



# Release Notes for Cisco NCS 540 Series Routers, Cisco IOS XR Release 24.2.11

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## Network Convergence System 540 Series Routers

### What's New in Cisco IOS XR Release 24.2.11

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](#).

The following features are supported on the Cisco NCS 540 Series router variants running on Cisco IOS XR7.

- N540X-16Z4G8Q2C-A/D
- N540-12Z20G-SYS-A/D
- N540X-12Z16G-SYS-A/D
- N540X-6Z18G-SYS-A/D
- N540X-8Z16G-SYS- A/D
- N540X-4Z14G2Q -A/D
- N540-24Q8L2DD-SYS
- N540-6Z14S-SYS-D
- N540X-16Z8Q2C-D
- N540-28Z4C-SYS-A/D
- N540-FH-CSR-SYS
- N540-FH-AGG-SYS

| Feature | Description |
|---------|-------------|
| Routing |             |

| Feature   | Description   |
|---|---|
| <a href="#">Support for NCS 540 routers as Seamless BFD reflector</a>                     | <p>This feature introduces support for NCS 540 routers as a Seamless BFD (SBFD) reflector.</p> <p>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.</p> <p>Previously, support for Seamless BFD reflector was not available.</p> <p>The feature introduces these changes:</p> <p><b>CLI:</b></p> <p>The <b>sbfd</b> command is extended to support NCS 540 routers.</p>  |
| <b>Segment Routing</b>  |   |
| <a href="#">Data Plane Validation for SR-MPLS IPv6-based Controller Instantiated LSPs</a> | <p>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.</p> <p>Previously, SR data plane validation was possible over IPv4-based LSPs.</p> <p>The feature introduces these changes:</p> <p><b>CLI:</b></p> <p>The <b>dataplane-only</b> keyword is introduced in the <b>traceroute sr-mpls</b> and <b>ping sr-mpls</b> commands.</p> <p><b>YANG Data Models:</b></p> <ul style="list-style-type: none"> <li>• <code>Cisco-IOS-XR-mpls-traceroute-act.yang</code></li> <li>• <code>Cisco-IOS-XR-mpls-ping-act.yang</code></li> </ul> <p>See (<a href="#">GitHub</a>, <a href="#">Yang Data Models Navigator</a>)</p> |

| Feature   | Description   |
|---|---|
| <a href="#">Delay Measurement for IP Endpoint over SRv6 Network</a>   | <p>In Segment Routing over an IPv6 network (SRv6), you can measure packet delay from the source to a specific IP endpoint. You can use this information for troubleshooting, network maintenance, and optimizing network performance.</p> <p>Additionally, you can use flow labels to verify the delay of each subsequent hop path towards the IP endpoint of that path. So that, when network traffic is distributed across multiple available paths towards an IP endpoint, delay measurement tracks the delay of each of these paths towards the IP endpoint.</p> <p>The feature introduces these changes:</p> <p><b>CLI:</b></p> <ul style="list-style-type: none"> <li>• The <b>source-address ipv6</b> keyword is introduced in the <b>performance-measurement endpoint</b> command.</li> <li>• The <b>segment-list name</b> keyword is introduced in the <b>segment-routing traffic-eng explicit</b> command.</li> <li>• The <b>flow-label</b> keyword is introduced in the <b>performance-measurement delay-profile name</b> command.</li> </ul> <p><b>YANG Data Model:</b></p> <ul style="list-style-type: none"> <li>• <code>Cisco-IOS-XR-um-performance-measurement-cfg</code></li> <li>• <code>Cisco-IOS-XR-perf-meas-oper.yang</code></li> </ul> <p>(See <a href="#">GitHub</a>, <a href="#">YANG Data Models Navigator</a>)</p> |
| <a href="#">Display Neighbor Router Capabilities in OSPF Networks</a> | <p>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.</p> <p>Previously, there was no straightforward method to display the segment routing and other capabilities of neighboring routers in an OSPF network.</p> <p>The feature introduces these changes:</p> <p><b>CLI:</b></p> <ul style="list-style-type: none"> <li>• The <b>capabilities</b> keyword is introduced in the <b>show ospf neighbor</b> command.</li> </ul> <p><b>YANG Data Models:</b></p> <ul style="list-style-type: none"> <li>• <code>Cisco-IOS-XR-ipv4-ospf-oper.yang</code></li> </ul> <p>See (<a href="#">GitHub</a>, <a href="#">Yang Data Models Navigator</a>)</p>  |

| Feature  | Description  |
|--|--|
| <a href="#">Liveness Monitoring for IP Endpoint over SRv6 Network</a>          | <p>In Segment Routing over an IPv6 network (SRv6), you can keep track of the operational status of both the forward and reverse paths of a particular node or IP endpoint. You can use this information for troubleshooting, network maintenance, and optimizing network performance.</p> <p>Additionally, you can use flow labels to verify the liveness of each subsequent hop path toward the IP endpoint of that path. So that, when network traffic is distributed across multiple available paths towards an IP endpoint, liveness detection tracks the operational status of each of these paths towards the IP endpoint.</p> <p>The feature introduces these changes:</p> <p><b>CLI:</b></p> <ul style="list-style-type: none"> <li>• The <b>reverse-path</b> and <b>segment-list name</b> keywords are introduced in the <b>segment-routing traffic-eng explicit</b> command.</li> <li>• The <b>source-address ipv6</b> is introduced in the <b>performance-measurement endpoint</b> command.</li> </ul> <p><b>YANG Data Model:</b></p> <ul style="list-style-type: none"> <li>• <code>Cisco-IOS-XR-um-performance-measurement-cfg</code></li> <li>• <code>Cisco-IOS-XR-perf-meas-oper.yang</code></li> </ul> <p>(see <a href="#">GitHub</a>, <a href="#">YANG Data Models Navigator</a>)</p> |
| <a href="#">MPLS OAM support for SR-TE Policies using MPLS IPv6-based LSPs</a> | <p>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).</p> <p>Previously, MPLS OAM support was only for IPv4-based LSPs.</p> <p>The feature introduces these changes:</p> <p><b>CLI:</b></p> <p>The <b>traceroute sr-mpls</b> and <b>ping sr-mpls</b> commands are extended to support IPv6 nexthop addresses.</p> <p><b>YANG Data Models:</b></p> <ul style="list-style-type: none"> <li>• <code>Cisco-IOS-XR-mpls-traceroute-act.yang</code></li> <li>• <code>Cisco-IOS-XR-mpls-ping-act.yang</code></li> </ul> <p>See (<a href="#">GitHub</a>, <a href="#">Yang Data Models Navigator</a>)</p>  |

| Feature   | Description   |
|---|---|
| <a href="#">Multi-area Loopback Interface Support for OSPF</a>      | <p>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.</p> <p>Previously, each loopback interface was linked to only one area.</p> <p>The feature introduces these changes:</p> <p><b>CLI:</b></p> <p>The <a href="#">multi-area-interface</a> command is extended to support loopback interfaces.</p>  |
| <a href="#">SRv6 Traffic Class DSCP Marking Enhancement for QoS</a> | <p>This feature enables you to configure the traffic-class DSCP marking to 6-bits using the <a href="#">newpolicy-map-extend</a> keyword in the</p> <p><b>hw-module profile segment-routing srv6 mode microsegment f3216 encapsulation traffic-class</b> CLI in both the L2 and L3 traffic configurations for SRv6. This is a mutually inclusive feature for L2 and L3 traffic. Therefore, this feature cannot be used in the individual configuration for L2 and L3 traffic.</p> <p>When you use the <a href="#">policy-map-extend</a> keyword in the <b>hw-module profile segment-routing srv6 mode microsegment f3216 encapsulation traffic-class</b> CLI, the existing 3-bit DSCP marking set by the <b>hw-module profile segment-routing srv6 mode microsegment f3216 encapsulation traffic-class l3-traffic policy-map</b> CLI in the L3 traffic configuration is modified to 6-bits.</p> <p>This feature introduces this change:</p> <p><b>CLI:</b> The <a href="#">policy-map-extend</a> keyword is introduced in the <a href="#">hw-module profile segment-routing srv6 mode microsegment f3216 encapsulation traffic-class</a> command.</p> |
| <a href="#">SR ECMP-FEC Optimization for IPv6 Prefixes</a>          | <p>You can now minimize ECMP-FEC resource consumption and duplication of resources during underlay programming for an SR-MPLS network for IPv6 prefixes. The feature supports sharing the same ECMP-FEC, regular FEC, and Egress Encapsulation DB (EEDB) entries for all paths with the same outgoing MPLS label among IPv6 prefixes. This improvement is now possible by using the <b>hw-module fib mpls label lsr-optimized</b> command.</p> <p>In earlier releases, ECMP-FEC optimization for IPv6 prefixes was available.</p>   |

| Feature   | Description  |
|---|--|
| <a href="#">User-Defined Generic Metric Support for IS-IS Flex Algo</a> | <p>This feature adds support for user-defined generic metric as a metric type for IS-IS Flexible Algorithm.</p> <p>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.</p> <p>The feature introduces the following changes:</p> <p><b>CLI:</b></p> <ul style="list-style-type: none"> <li>The feature introduces the <a href="#">generic-metric flex-algo</a> and <a href="#">metric-type generic</a> commands.</li> </ul> <p><b>YANG Data Models:</b></p> <ul style="list-style-type: none"> <li><code>Cisco-IOS-XR-um-router-isis-cfg.yang</code></li> </ul> |
| <b>L3VPN</b>  |  |
| <a href="#">MPLS Layer 3 VPNs CLI Enhancements</a>                      | <p>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 <a href="#">show mpls forwarding labels</a> command.</p> <p>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.</p>  |
| <b>Netflow</b>  |  |
| <a href="#">Monitor GTP-U Traffic in 5G Network</a>                     | <p>You can now export GTP-U traffic flow records using NetFlow v9 and IPFIX in 5G network. This enables you to monitor provides you with bidirectional traffic monitoring crucial for analytics and robust DDoS prevention strategies.</p> <p>This feature modifies the output of the <a href="#">show flow monitor</a> command.</p>   |
| <b>Network Synchronization</b>  |  |

| Feature  | Description  |
|--|--|
| <a href="#">Detect Packet Timing Signal Fail -unusable</a>   | <p>This feature allows the exclusion of Foreign Masters (FMs) with unstable timing from Best Master Clock Algorithm (BMCA). It enables the detection of clocks that are unusable due to Packet Timing Signal Fail (PTSF) and keeps them under surveillance for any timing stabilization. Once improvements are observed, these clocks can be reassessed and potentially reinstated as viable sources.</p> <p>The system's reliability is improved by regularly checking all Frequency Managers (FMs) for their Precision Time Protocol (PTP) timing accuracy, including those that are currently not selected. This allows for dynamic selection of time sources, which in turn improves service delivery and strengthens the resilience of the synchronization infrastructure..</p> <p>This feature introduces these changes:</p> <p><b>CLI:</b></p> <ul style="list-style-type: none"> <li>• <b>detect-ptsf-unusable</b></li> <li>• The <b>show ptp foreign-masters</b> command output is enhanced to include phase difference values and servo status.</li> </ul> |
| <a href="#">Delay Request-Response Mechanism for Passive Ports and PTP Phase Difference Alarm Triggering</a> | <p>You can now enable the participation of passive ports in the Delay Request-Response Mechanism (DRRM), thus ensuring that in case the phase difference readings exceed the allowed threshold then syslogs are displayed.</p> <p>This feature enables you to detect potential errors such as fiber asymmetry or a clock failure in the PTP network by measuring the phase difference between passive port and secondary port.</p> <p>This feature introduces these changes:</p> <p><b>CLI:</b></p> <ul style="list-style-type: none"> <li>• <b>phase-difference-threshold-breach</b></li> <li>• The <b>show ptp foreign-masters</b> command output is enhanced to include phase difference values and servo status.</li> </ul> <p><b>YANG Data Models:</b></p> <p>The following data models are enhanced:</p> <ul style="list-style-type: none"> <li>• <code>Cisco-IOS-XR-ptp-cfg.yang</code></li> <li>• <code>Cisco-IOS-XR-um-ptp-cfg.yang</code></li> </ul>   |
| <b>System Management</b>   |  |

| Feature   | Description   |
|---|---|
| <a href="#">Frame Delay Range for ITU-T Y.1564 Test</a>   | <p>You now have the ability to conduct a finer analysis of frame delay by measuring the Frame Delay Range (FDR) within a designated percentile. This metric captures the variation between the minimum frame delay observed and the delay at your chosen percentile. Also, delay times are organized into bins, which you can configure in terms of width and count to suit your analysis needs. By customizing these parameters, you can obtain an in-depth look at the distribution of observed delays, providing a nuanced understanding of network performance.</p> <p>This feature introduces these changes:</p> <p><b>CLI:</b></p> <p>The following keywords are added to the <b>frame delay</b> command:</p> <ul style="list-style-type: none"> <li>• <b>bins</b></li> <li>• <b>width</b></li> <li>• <b>frame- delay-range percentile</b></li> <li>• <b>minimum-delay</b></li> </ul> <p><b>Yang Data Models:</b></p> <p>The following data models are enhanced for this feature:</p> <ul style="list-style-type: none"> <li>• <code>Cisco-IOS-XR-ethernet-sat-oper.yang</code></li> <li>• <code>Cisco-IOS-XR-ethernet-sat-cfg.yang</code></li> </ul> |
| <a href="#">Default Encapsulation Mode of ITU-T Y.1564</a>  | <p>The default encapsulation mode helps to set a baseline to know how the Ethernet service behaves for default operations in Service Activation Test.</p>   |
| <a href="#">User-Specified MTU Support for EMIX Traffic in Service Activation Tests</a>                           | <p>Defining the MTU packet size in Service Activation Tests (SAT) allows for tailored testing that matches the network's maximum frame capacity. This precision testing ensures accurate service performance validation and a reliable network service rollout.</p> <p>This feature introduces the following changes:</p> <p><b>CLI:</b></p> <p><b>packet-size emix Sequence h</b></p>  |
| <b>System Security</b>  |   |
| <a href="#">Support for Layer 2 Untagged Sub-interface configuration in IEEE 802.1X Port-based Authentication</a> | <p>This feature allows you to configure the Layer 2 untagged sub-interfaces in the IEEE 802.1X port-based authentication.</p>   |
| <b>System Monitoring</b>  |   |



| Feature   | Description   |
|---|---|
| <a href="#">Traffic Statistics with Packet Drop Location</a>                          | <p>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.</p> <p>In earlier releases, you used multiple show commands with their respective locations to detect packet drops.</p> <p>This feature introduces the <b>show drops all</b> command.</p>  |
| <b>System Setup</b>   |   |
| <a href="#">Installing Owner and Partner RPMs Using IOS XR Install Infrastructure</a> | <p>In previous releases, the Owner and Partner applications could not be installed via the same install infrastructure as the rest of the IOS XR software. Instead, you had to install these applications via the Application Manager interface.</p> <p>Starting this release, you can use the existing IOS XR install infrastructure to install your proprietary Owner and Partner RPMs. This enhancement streamlines the process for integrating third-party software seamlessly into the IOS XR environment, including bundling the owner and partner RPMs into a GISO.</p> <p>This feature introduces the keyword <b>skip-implicit-owner-packages-checks</b> in the following install commands:</p> <ul style="list-style-type: none"> <li>• install package add</li> <li>• install replace</li> <li>• install replace reimage</li> </ul> |

The following feature is supported only on N540X-6Z18G-SYS-A/D variants.

| Feature   | Feature  |
|---|--|
| <b>Modular QoS</b>  |  |
| <a href="#">Increase in Number of Ingress QoS Policies Supported on Layer 2</a> | <p>Layer 2 Virtual Private Network (L2VPN) now supports increase in number of ingress QoS policies on all the class-map sizes.</p> <p>Now you can attach the additional QoS policies to the interfaces, to manage, prioritize, and control the flow of traffic at ingress.</p> <p>This feature is supported on the following Cisco NCS 540 router variants:</p> <ul style="list-style-type: none"> <li>• N540X-6Z18G-SYS-A</li> <li>• N540X-6Z18G-SYS-D</li> </ul> <p>To enable the increased ingress QoS policies on all the class-map sizes in Layer 2, this feature introduces the following new command:</p> <ul style="list-style-type: none"> <li>• <a href="#">hw-module profile qos policer-scale l2-mode</a></li> </ul> |

The following feature is supported only on N540-24Q8L2DD-SYS router variant.

| Feature  | Description  |
|--|--|
| <b>Interface and Hardware Component</b>                          |  |
| <a href="#">8x25G Breakout Port Support on N540-24Q8L2DD-SYS</a> | <p>An 8x25G breakout interface allows you to split the 400G high-density ports into multiple lower-density ports.</p> <p>You can now configure 8x25G breakout ports using the optics <a href="#">QDD-2X100-SR4-S</a>.</p> <p>Breakout port is supported on the following Cisco NCS 540 router variant:</p> <ul style="list-style-type: none"> <li>• N540-24Q8L2DD-SYS</li> </ul> |

## 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 540 Series Routers*.

| Feature   | Description  |
|---|--|
| <b>Programmability</b>                                      |  |
| <code>openconfig-local-routing.yang</code><br>Version 2.0.1 | <p>The OpenConfig data model, which is part of the <code>openconfig-network-instance.yang</code> 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.</p> <p>This data model supports event-driven and Model-driven telemetry.</p> |

| Feature                               | Description  |
|---------------------------------------|--|
| openconfig-sflow.yang Version 1.0.0   | <p>This OpenConfig data model is enhanced to support:</p> <ul style="list-style-type: none"> <li>stream cadence-driven telemetry data for the total number of flow record packets sent to the collector using <b>packets-sent</b> leaf</li> <li>Stream cadence-driven telemetry data for the total number of packets sampled from the interface using <b>packets-sampled</b> leaf</li> </ul> <p>This data model supports event-driven and Model-driven telemetry.</p>  |
| Cisco-IOS-XR-infra-statsd-oper.yang   | <p>The native yang data model streams cached counters using a TARGET_DEFINED subscription.</p> <p>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.</p> |
| openconfig-if-ip.yang Version 3.5.0   | <p>The OpenConfig data model has been updated from version 3.0.0 to 3.5.0. This data model helps you specify data structures for managing both configuration and operational state on IP interfaces, supporting IPv4 and IPv6. You can stream telemetry for the operational state of these interfaces using both model-driven and event-driven approaches.</p>   |
| Cisco-IOS-XR-ipv4-ospf-oper.yang      | <p>This native data model is enhanced with new leaves <i>sr-capable</i>, <i>ri-capabilities-tlv</i>, <i>te-capable</i>, <i>gr-capable</i>, <i>grh-capable</i>, and <i>host-name</i> in the <i>OSPF-SH-NEIGHBOR-DETAIL</i> and <i>OSPF-SH-NEIGHBOR</i> groupings to display neighbor router capabilities in OSPF networks.</p>  |
| Cisco-IOS-XR-evpn-oper.yang           | <p>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.</p>  |
| Cisco-IOS-XR-mpls-traceroute-act.yang | <p>This unified data model is enhanced with a new container, <i>ipv6</i>, and leaves such as <i>next-hop</i>, <i>lsp-endpoint</i>, and <i>force-ipv6-explicit-null</i> in the <i>type-ipv6-next-hop</i> interface to extend support to Segment Routing OAM to verify network configuration for SR-MPLS IPv6-based LSPs.</p>  |
| Cisco-IOS-XR-um-router-isis-cfg       | <p>This unified data model is enhanced with new containers <i>generic-metric</i>, and <i>generic-metric-level</i> 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.</p>   |

## 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   | <p>This release launches the following new optics on selective hardware within the product portfolio. For details and other new supported transceivers, refer to the <a href="#">Transceiver Module Group (TMG) Compatibility Matrix</a>.</p> <ul style="list-style-type: none"> <li>• Cisco 100GBASE QSFP-100G Modules               <ul style="list-style-type: none"> <li>• <a href="#">QSFP-100G-B20D4-I</a></li> <li>• <a href="#">QSFP-100G-B20U4-I</a></li> </ul> </li> <li>• Cisco 10GBASE Dense Wavelength-Division Multiplexing SFP+ Modules               <ul style="list-style-type: none"> <li>• <a href="#">DWDM-SFP10G-C-I</a></li> </ul> </li> <li>• Multirate GE, FE pluggable optics               <ul style="list-style-type: none"> <li>• <a href="#">ONS-SC-PTP-1510</a></li> <li>• <a href="#">ONS-SC-PTP-1514</a></li> </ul> </li> <li>• Quad Small Form-factor Pluggable Double Density               <ul style="list-style-type: none"> <li>• <a href="#">DP04QSDD-ER1</a></li> </ul> </li> <li>• Cisco 400G QSFP-DD Cable and Transceiver Module               <ul style="list-style-type: none"> <li>• <a href="#">QDD-400G-SR8-S</a></li> </ul> </li> </ul> |

## 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**.
- Cisco Secure DDoS Edge Protection is supported from Cisco IOS XR Release 7.10.1 on Cisco NCS 540 series routers. But the smart licensing usage and utilization reporting for the edge protection feature remains disabled. Usage details of the edge protection functionality will be enabled only in the future release. Hence, the **Smart Account In Use** utilization report for edge protection will show as 0 (zero) consumed.

- 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 indexaddress 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 adjacencyaddress** 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.

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 on the Cisco NCS 540 Series Router

- 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.
- Autonegotiation is disabled by default on the fixed GigE - 0/0/0/0 - 0/0/0/4 copper ports of N540X-16Z4G8Q2C-A/D and N540X-12Z16G-SYS-A/D router variants. To enable autonegotiation, use the **negotiation auto** command.
- If you're migrating from previous XR versions, then you must enable autonegotiation for fixed copper ports using the **negotiation auto** command before performing the software upgrade to avoid any links going down.
- Enabling or disabling frame preemption on the Time Sensitive Networking (TSN) port results in traffic drop for N540-FH-CSR-SYS. The port Twenty Five G0/0/12 is used as the TSN port.
- Fabric multicast queue stats are not supported in N540X-8Z16G-SYS-A/D, N540X-6Z18G-SYS-A/D, N540-6Z14S-SYS-D, N540-6Z18G-SYS-A/D, and N540X-4Z14G2Q-A/D variants.
- Unlabeled BGP PIC EDGE for global prefixes is not supported.

- The interface ports 0/0/0/24 to 0/0/0/31 do not support 1G Copper SFPs on N540-24Z8Q2C-SYS, N540-ACC-SYS, and N540X-ACC-SYS variants. Also, these ports do not support Auto-Negotiation with 1GE optical SFPs and they cannot act as 1GE Synchronous Ethernet sources.
- The interface ports 0/0/0/20 to 0/0/0/27 do not support 1G Copper SFPs on N540X-16Z4G8Q2C-A, N540X-16Z8Q2C-D, and N540X-16Z4G8Q2C-D variants. Also, these ports do not support Auto-Negotiation with 1GE optical SFPs and they cannot act as 1GE Synchronous Ethernet sources.
- The 1G ports on the N540-24Q8L2DD-SYS variant do not support Auto-Negotiation with 1GE optical SFPs.
- Remove the speed settings on the 1G Copper optics when 10M/100M is configured and replaced with 1G SFP optics.
- The **hw-module profile mfib statistics** command is not supported.

## Caveats

There are no caveats in this release.

## IOS XR Base Images and Optional Packages

For more information on system setup and software installation process, see [System Setup and Software Installation Guide for Cisco NCS 540 Series Routers](#).

For general and ordering information see:

- [Cisco Network Convergence System 540 Fronthaul Routers Data Sheet](#)
- [Cisco Network Convergence System 540 Large Density Router Data Sheet](#)
- [Cisco Network Convergence System 540 Medium Density Routers Data Sheet](#)
- [Cisco Network Convergence System 540 Small Density Router Data Sheet](#)

To install the Cisco NCS 540 Series Routers, see [Cisco NCS 540 Router Hardware Installation Guide](#).

## Release 24.2.11 Software

The following tables list the supported base images and optional packages and their corresponding file names.

- The first table lists the supported software for N540-24Q8L2DD-SYS, N540X-16Z4G8Q2C-A/D, N540-28Z4C-SYS-A/D, N540X-12Z16G-SYS-A/D, N540-12Z20G-SYS-A/D, N540-FH-CSR-SYS, N540X-16Z8Q2C-D and N540-FH-AGG-SYS variants.
- The second table lists the supported software for N540X-4Z14G2Q-A/D, N540X-8Z16G-SYS-A/D, N540-6Z14S-SYS-D, N540-6Z18G-SYS-A/D, and N540X-6Z18G-SYS-A/D variants.

Visit the [Cisco Software Download page](#) to download the Cisco IOS XR software images.

**Table 1: Release 24.2.11 Software for N540-24Q8L2DD-SYS, N540X-16Z4G8Q2C-A/D, N540-28Z4C-SYS-A/D, N540X-12Z16G-SYS-A/D, N540-12Z20G-SYS-A/D, N540-FH-CSR-SYS, N540X-16Z8Q2C-D and N540-FH-AGG-SYS**

| Base Image  | Filename                     | Description  |
|---|------------------------------|--|
| IOS XR Base Image                                       | ncs540l-x64-24.2.11.iso      | <p>IOS XR base image with mandatory packages.</p> <p>The base ISO image also includes the following optional packages:</p> <ul style="list-style-type: none"> <li>• xr-bgp</li> <li>• xr-cdp</li> <li>• xr-eigrp</li> <li>• xr-ipsla</li> <li>• xr-is-is</li> <li>• xr-k9sec</li> <li>• xr-lictrl</li> <li>• xr-lldp</li> <li>• xr-mcast</li> <li>• xr-mpls-oam</li> <li>• xr-netflow</li> <li>• xr-ospf</li> <li>• xr-perf-meas</li> <li>• xr-perfmgmt</li> <li>• xr-rip</li> <li>• xr-telnet</li> <li>• xr-track</li> </ul> <p>These optional packages are also included in NCS540l-iosxr-24.2.11.tar.</p> |
| USB Boot Package  | ncs540l-usb_boot-24.2.11.zip | <p>Package required to perform USB Boot.</p> <p>Includes the same packages as the base image.</p>  |
| <b>Optional Packages not included in the base image</b> |                              |  |
| Package   | Filename                     | Description  |
| IOS XR Telnet (xr-telnet)                               | NCS540l-iosxr-24.2.11.tar    | Supports Telnet  |
| IOS XR EIGRP (xr-eigrp)                                 | NCS540l-iosxr-24.2.11.tar    | Supports EIGRP   |

|                         |                                |                 |
|-------------------------|--------------------------------|-----------------|
| IOS XR CDP (xr-cdp)     | NCS540l-iosxr-24.2.11.tar      | Supports CDP    |
| IOS XR k9sec (xr-k9sec) | NCS540l-k9sec-rpms.24.2.11.tar | Supports 802.1X |
| IOS XR RIP (xr-rip)     | NCS540l-iosxr-24.2.11.tar      | Supports RIP    |

**Table 2: Release 24.2.11 Software for N540X-4Z14G2Q-A/D, N540X-8Z16G-SYS-A/D, N540-6Z14S-SYS-D, N540-6Z18G-SYS-A/D, and N540X-6Z18G-SYS-A/D**

| Base Image        | Filename                    | Description   |
|-------------------|-----------------------------|---|
| IOS XR Base Image | ncs540l-aarch64-24.2.11.iso | <p>IOS XR base image with mandatory packages.</p> <p>The ISO image also includes the following optional packages:</p> <ul style="list-style-type: none"> <li>• xr-bgp</li> <li>• xr-cdp</li> <li>• xr-eigrp</li> <li>• xr-ipsla</li> <li>• xr-is-is</li> <li>• xr-k9sec</li> <li>• xr-lictrl</li> <li>• xr-lldp</li> <li>• xr-mcast</li> <li>• xr-mpls-oam</li> <li>• xr-ncs540l-mcast</li> <li>• xr-ncs540l-netflow</li> <li>• xr-netflow</li> <li>• xr-ospf</li> <li>• xr-perf-meas</li> <li>• xr-perfmgmt</li> <li>• xr-rip</li> <li>• xr-telnet</li> <li>• xr-track</li> </ul> <p>These optional packages are also included in NCS540l aarch64 iosxr optional rpms-24.2.11.tar.</p> |



| USB Boot Package  | ncs540l-aarch64-usb_boot-24.2.11.zip            | Package required to perform USB Boot.<br>Includes the same packages as the base image. |
|---|---|--|
| <b>Optional Packages not included in the base image</b> |   |  |
| Package   | Filename  | Description  |
| IOS XR Telnet (xr-telnet)                               | NCS540l-aarch64-iosxr-optional-rpms-24.2.11.tar | Supports Telnet  |
| IOS XR EIGRP (xr-eigrp)                                 | NCS540l-aarch64-iosxr-optional-rpms-24.2.11.tar | Supports EIGRP   |
| IOS XR CDP (xr-cdp)                                     | NCS540l-aarch64-iosxr-optional-rpms-24.2.11.tar | Supports CDP   |
| IOS XR k9sec (xr-k9sec)                                 | NCS540l-aarch64-k9sec-rpms.24.2.11.tar          | Supports 802.1X  |
| IOS XR RIP (xr-rip)                                     | NCS540l-aarch64-iosxr-optional-rpms-24.2.11.tar | Supports RIP   |

## Determine Software Version

Log in to the router and enter the **show version** command on the N540X-16Z4G8Q2C-A/D, N540-28Z4C-SYS-A/D, N540X-12Z16G-SYS-A/D, and N540-12Z20G-SYS-A/D variants:

```
RP/0/RP0/CPU0:Router#show version
Fri Jul 5 14:26:39.790 IST
Cisco IOS XR Software, Version 24.2.11 LNT
Copyright (c) 2013-2024 by Cisco Systems, Inc.

Build Information:
  Built By      : sajjshah
  Built On     : Tue Jul 02 23:56:31 UTC 2024
  Build Host   : iox-ucs-054
  Workspace    : /auto/srcarchive11/prod/24.2.11/ncs540l/ws/
  Version      : 24.2.11
  Label       : 24.2.11
```

```
cisco NCS540L (C3708 @ 1.70GHz)
cisco N540X-16Z4G8Q2C-A (C3708 @ 1.70GHz) processor with 8GB of memory
EG-PE41 uptime is 1 day, 11 hours, 10 minutes
Cisco NCS 540 System with 16x10G+4x1Gcu+8x25G+2x100G DC
```

Log in to the router and enter the **show version** command on the N540X-4Z14G2Q-A/D, N540-6Z18G-SYS-A/D, N540X-8Z16G-SYS-A/D, N540-6Z14S-SYS-D, and N540X-6Z18G-SYS-A/D variants:

```
RP/0/RP0/CPU0:Router#show version
Cisco IOS XR Software, Version 24.2.11 LNT
Copyright (c) 2013-2024 by Cisco Systems, Inc.

Build Information:
  Built By      : sajjshah
  Built On     : Wed Jul 03 00:06:49 UTC 2024
  Build Host   : iox-ucs-055
  Workspace    : /auto/srcarchive11/prod/24.2.11/ncs540l-aarch64/ws/
  Version      : 24.2.11
  Label       : 24.2.11
```

```
cisco NCS540L
cisco N540X-6Z18G-SYS-A processor with 8GB of memory
```

```
Darwin-CE48 uptime is 17 hours, 6 minutes
Cisco NCS 540 Series Fixed Router 18x1G, 6x1/10G, AC
```

Log in to the router and enter the **show version** command on the N540-24Q8L2DD-SYS variant:

```
RP/0/RP0/CPU0:Router#show version
Fri Jul 5 14:26:39.790 IST
Cisco IOS XR Software, Version 24.2.11 LNT
Copyright (c) 2013-2024 by Cisco Systems, Inc.
```

Build Information:

```
Built By      : sajshah
Built On      : Tue Jul 02 23:56:31 UTC 2024
Build Host    : iox-ucs-054
Workspace     : /auto/srcarchive11/prod/24.2.11/ncs540l/ws/
Version       : 24.2.11
Label        : 24.2.11
```

```
cisco NCS540L (C3708 @ 1.70GHz)
cisco N540-24Q8L2DD-SYS (C3708 @ 1.70GHz) processor with 8GB of memory
EG-PE41 uptime is 1 day, 11 hours, 10 minutes
Cisco NCS 540 System with 16x10G+4x1Gcu+8x25G+2x100G DC
```

Log in to the router and enter the **show version** command on the N540-FH-AGG-SYS variant:

```
RP/0/RP0/CPU0:Router#show version
Fri Jul 5 14:26:39.790 IST
Cisco IOS XR Software, Version 24.2.11 LNT
Copyright (c) 2013-2024 by Cisco Systems, Inc.
```

Build Information:

```
Built By      : sajshah
Built On      : Tue Jul 02 23:56:31 UTC 2024
Build Host    : iox-ucs-054
Workspace     : /auto/srcarchive11/prod/24.2.11/ncs540l/ws/
Version       : 24.2.11
Label        : 24.2.11
```

```
cisco NCS540L (C3708 @ 1.70GHz)
cisco N540-FH-AGG-SYS (C3708 @ 1.70GHz) processor with 8GB of memory
EG-PE41 uptime is 1 day, 11 hours, 10 minutes
Cisco NCS 540 System with 16x10G+4x1Gcu+8x25G+2x100G DC
```

## Determine Firmware Support

Use the show command in EXEC 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. The Golden FPDs with “NEED UPGD” can be ignored, the Golden FPDs are not upgradable.



**Note** If the **Req Reload** field is mentioned as **Yes** in the output, then it indicates the need for a router reboot for the FPD's latest version to take effect.

Log in to the router and enter the **show fpd package** and **show hw-module fpd** commands on the Cisco N540-28Z4C-SYS-A/D, N540-12Z20G-SYS-A/D, N540X-12Z16G-SYS-A/D, N540X-16Z8Q2C-D, and N540X-16Z4G8Q2C-A/D variants:

```
RP/0/RP0/CPU0:Router#show fpd package
Fri Jul 5 14:26:49.444 IST
```

```
=====
```

| Field Programmable Device Package |                 |            |        |                |                   |
|-----------------------------------|-----------------|------------|--------|----------------|-------------------|
| Card Type                         | FPD Description | Req Reload | SW Ver | Min Req SW Ver | Min Req Board Ver |
| N540-12Z20G-SYS-A                 | ADM_FW          | YES        | 14.03  | 14.03          | 0.0               |
|                                   | ADMConfig       | NO         | 1.05   | 1.05           | 0.0               |
|                                   | IoFpga          | YES        | 3.08   | 3.08           | 0.0               |
|                                   | IoFpgaGolden    | YES        | 2.07   | 2.03           | 0.0               |
|                                   | Primary-BIOS    | YES        | 1.49   | 1.49           | 0.0               |
|                                   | StdbyFpga       | YES        | 0.50   | 0.50           | 0.0               |
|                                   | StdbyFpgaGolden | YES        | 0.50   | 0.40           | 0.0               |
|                                   | TamFw           | YES        | 4.13   | 4.13           | 0.0               |
|                                   | TamFwGolden     | YES        | 4.13   | 4.11           | 0.0               |
| N540-12Z20G-SYS-D                 | ADM_FW          | YES        | 14.03  | 14.03          | 0.0               |
|                                   | ADMConfig       | NO         | 1.05   | 1.05           | 0.0               |
|                                   | IoFpga          | YES        | 3.08   | 3.08           | 0.0               |
|                                   | IoFpgaGolden    | YES        | 2.07   | 2.03           | 0.0               |
|                                   | Primary-BIOS    | YES        | 1.49   | 1.49           | 0.0               |
|                                   | StdbyFpga       | YES        | 0.50   | 0.50           | 0.0               |
|                                   | StdbyFpgaGolden | YES        | 0.50   | 0.40           | 0.0               |
|                                   | TamFw           | YES        | 4.13   | 4.13           | 0.0               |
|                                   | TamFwGolden     | YES        | 4.13   | 4.11           | 0.0               |
| N540-28Z4C-SYS-A                  | ADM_FW          | YES        | 14.03  | 14.03          | 0.0               |
|                                   | ADMConfig       | NO         | 1.05   | 1.05           | 0.0               |
|                                   | IoFpga          | YES        | 3.08   | 3.08           | 0.0               |
|                                   | IoFpgaGolden    | YES        | 2.07   | 2.03           | 0.0               |
|                                   | JMAC1-Config    | YES        | 3.00   | 3.00           | 0.0               |
|                                   | JMAC2-Config    | YES        | 3.00   | 3.00           | 0.0               |
|                                   | JMAC3-Config    | YES        | 3.00   | 3.00           | 0.0               |
|                                   | JMAC4-Config    | YES        | 3.00   | 3.00           | 0.0               |
|                                   | JMAC5-Config    | YES        | 3.00   | 3.00           | 0.0               |
|                                   | Primary-BIOS    | YES        | 1.49   | 1.49           | 0.0               |
|                                   | StdbyFpga       | YES        | 0.50   | 0.50           | 0.0               |
|                                   | StdbyFpgaGolden | YES        | 0.50   | 0.40           | 0.0               |
|                                   | TamFw           | YES        | 4.13   | 4.13           | 0.0               |
| TamFwGolden                       | YES             | 4.13       | 4.11   | 0.0            |                   |
| N540-28Z4C-SYS-D                  | ADM_FW          | YES        | 14.03  | 14.03          | 0.0               |
|                                   | ADMConfig       | NO         | 1.05   | 1.05           | 0.0               |
|                                   | IoFpga          | YES        | 3.08   | 3.08           | 0.0               |
|                                   | IoFpgaGolden    | YES        | 2.07   | 2.03           | 0.0               |
|                                   | JMAC1-Config    | YES        | 3.00   | 3.00           | 0.0               |
|                                   | JMAC2-Config    | YES        | 3.00   | 3.00           | 0.0               |
|                                   | JMAC3-Config    | YES        | 3.00   | 3.00           | 0.0               |
|                                   | JMAC4-Config    | YES        | 3.00   | 3.00           | 0.0               |
|                                   | JMAC5-Config    | YES        | 3.00   | 3.00           | 0.0               |
|                                   | Primary-BIOS    | YES        | 1.49   | 1.49           | 0.0               |
|                                   | StdbyFpga       | YES        | 0.50   | 0.50           | 0.0               |
|                                   | StdbyFpgaGolden | YES        | 0.50   | 0.40           | 0.0               |
|                                   | TamFw           | YES        | 4.13   | 4.13           | 0.0               |
| TamFwGolden                       | YES             | 4.13       | 4.11   | 0.0            |                   |
| N540X-12Z16G-SYS-A                | ADM_FW          | YES        | 14.03  | 14.03          | 0.0               |
|                                   | ADMConfig       | NO         | 1.05   | 1.05           | 0.0               |
|                                   | IoFpga          | YES        | 3.08   | 3.08           | 0.0               |
|                                   | IoFpgaGolden    | YES        | 2.07   | 2.03           | 0.0               |
|                                   | Primary-BIOS    | YES        | 1.49   | 1.49           | 0.0               |
|                                   | StdbyFpga       | YES        | 0.50   | 0.50           | 0.0               |
|                                   | StdbyFpgaGolden | YES        | 0.50   | 0.40           | 0.0               |
|                                   | TamFw           | YES        | 4.13   | 4.13           | 0.0               |

## Determine Firmware Support

|                    |                 |     |       |       |     |
|--------------------|-----------------|-----|-------|-------|-----|
|                    | TamFwGolden     | YES | 4.13  | 4.11  | 0.0 |
| -----              |                 |     |       |       |     |
| N540X-12Z16G-SYS-D | ADM_FW          | YES | 14.03 | 14.03 | 0.0 |
|                    | ADMConfig       | NO  | 1.05  | 1.05  | 0.0 |
|                    | IoFpga          | YES | 3.08  | 3.08  | 0.0 |
|                    | IoFpgaGolden    | YES | 2.07  | 2.03  | 0.0 |
|                    | Primary-BIOS    | YES | 1.49  | 1.49  | 0.0 |
|                    | StdbyFpga       | YES | 0.50  | 0.50  | 0.0 |
|                    | StdbyFpgaGolden | YES | 0.50  | 0.40  | 0.0 |
|                    | TamFw           | YES | 4.13  | 4.13  | 0.0 |
|                    | TamFwGolden     | YES | 4.13  | 4.11  | 0.0 |
| -----              |                 |     |       |       |     |
| N540X-16Z4G8Q2C-A  | ADM_FW          | YES | 14.03 | 14.03 | 0.0 |
|                    | ADMConfig       | NO  | 1.05  | 1.05  | 0.0 |
|                    | IoFpga          | YES | 3.08  | 3.08  | 0.0 |
|                    | IoFpgaGolden    | YES | 2.07  | 2.03  | 0.0 |
|                    | Primary-BIOS    | YES | 1.49  | 1.49  | 0.0 |
|                    | StdbyFpga       | YES | 0.50  | 0.50  | 0.0 |
|                    | StdbyFpgaGolden | YES | 0.50  | 0.40  | 0.0 |
|                    | TamFw           | YES | 4.13  | 4.13  | 0.0 |
|                    | TamFwGolden     | YES | 4.13  | 4.11  | 0.0 |
| -----              |                 |     |       |       |     |
| N540X-16Z4G8Q2C-D  | ADM_FW          | YES | 14.03 | 14.03 | 0.0 |
|                    | ADMConfig       | NO  | 1.05  | 1.05  | 0.0 |
|                    | IoFpga          | YES | 3.08  | 3.08  | 0.0 |
|                    | IoFpgaGolden    | YES | 2.07  | 2.03  | 0.0 |
|                    | Primary-BIOS    | YES | 1.49  | 1.49  | 0.0 |
|                    | StdbyFpga       | YES | 0.50  | 0.50  | 0.0 |
|                    | StdbyFpgaGolden | YES | 0.50  | 0.40  | 0.0 |
|                    | TamFw           | YES | 4.13  | 4.13  | 0.0 |
|                    | TamFwGolden     | YES | 4.13  | 4.11  | 0.0 |
| -----              |                 |     |       |       |     |
| N540X-16Z8Q2C-A    | ADMConfig       | NO  | 1.05  | 1.05  | 0.0 |
|                    | IoFpga          | YES | 3.08  | 3.08  | 0.0 |
|                    | IoFpgaGolden    | YES | 2.07  | 2.03  | 0.0 |
|                    | Primary-BIOS    | YES | 1.49  | 1.49  | 0.0 |
|                    | StdbyFpga       | YES | 0.50  | 0.50  | 0.0 |
|                    | StdbyFpgaGolden | YES | 0.50  | 0.40  | 0.0 |
|                    | TamFw           | YES | 4.13  | 4.13  | 0.0 |
|                    | TamFwGolden     | YES | 4.13  | 4.11  | 0.0 |
| -----              |                 |     |       |       |     |
| N540X-16Z8Q2C-D    | ADMConfig       | NO  | 1.05  | 1.05  | 0.0 |
|                    | IoFpga          | YES | 3.08  | 3.08  | 0.0 |
|                    | IoFpgaGolden    | YES | 2.07  | 2.03  | 0.0 |
|                    | Primary-BIOS    | YES | 1.49  | 1.49  | 0.0 |
|                    | StdbyFpga       | YES | 0.50  | 0.50  | 0.0 |
|                    | StdbyFpgaGolden | YES | 0.50  | 0.40  | 0.0 |
|                    | TamFw           | YES | 4.13  | 4.13  | 0.0 |
|                    | TamFwGolden     | YES | 4.13  | 4.11  | 0.0 |

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

Fri Jul 5 14:26:57.786 IST

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 | N540X-16Z4G8Q2C-A | 0.2   | ADM_FW     | CURRENT      | 14.03 14.03      |
|            | NOT REQ           |       |            |              |                  |
| 0/RP0/CPU0 | N540X-16Z4G8Q2C-A | 0.2   | ADMConfig  | CURRENT      | 1.05 1.05        |
|            | NOT REQ           |       |            |              |                  |
| 0/RP0/CPU0 | N540X-16Z4G8Q2C-A | 0.2   | IoFpga     | CURRENT      | 3.08 3.08        |

|       |            |                   |     |                 |    |         |      |      |
|-------|------------|-------------------|-----|-----------------|----|---------|------|------|
| 0/RP0 | 0/RP0/CPU0 | N540X-16Z4G8Q2C-A | 0.2 | IoFpgaGolden    | B  | CURRENT | 2.0  | 2.03 |
| 0/RP0 | 0/RP0/CPU0 | N540X-16Z4G8Q2C-A | 0.2 | Primary-BIOS    | SA | CURRENT | 1.49 | 1.49 |
| 0/RP0 | 0/RP0/CPU0 | N540X-16Z4G8Q2C-A | 0.2 | StdbyFpga       | S  | CURRENT | 0.50 | 0.50 |
| 0/RP0 | 0/RP0/CPU0 | N540X-16Z4G8Q2C-A | 0.2 | StdbyFpgaGolden | BS | CURRENT | 0.50 | 0.40 |
| 0/RP0 | 0/RP0/CPU0 | N540X-16Z4G8Q2C-A | 0.2 | TamFw           | S  | CURRENT | 4.13 | 4.13 |
| 0/RP0 | 0/RP0/CPU0 | N540X-16Z4G8Q2C-A | 0.2 | TamFwGolden     | BS | CURRENT | 4.13 | 4.11 |

Log in to the router and enter the **show fpd package** and **show hw-module fpd** commands on the Cisco N540X-4Z14G2Q-A/D, N540-6Z18G-SYS-A/D, N540X-6Z18G-SYS-A/D, N540-6Z14S-SYS-D, and N540X-8Z16G-SYS-A/D variants:

RP/0/RP0/CPU0:Router#**show fpd package**

```

=====
                                     Field Programmable Device Package
=====
Card Type           FPD Description           Req  SW   Min Req  Min Req
                        Reload  Ver   SW Ver   Board Ver
=====
-----
N540-6Z14S-SYS-D   ADMConfig                 NO    5.03   5.03     0.0
                   BckUp-BootLoader         YES   20.08  20.08     0.0
                   IoFpga                   YES   0.17   0.17     0.0
                   IoFpgaGolden             YES   0.15   0.15     0.0
                   Prim-BootLoader          YES   20.08  20.08     0.0
                   StdbyFpga                YES   2.05   2.05     0.0
                   StdbyFpgaGolden          YES   0.33   0.33     0.0
                   TamFw                    YES   6.05   6.05     0.0
                   TamFwGolden              YES   6.05   6.05     0.0
-----
N540-6Z18G-SYS-A   ADMConfig                 NO    5.03   5.03     0.0
                   BckUp-BootLoader         YES   20.08  20.08     0.0
                   IoFpga                   YES   0.08   0.08     0.0
                   IoFpgaGolden             YES   0.03   0.03     0.0
                   Prim-BootLoader          YES   20.08  20.08     0.0
                   StdbyFpga                YES   2.05   2.05     0.0
                   StdbyFpgaGolden          YES   0.33   0.33     0.0
                   TamFw                    YES   6.05   6.05     0.0
                   TamFwGolden              YES   6.05   6.05     0.0
-----
N540-6Z18G-SYS-D   ADMConfig                 NO    5.03   5.03     0.0
                   BckUp-BootLoader         YES   20.08  20.08     0.0
                   IoFpga                   YES   0.08   0.08     0.0
                   IoFpgaGolden             YES   0.03   0.03     0.0
                   Prim-BootLoader          YES   20.08  20.08     0.0
                   StdbyFpga                YES   2.05   2.05     0.0
                   StdbyFpgaGolden          YES   0.33   0.33     0.0
                   TamFw                    YES   6.05   6.05     0.0
                   TamFwGolden              YES   6.05   6.05     0.0
-----
N540X-4Z14G2Q-A   ADMConfig                 NO    5.00   5.00     0.0
                   BckUp-BootLoader         YES   20.08  20.08     0.0
                   IoFpga                   YES   0.17   0.17     0.0
                   IoFpgaGolden             YES   0.15   0.15     0.0
                   Prim-BootLoader          YES   20.08  20.08     0.0
                   StdbyFpga                YES   2.05   2.05     0.0
                   StdbyFpgaGolden          YES   0.33   0.33     0.0
                   TamFw                    YES   6.05   6.05     0.0
=====

```

## Determine Firmware Support

|                   |                  |     |       |       |     |
|-------------------|------------------|-----|-------|-------|-----|
|                   | TamFwGolden      | YES | 6.05  | 6.05  | 0.0 |
| -----             |                  |     |       |       |     |
| N540X-4Z14G2Q-D   | ADMConfig        | NO  | 5.00  | 5.00  | 0.0 |
|                   | BckUp-BootLoader | YES | 20.08 | 20.08 | 0.0 |
|                   | IoFpga           | YES | 0.17  | 0.17  | 0.0 |
|                   | IoFpgaGolden     | YES | 0.15  | 0.15  | 0.0 |
|                   | Prim-BootLoader  | YES | 20.08 | 20.08 | 0.0 |
|                   | StdyFpga         | YES | 2.05  | 2.05  | 0.0 |
|                   | StdyFpgaGolden   | YES | 0.33  | 0.33  | 0.0 |
|                   | TamFw            | YES | 6.05  | 6.05  | 0.0 |
|                   | TamFwGolden      | YES | 6.05  | 6.05  | 0.0 |
| -----             |                  |     |       |       |     |
| N540X-6Z18G-SYS-A | ADMConfig        | NO  | 5.00  | 5.00  | 0.0 |
|                   | BckUp-BootLoader | YES | 20.08 | 20.08 | 0.0 |
|                   | IoFpga           | YES | 0.17  | 0.17  | 0.0 |
|                   | IoFpgaGolden     | YES | 0.15  | 0.15  | 0.0 |
|                   | Prim-BootLoader  | YES | 20.08 | 20.08 | 0.0 |
|                   | StdyFpga         | YES | 2.05  | 2.05  | 0.0 |
|                   | StdyFpgaGolden   | YES | 0.33  | 0.33  | 0.0 |
|                   | TamFw            | YES | 6.05  | 6.05  | 0.0 |
|                   | TamFwGolden      | YES | 6.05  | 6.05  | 0.0 |
| -----             |                  |     |       |       |     |
| N540X-6Z18G-SYS-D | ADMConfig        | NO  | 5.00  | 5.00  | 0.0 |
|                   | BckUp-BootLoader | YES | 20.08 | 20.08 | 0.0 |
|                   | IoFpga           | YES | 0.17  | 0.17  | 0.0 |
|                   | IoFpgaGolden     | YES | 0.15  | 0.15  | 0.0 |
|                   | Prim-BootLoader  | YES | 20.08 | 20.08 | 0.0 |
|                   | StdyFpga         | YES | 2.05  | 2.05  | 0.0 |
|                   | StdyFpgaGolden   | YES | 0.33  | 0.33  | 0.0 |
|                   | TamFw            | YES | 6.05  | 6.05  | 0.0 |
|                   | TamFwGolden      | YES | 6.05  | 6.05  | 0.0 |
| -----             |                  |     |       |       |     |
| N540X-8Z16G-SYS-A | ADMConfig        | NO  | 5.00  | 5.00  | 0.0 |
|                   | BckUp-BootLoader | YES | 20.08 | 20.08 | 0.0 |
|                   | IoFpga           | YES | 0.17  | 0.17  | 0.0 |
|                   | IoFpgaGolden     | YES | 0.15  | 0.15  | 0.0 |
|                   | Prim-BootLoader  | YES | 20.08 | 20.08 | 0.0 |
|                   | StdyFpga         | YES | 2.05  | 2.05  | 0.0 |
|                   | StdyFpgaGolden   | YES | 0.33  | 0.33  | 0.0 |
|                   | TamFw            | YES | 6.05  | 6.05  | 0.0 |
|                   | TamFwGolden      | YES | 6.05  | 6.05  | 0.0 |
| -----             |                  |     |       |       |     |
| N540X-8Z16G-SYS-D | ADMConfig        | NO  | 5.00  | 5.00  | 0.0 |
|                   | BckUp-BootLoader | YES | 20.08 | 20.08 | 0.0 |
|                   | IoFpga           | YES | 0.17  | 0.17  | 0.0 |
|                   | IoFpgaGolden     | YES | 0.15  | 0.15  | 0.0 |
|                   | Prim-BootLoader  | YES | 20.08 | 20.08 | 0.0 |
|                   | StdyFpga         | YES | 2.05  | 2.05  | 0.0 |
|                   | StdyFpgaGolden   | YES | 0.33  | 0.33  | 0.0 |
|                   | TamFw            | YES | 6.05  | 6.05  | 0.0 |
|                   | TamFwGolden      | YES | 6.05  | 6.05  | 0.0 |

RP0/RP0/CPU0:Router#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 | N540X-6Z18G-SYS-A | 0.2   | ADMConfig    | CURRENT    | 5.00    | 5.00         |  |
|            | NOT REQ           |       |              |            |         |              |  |
| 0/RP0/CPU0 | N540X-6Z18G-SYS-A | 0.2   | IoFpga       | CURRENT    | 0.17    | 0.17         |  |
| 0/RP0      |                   |       |              |            |         |              |  |
| 0/RP0/CPU0 | N540X-6Z18G-SYS-A | 0.2   | IoFpgaGolden | B CURRENT  | 0.15    | 0.15         |  |

```

0/RP0
0/RP0/CPU0 N540X-6Z18G-SYS-A 0.2 Prim-BootLoader A CURRENT 20.08 20.08
0/RP0
0/RP0/CPU0 N540X-6Z18G-SYS-A 0.2 StdbyFpga S CURRENT 2.05 2.05
0/RP0
0/RP0/CPU0 N540X-6Z18G-SYS-A 0.2 StdbyFpgaGolden BS CURRENT 0.33 0.33
0/RP0
0/RP0/CPU0 N540X-6Z18G-SYS-A 0.2 TamFw S CURRENT 6.05 6.05
0/RP0
0/RP0/CPU0 N540X-6Z18G-SYS-A 0.2 TamFwGolden BS CURRENT 6.05 6.05
0/RP0
    
```

Log in to the router and enter the **show fpd package** and **show hw-module fpd** commands on the Cisco N540-24Q8L2DD-SYS variant:

```

RP/0/RP0/CPU0:Router#show fpd package
=====
Field Programmable Device Package
=====
Card Type          FPD Description          Req  SW   Min Req  Min Req
=====  =====  =====  =====  =====  =====
N540-24Q8L2DD-SYS  ADM-DBConfig             NO   2.05   2.05     0.0
                  ADM-MBConfig             NO   2.05   2.05     0.0
                  IoFpga                   YES  2.12   2.12     0.0
                  IoFpgaGolden             YES  2.12   2.12     0.0
                  Primary-BIOS             YES  4.07   4.07     0.0
                  SsdSAMSA64G3            YES 12.41  12.41     0.0
                  StdbyFpga                YES  2.59   2.59     0.0
                  StdbyFpgaGolden         YES  2.56   2.39     0.0
                  TamFw                   YES  6.05   6.05     0.0
                  TamFwGolden             YES  6.05   6.05     0.0
    
```

```

RP/0/RP0/CPU0:Router#show hw-module fpd
Fri Jul 5 14:26:57.786 IST
    
```

```

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 N540X-16Z4G8Q2C-A 0.2  ADM_FW                CURRENT    14.03    14.03
NOT REQ
0/RP0/CPU0 N540X-16Z4G8Q2C-A 0.2  ADMConfig             CURRENT    1.05     1.05
NOT REQ
0/RP0/CPU0 N540X-16Z4G8Q2C-A 0.2  IoFpga                CURRENT    3.08     3.08
0/RP0
0/RP0/CPU0 N540X-16Z4G8Q2C-A 0.2  IoFpgaGolden         B  CURRENT    2.0      2.03
0/RP0
0/RP0/CPU0 N540X-16Z4G8Q2C-A 0.2  Primary-BIOS         SA  CURRENT    1.49     1.49
0/RP0
0/RP0/CPU0 N540X-16Z4G8Q2C-A 0.2  StdbyFpga            S  CURRENT    0.50     0.50
0/RP0
0/RP0/CPU0 N540X-16Z4G8Q2C-A 0.2  StdbyFpgaGolden     BS  CURRENT    0.50     0.40
0/RP0
0/RP0/CPU0 N540X-16Z4G8Q2C-A 0.2  TamFw                S  CURRENT    4.13     4.13
0/RP0
0/RP0/CPU0 N540X-16Z4G8Q2C-A 0.2  TamFwGolden         BS  CURRENT    4.13     4.11
0/RP0
    
```

Log in to the router and enter the **show fpd package** and **show hw-module fpd** commands on the Cisco N540-FH-AGG-SYS variant:

## Important Notes

```
RP/0/RP0/CPU0:Router#show fpd package
Fri Jul 5 14:26:49.444 IST
```

```
=====
```

| Field Programmable Device Package |                 |            |        |                |                   |
|-----------------------------------|-----------------|------------|--------|----------------|-------------------|
| Card Type                         | FPD Description | Req Reload | SW Ver | Min Req SW Ver | Min Req Board Ver |
| N540-FH-AGG-SYS                   | ADM1_Config     | NO         | 1.02   | 1.02           | 1.0               |
|                                   | ADM2_Config     | NO         | 1.02   | 1.02           | 1.0               |
|                                   | DpFpgaCpri      | YES        | 0.24   | 0.24           | 0.0               |
|                                   | DpFpgaEth       | YES        | 1.22   | 1.22           | 0.0               |
|                                   | IoFpga          | YES        | 1.30   | 1.30           | 0.0               |
|                                   | IoFpgaGolden    | YES        | 1.30   | 1.30           | 0.0               |
|                                   | Primary-BIOS    | YES        | 1.49   | 1.49           | 0.0               |
|                                   | StdbyFpga       | YES        | 0.46   | 0.46           | 0.0               |
|                                   | StdbyFpgaGolden | YES        | 0.46   | 0.46           | 0.0               |
|                                   | TamFw           | YES        | 6.05   | 6.05           | 0.0               |
|                                   | TamFwGolden     | YES        | 6.05   | 6.05           | 0.0               |

```
RP/0/RP0/CPU0:Router#show hw-module fpd
Fri Jul 5 14:26:57.786 IST
```

Auto-upgrade:Enabled

Attribute codes: B golden, P protect, S secure, A Anti Theft aware

| Location   | Card type         | HWver | FPD device      | ATR Status | FPD Versions |          |
|------------|-------------------|-------|-----------------|------------|--------------|----------|
|            |                   |       |                 |            | Running      | Programd |
| 0/RP0/CPU0 | N540X-16Z4G8Q2C-A | 0.2   | ADM_FW          | CURRENT    | 14.03        | 14.03    |
|            | NOT REQ           |       |                 |            |              |          |
| 0/RP0/CPU0 | N540X-16Z4G8Q2C-A | 0.2   | ADMConfig       | CURRENT    | 1.05         | 1.05     |
|            | NOT REQ           |       |                 |            |              |          |
| 0/RP0/CPU0 | N540X-16Z4G8Q2C-A | 0.2   | IoFpga          | CURRENT    | 3.08         | 3.08     |
|            | 0/RP0             |       |                 |            |              |          |
| 0/RP0/CPU0 | N540X-16Z4G8Q2C-A | 0.2   | IoFpgaGolden    | B CURRENT  | 2.0          | 2.03     |
|            | 0/RP0             |       |                 |            |              |          |
| 0/RP0/CPU0 | N540X-16Z4G8Q2C-A | 0.2   | Primary-BIOS    | SA CURRENT | 1.49         | 1.49     |
|            | 0/RP0             |       |                 |            |              |          |
| 0/RP0/CPU0 | N540X-16Z4G8Q2C-A | 0.2   | StdbyFpga       | S CURRENT  | 0.50         | 0.50     |
|            | 0/RP0             |       |                 |            |              |          |
| 0/RP0/CPU0 | N540X-16Z4G8Q2C-A | 0.2   | StdbyFpgaGolden | BS CURRENT | 0.50         | 0.40     |
|            | 0/RP0             |       |                 |            |              |          |
| 0/RP0/CPU0 | N540X-16Z4G8Q2C-A | 0.2   | TamFw           | S CURRENT  | 4.13         | 4.13     |
|            | 0/RP0             |       |                 |            |              |          |
| 0/RP0/CPU0 | N540X-16Z4G8Q2C-A | 0.2   | TamFwGolden     | BS CURRENT | 4.13         | 4.11     |
|            | 0/RP0             |       |                 |            |              |          |

## 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](#).



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**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.

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## 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 NCS540 and click **Enter**.

## Upgrading Cisco IOS XR Software



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**Note** For software installation and upgrades, refer to the respective upgrade/downgrade docs .tar files based on your [540 router variant](#).

---

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.

The upgrade document for N540-28Z4C-SYS-A/D, N540-12Z20G-SYS-A/D, N540X-12Z16G-SYS-A/D, N540X-16Z4G8Q2C-A/D, N540-24Q8L2DD-SYS, N540-FH-AGG-SYS, N540X-16Z8Q2C-D, and N540-FH-CSR-SYS variants is available along with the software image in *NCS540l-docs-24.2.11.tar* file.

The upgrade document for N540X-4Z14G2Q-A/D, N540X-8Z16G-SYS-A/D, N540-6Z14S-SYS-D, N540-6Z18G-SYS-A/D, and N540X-6Z18G-SYS-A/D variants is available along with the software image in *NCS540l-aarch64-docs-24.2.11.tar* file.



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**Note** Quad configurations will be lost when you perform a software downgrade on Cisco NCS 540 Routers that support quad configurations from IOS XR Release 7.5.1 onwards to a release prior to IOS XR Release 7.5.1 due to a non-backward compatibility change. The lost configuration can be applied manually after the downgrade.

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

<https://www.cisco.com/c/en/us/td/docs/iosxr/ncs-540-series-routers.html>

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