-4-RSP4E    ADM(A)                   NO      1.06      1.06       0.0
                        IOFPGA(A)                YES     0.69      0.69       0.0
                        PRIMARY-BIOS(A)          YES     0.24      0.24       0.0
                        SATA(A)                  NO      2.20      2.20       0.0
                        SATA_MAR(A)              NO      1.30      1.30       0.0
                        SATA_MAR_B4(A)           NO      1.10      1.10       0.0
                        SATA_SMI(A)              NO      1.10      1.10       0.0
        --------------------------------------------------------------------------------
        N560-4-RSP4E-CC ADM(A)                   NO      1.06      1.06       0.0
                        IOFPGA(A)                YES     0.69      0.69       0.0
                        PRIMARY-BIOS(A)          YES     0.24      0.24       0.0
                        SATA(A)                  NO      2.20      2.20       0.0
                        SATA_MAR(A)              NO      1.30      1.30       0.0
                        SATA_MAR_B4(A)           NO      1.10      1.10       0.0
                        SATA_SMI(A)              NO      1.10      1.10       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_BRT_FW_P0        NO      70.130    70.130     0.0
                        QDD_100_BRT_FW_P1        NO      70.130    70.130     0.0
                        QDD_100_FW_P0            NO      61.23     61.23      0.0
                        QDD_100_FW_P1            NO      61.23     61.23      0.0
                        QDD_400_ZRP_FW_P0        NO      161.24    161.24     0.0
                        QDD_400_ZRP_FW_P1        NO      161.24    161.24     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     0.80      0.80       0.0
                        PRIMARY-BIOS(A)          YES     0.24      0.24       0.0
                        SATA(A)                  NO      2.20      2.20       0.0
                        SATA_MAR(A)              NO      1.30      1.30       0.0
                        SATA_MAR_B4(A)           NO      1.10      1.10       0.0
                        SATA_SMI(A)              NO      1.10      1.10       0.0
        --------------------------------------------------------------------------------
        N560-RSP4-E     ADM(A)                   NO      1.06      1.06       0.0
                        IOFPGA(A)                YES     0.80      0.80       0.0
                        PRIMARY-BIOS(A)          YES     0.24      0.24       0.0
                        SATA(A)                  NO      2.20      2.20       0.0
                        SATA_MAR(A)              NO      1.30      1.30       0.0
```

```
                        SATA_MAR_B4(A)                  NO      1.10      1.10      0.0
                        SATA_SMI(A)                     NO      1.10      1.10      0.0
        -----------------------------------------------------------------------------
        NCS4200-1T16G-PS    IMFPGA                      YES     1.115     1.115     0.0
        -----------------------------------------------------------------------------
        NCS4200-2H-PQ       IMFPGA                      YES     6.06      6.06      0.0
        -----------------------------------------------------------------------------
        NCS4200-8T-PS       IMFPGA                      YES     17.05     17.05     0.0
        -----------------------------------------------------------------------------
        NCS4216-F2B-FAN     PSOC(A)                     NO      44.08     44.08     0.0
        -----------------------------------------------------------------------------
        NCS4216-RSP-800     ADM(A)                      NO      1.06      1.06      0.0
                            IOFPGA(A)                   YES     0.02      0.02      0.0
                            PRIMARY-BIOS(A)             YES     0.24      0.24      0.0
                            SATA(A)                     NO      2.20      2.20      0.0
                            SATA_MAR(A)                 NO      1.30      1.30      0.0
                            SATA_MAR_B4(A)              NO      1.10      1.10      0.0
                            SATA_SMI(A)                 NO      1.10      1.10      0.0
```

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

```
RP/0/RP0/CPU0:Router#show hw-module fpd
Auto-upgrade:Enabled

                                                                     FPD Versions
                                                                     ==============
Location    Card type           HWver  FPD device     ATR Status     Running   Programd
-----------------------------------------------------------------------------------------
0/1         A900-IMA8CS1Z-M     0.0    IMFPGA             CURRENT     1.115     1.115

0/4         A900-IMA8Z          0.0    IMFPGA             CURRENT     17.05     17.05

0/5         A900-IMA8Z          0.0    IMFPGA             CURRENT     17.05     17.05

0/7         N560-IMA1W          0.0    IMFPGA             CURRENT     1.28      1.28

0/9         N560-IMA2C          0.0    IMFPGA             CURRENT     6.06      6.06

0/10        A900-IMA8Z          0.0    IMFPGA             CURRENT     17.05     17.05

0/13        A900-IMA8Z          0.0    IMFPGA             CURRENT     17.05     17.05

0/15        A900-IMA8CS1Z-M     0.0    IMFPGA             CURRENT     1.115     1.115

0/RP0       N560-RSP4-E         0.0    ADM                CURRENT     1.06      1.06

0/RP0       N560-RSP4-E         0.0    IOFPGA             CURRENT     0.80      0.80

0/RP0       N560-RSP4-E         0.0    PRIMARY-BIOS       CURRENT     0.24      0.24

0/RP0       N560-RSP4-E         0.0    SATA               CURRENT     2.20      2.20

0/RP1       N560-RSP4-E         0.0    ADM                CURRENT     1.06      1.06

0/RP1       N560-RSP4-E         0.0    IOFPGA             CURRENT     0.80      0.80

0/RP1       N560-RSP4-E         0.0    PRIMARY-BIOS       CURRENT     0.24      0.24

0/RP1       N560-RSP4-E         0.0    SATA               CURRENT     2.20      2.20

0/FT0       N560-FAN-H          1.0    PSOC               CURRENT     2.02      2.02
```

# Important Notes

## 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

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

For software installation and upgrades, refer to the respective upgrade/downgrade docs *.tar* files based on your 560 router varaint.

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_24.3.1.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.

## 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 560 router documentation is located at the following URL:

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