Cisco IOS Software Reference Guide

Version 1.0

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Contents

Introduction

Cisco IOS® Software is the premier network infrastructure software and delivers seamless integration of technology innovation, business-critical services and hardware support. Cisco IOS Software currently operates on millions of active systems, from small home office routers to the core systems of the largest service provider networks in the world and is one of the most widely deployed network operating software in the world.

It is optimized for the IP-based networks of today, offers fast convergence, provides extraordinary resiliency and advanced networking services by separating control, forwarding, and management planes to yield innovative services and high performance. Extremely flexible, adaptable, and scalable, Cisco IOS Software can run on both high-end distributed hardware and low-end single processor systems. It employs hardware switching with advanced network processors, application-specific integrated circuits, and fast-access memory (content addressable memory) where the stored data item is located by the contents of the memory itself.

Cisco IOS Software minimizes operational expenses, maximizes return on investment, and improves business productivity:

- **Minimizes new infrastructure**—The continuous expansion of features and functionality enables users to adapt to evolving business needs.
- **Increases organizational productivity**—Reliably delivers access to business-critical applications regardless of time or location.
- **Protects the network from accidental and malicious events**—Minimizes intervention and operational support costs.

Cisco IOS Software Family

Cisco IOS Software continues to evolve over time to meet the rapidly changing requirements of the most demanding enterprise and service provider networks. As a family of releases, the feature richness and broad hardware support delivered in Cisco IOS Software is unmatched in the industry.

Table 1.

Type	Release	Description
IOS	Release 15	A comprehensive portfolio of Cisco technologies, which includes leading-edge functionality delivered in Releases 12.4 and 12.4T, one of the broadest range of hardware platforms in the industry, which includes Cisco ISRs, Flexible NetFlow and Network-Based Application Recognition (NBAR) integration to provide layer 2-7 application visibility, and support for new hardware ISR G2 Series routers.
IOS	Release 12	A comprehensive portfolio of Cisco IOS Software technologies and broad hardware adoption for Enterprise, Access, and commercial networks. Incorporates new software features and hardware introduced in the earlier T release, and additional software fixes. Maintenance releases inherit new Cisco IOS Software functionality and hardware from T releases. This is typically new functionality. Hardware is not introduced in maintenance releases.
IOS	Release 12.2SB Release 12.2SC	Cisco IOS Software functionality and hardware for Broadband and Leased-Line Aggregation, comprehensive portfolio of mid-range routers for service provider edge networks.
IOS	Release 12.2SX	Cisco IOS Software functionality and hardware for high-end Ethernet LAN switching for enterprise access, distribution, core and data center networks.
IOS	Release 12.2SE Release 12.2SG	Cisco IOS Software functionality and hardware for mid-range and low-end Ethernet LAN switching for enterprise access and distribution networks, and mid-range and low-end metro Ethernet for service provider edge networks.
IOS	Release 12.2SR	Cisco IOS Software functionality and hardware for high end metro Ethernet and MPLS PE for service provider edge networks.
IOS XR	Release 4	Cisco IOS XR Software functionality and hardware for the Cisco CRS-1 Carrier Routing System (CRS), CRS-3 Carrier Routing System, ASR9000 Series routers and Cisco XR 12000 Series routers for service provider core networks. Designed to address the terabit scaling, secure virtualization, high availability, and distributed processing requirements of large IP next-generation networks.

Type	Release	Description
IOS XE	Release 3	Cisco IOS XE Software for the Cisco ASR 1000 Series, Cisco ASR 900 Series and Cisco Catalyst 4000 Series Supervisor 7 provides an optimized and predictable way to deliver software and hardware features in a time-based release sequence. Cisco IOS XE Software is a modular operating system built on a Linux kernel.
NX-OS	Release 5	A data-center-class operating system built to meet the demands of the virtualized data center. NX-OS for Nexus 7000 and Nexus 5000 switches maintains operational features and consistency across data centers such as a modular, flexible architecture, continuous system availability, and switch virtualization capabilities.

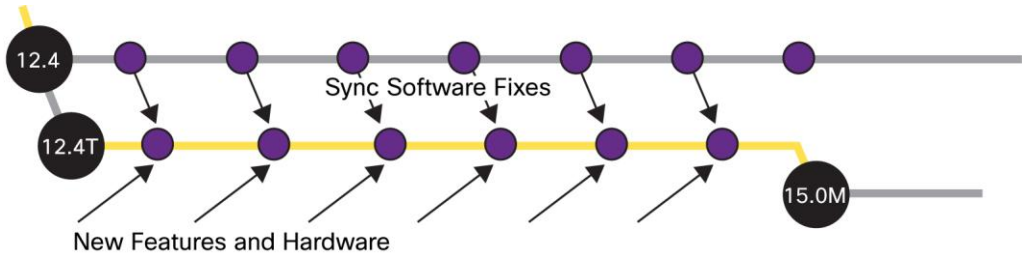
Table 2. Cisco IOS Software Family Hardware

Hardware (Platform)	Recommended IOS, XE, NX, XR
Cisco 800, 1800, 1900, 2800, 3200, 3800 Series Routers	15.0M 12.4 12.4T
Cisco 2900 and 3900 Series Routers	15.0M
Cisco 3600 and 3700 Series Routers	12.4 12.4T
Cisco AS5x50	15.0M 12.4 12.4T
Cisco Catalyst 2970, 3560 and 3750 Series Switches	12.2SE
Cisco Catalyst 4500 and 4900 Series Switches	12.2SG 12.2EW
Cisco Catalyst 4500 Series Switches with Supervisor 7E	XE Release 3
Cisco Catalyst 6500 Series Switch and Catalyst 6500 VSS	12.2SX
Cisco ASR 1000 Series Router	XE Release 3
Cisco ASR 900 Series Router	XE Release 3
Cisco 10000 Series Router	12.2SB 12.2XN
Cisco ASR 9000 Series Router	XR Release 4
Cisco 12000 Series Router	XR Release 4 12.0S
Cisco CRS-1 Carrier Routing System **Cisco CRS-3 Carrier Routing System**	XR Release 4
Cisco Nexus 7000 Series Routers	NX-OS Release 6
Cisco Nexus 3000 and 5000 Series Routers	NX-OS Release 5

Cisco IOS Software Family Numbering

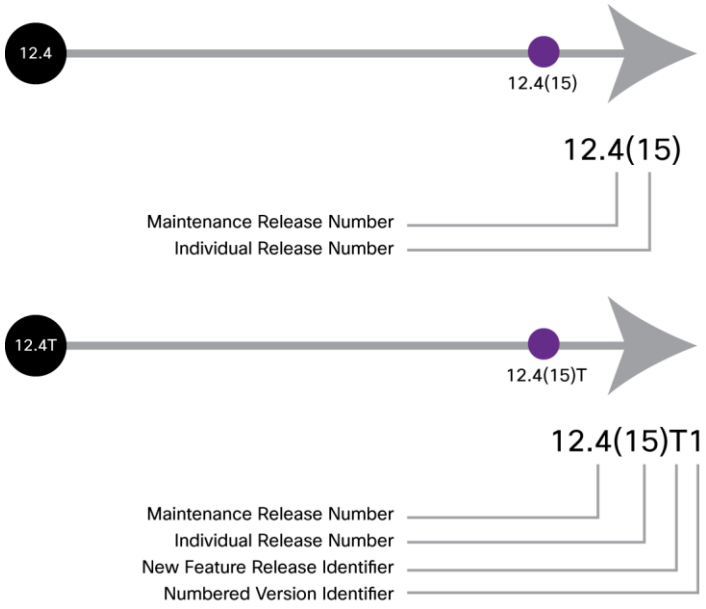
In order to effectively manage Cisco IOS Software releases within your network, it is important to understand IOS, IOS XE, IOS XR and NX-OS numbering.

Figure 1. IOS T Relationships



Cisco IOS Software Maintenance Release 12.4 receives software fixes on a regular basis, but does not receive new software features or hardware. It is important to note that the fixes applied to Cisco IOS Software Release 12.4 are synchronized with subsequent versions of Cisco IOS Software Release 12.4T. Derived from Cisco IOS Software Release 12.4, Cisco IOS Software Release 12.4T receives regular software fixes and provides new features and hardware. This relationship is carried forward with Cisco IOS Software Releases 15.0M and 15.0T. The software fixes and new software features and hardware support in Cisco IOS Software Releases 12.4 and 12.4T are consolidated in Cisco IOS Software Release 15.0. Additional new software features and hardware are provided in Cisco IOS Software Release 15.0T. The key elements of IOS T numbering are the maintenance release number, individual release number, and the numbered version identifier.

Figure 2. IOS T Numbering



Note: The maintenance release number is the unique number of the release.

- The individual release number is the version identifier of the release. Each individual release of Cisco IOS Software Maintenance Release 12.4 includes additional software fixes. Each individual release of Cisco IOS Software Release 12.4T includes additional software fixes, and new software features and hardware.
- The numbered version identifier is the incremental version of each individual release. Each numbered version delivers additional software fixes on an accelerated schedule, prior to the next planned individual release.
- Due to separate schedules, Cisco IOS Software Maintenance Release 12.4 and Cisco IOS Software Release 12.4T do not share individual release numbers. If Cisco IOS Software Release 12.4 and Cisco IOS Software Release 12.4T did share an individual release number, the releases would include the same software fixes.

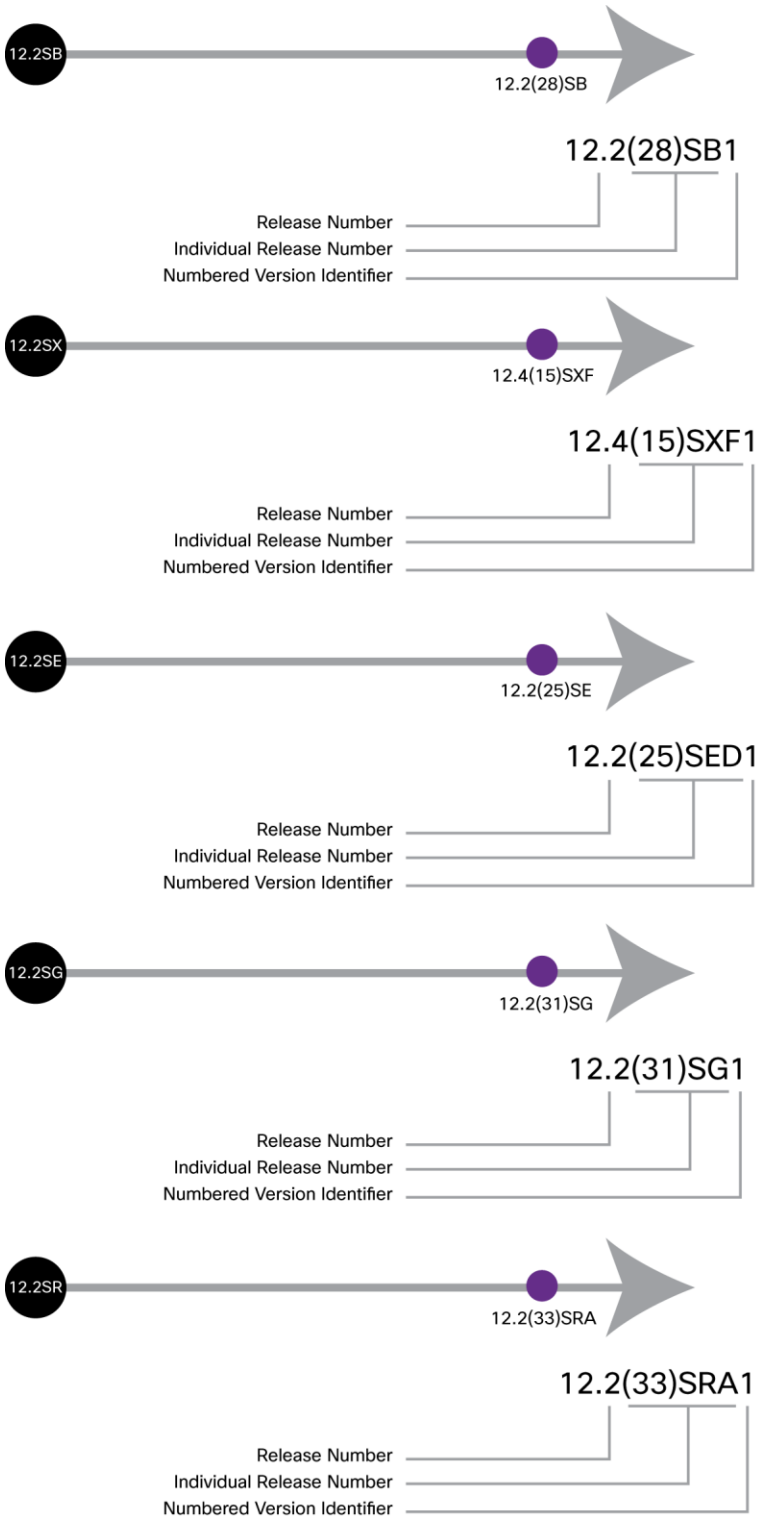
IOS S Numbering

The releases within the IOS S family share a common code base from Cisco IOS Software Release 12.2S. On top of the common code base, additional software fixes and new software features are included in each version of Cisco IOS Software Releases 12.2SB, 12.2SX, 12.2SE, 12.2SG, and 12.2SR. After their inclusion, where applicable, the additional software fixes and new software features are propagated to other IOS S family members.

Since they share a common code base and because of the independent delivery of fixes, features, and hardware, Cisco optimizes the IOS S family members to meet the rapidly changing requirements of critical enterprise and service provider market segments.

The key elements of IOS S numbering are the release number, individual release number, and the numbered version identifier.

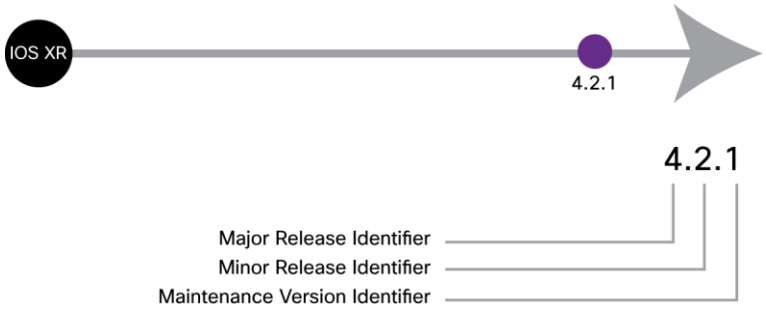
Figure 3. OS S Numbering



IOS XR Numbering

Cisco IOS XR software comprises modular packages. Each package contains the components to perform a specific set of router functions, such as routing, security, or line card support. The key elements of IOS XR numbering are the major release identifier, minor release identifier, and maintenance revision identifier.

Figure 4. IOS XR Numbering



The major release identifier is the major release number for a package. A major release occurs when there is a significant architectural change to the product. For example, an important new capability is introduced. All packages that operate on the router must be at the same major release level. The minor release identifier is the minor release number for a given package. A minor release contains one or more new features or software fixes.

The minor release version does not have to be identical for all software packages that operate on the router. The operating packages must be certified by Cisco as compatible with each other. The maintenance revision identifier is the maintenance release number for a given package. A maintenance release contains a collection of software fixes.

The maintenance release version does not have to be identical for all software packages that operate on the router. The major and minor versions of the maintenance release must match those of the package that is updated.

NX-OS Numbering

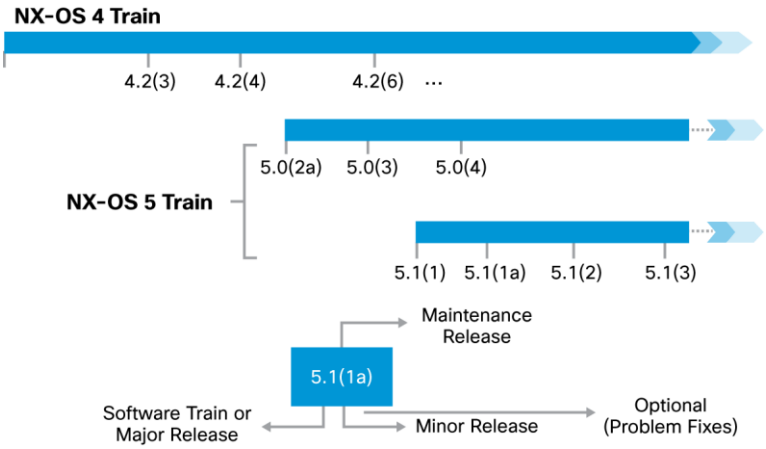
Table 3. Cisco NX-OS Software Release Types

Cisco NX-OS Software Release Type	Description
Major release or software train	A major release or software train introduces significant new features, functions or hardware platforms. **Examples:** Releases 4 and 5.
Minor release	Each major release consists of multiple minor releases. Each minor release enhances a major release with new features. **Examples:** Releases 4.2 and 5.1
Maintenance release	A maintenance release primarily resolves product defects in a minor release. Helping ensure that each maintenance release addresses product defects preserves the integrity and stability of the minor release. No new features are added in a maintenance release, except on an exception basis. **Examples:** Releases 4.2(6) and 5.1(3)

Each Cisco NX-OS Software release is uniquely numbered as X.Y(z), where X is the major release or train, Y is a minor feature release that enhances major release X, and z is a maintenance release that addresses product defects in minor release Y.

Figure 5 below is a graphical representation of the Cisco NX-OS Software releases, based on the example of the Cisco Nexus® 7000 Series Switches.

Figure 5. Cisco NX-OS Software Releases on Cisco Nexus 7000 Series Switches



Cisco IOS Software Release Migration

Cisco recommends that customers take inventory of the Cisco IOS Software releases deployed in their networks on a regular basis. This helps to ensure that networks run the most current, supported releases and to keep the total number of deployed releases to a minimum.

In general, the migration path for a Cisco IOS Software release is to the latest version of that release. The latest version incorporates the current software fixes, hardware support, and new software features. For example, upgrade from a maintenance release to a new version of that maintenance release, and upgrade from a T release or an SG release to a new version of the T or SG release, respectively.

In order to support new hardware or functionality, customers sometimes need to upgrade from a maintenance release to a T release, or to a completely different family. For example, to support the latest features of the Cisco 10000, upgrade from Cisco IOS Software Release 12.0S or 12.3XI to Cisco IOS Software Release 12.3SB, or to support the latest features of the Catalyst 6500, upgrade from Cisco IOS Software Release 12.1E to 12.2SX.

The IOS T Migration Examples section below presents high-level examples of migration for some of the current IOS T, IOS S, and IOS XR releases.

Note: Note: Cisco IOS Software release migration is an ongoing process that takes detailed planning. Customers must work closely with their account managers when they take inventory of their deployed Cisco IOS Software releases and plan migration to the current releases.

IOS T Migration Examples

Table 4. Migration Paths from Cisco IOS Software Release 12.4(25)

Migration Strategy	Example Strategy
Cisco IOS Software Release 12.4(25x) runs on the network, where x is a numbered version of Cisco IOS Software Release 12.4(25), such as Cisco IOS Software Release 12.4(25a). You need additional software fixes on an accelerated schedule prior to the next individual release, which is Cisco IOS Software 12.4(26).	Migrate to the next (or later) numbered version of Cisco IOS Software Release 12.4(25), such as 12.4(25b).
Cisco IOS Software Release 12.4(25) runs on the network. You need additional software fixes.	Migrate to the next (or later) individual release after Cisco IOS Software Release 12.4(25), such as Release 12.4(26).
Cisco IOS Software Release 12.4(25) runs on the network. You need software fixes, new features, and hardware support delivered in the Cisco IOS Software Release 12.4T family.	Migrate to the next (or later) instance of Cisco IOS Software Release 12.4T. For example, migrate to Cisco IOS Software Release 12.4(25)T.
Cisco IOS Software Release 12.4(25) runs on the network. You need additional software fixes, new features, and hardware support delivered in the Cisco IOS Software Release 12.4T family, and you want to continue to run a maintenance release.	Migrate to the next maintenance Cisco IOS Software Release 15.0(x)M where x is the next (or later) instance of Cisco IOS Software Release 15.0. For example, migrate from Cisco IOS Software Release 12.4(25) to 15.0(1).
Cisco IOS Software Release 12.4(25) runs on the network. You need additional software fixes, new features, and hardware support in addition to what was delivered in Cisco IOS Software Release 12.4T. You do not need to run a maintenance release.	Migrate to Cisco IOS Software Release 15.0(x)T, where x is the next (or later) instance of Cisco IOS Software Release 15.0(x)T. For example, migrate from Cisco IOS Software Release 12.4(25) to 15.0(x)T.

Table 5. Migration Paths from Cisco IOS Software Release 12.4(24)T

Migration Strategy	Example Strategy
Cisco IOS Software Release 12.4(24)T runs on the network. You need the latest software fixes, new features, and hardware support.	Migrate to Cisco IOS Software Release 12.4(x)T, where x is the next (or later) instance of Cisco IOS Software Release 12.4T after Cisco IOS Software Release 12.4(25)T. For example, migrate from Cisco IOS Software Release 12.4(25)T to 12.4(26)T.
Cisco IOS Software Release 12.4(24)T runs on the network. You need additional software fixes, new features, and hardware support delivered in the Cisco IOS Software Release 12.4T family of releases.	Migrate to the next (or later) maintenance Cisco IOS Software Release 15.0(x), where x is the next instance of maintenance Cisco IOS Software Release 15. For example, migrate from Cisco IOS Software Release 12.4(25)T to 15.0(1).
Cisco IOS Software Release 12.4(25)T runs on the network. You need additional software fixes, new features, and hardware support.	Migrate to the next (or later) release of Cisco IOS Software 15.0(x)T, where x is the next instance of Cisco IOS Software Release 15T. For example, migrate from Cisco IOS Software Release 12.4(25)T to 15.0(1)T.

IOS S Migration Examples

Table 6. Migration Paths from Cisco IOS Software Release 12.2(33)SB

Migration Strategy	Example Strategy
Cisco IOS Software Release 12.2(33)SB runs on the network. You need the latest software fixes.	Migrate to Cisco IOS Software Release 12.2(33)SBx, where x is the next (or later) numbered version of Cisco IOS Software Release 12.2(33)SB. For example, migrate from Cisco IOS Software 12.2(33)SB to 12.2(33)SB7.
Cisco IOS Software Release 12.2(33)SB runs on the network. You need the latest software fixes, new features, and hardware support.	Migrate to Cisco IOS Software Release 12.2(x)SB or later, where x is the next individual release of Cisco IOS Software Release 12.2SB.

Table 7. Migration Paths from Cisco IOS Software Release 12.2(33)SXH

Migration Strategy	Example Strategy
Cisco IOS Software Release 12.2(33)SXH runs on the network. You need the latest software fixes.	Migrate to Cisco IOS Software Release 12.2(33)SXHx, where x is the next (or later) numbered version of Cisco IOS Software Release 12.2(33)SXH. For example, migrate from Cisco IOS Software Release 12.2(33)SXH to 12.2(35)SXH.

Migration Strategy	Example Strategy
Cisco IOS Software Release 12.2(33)SXH runs on the network. You need the latest software fixes, new features, and hardware support.	Migrate to Cisco IOS Software Release 12.2(x)SXx, where x is the next individual release of Cisco IOS Software Release 12.2SX. For example, migrate from Cisco IOS Release 12.2(33)SXH to 12.2(35)SXI.

Table 8. IOS XR Migration Examples

Migration Strategy	Example Strategy
Cisco IOS XR Release 3.9.0 runs on the network. You need the latest software fixes.	Migrate to Cisco IOS XR Release 3.9.x, where x is the next (or later) maintenance revision of Cisco IOS XR Release 3.9.1.
Cisco IOS XR Release 4.2.0 runs on the network. You need one or more new features or software fixes.	Migrate to Cisco IOS XR Release 4.x.0, where x is the next minor release of Cisco IOS XR Release 4. For example, migrate from Cisco IOS XR Release 4.1.0 to 4.2.0.
Cisco IOS XR Release 3.9.0 runs on the network. You need major new capabilities.	Migrate to the next major Cisco IOS XR release. For example, migrate from Cisco IOS XR Release 3.9.0 to Release 4.2.1.

Table 9. IOS NX-OS Migration Examples

Migration Strategy	Example Strategy
Cisco IOS NX-OS Release 6.1.0 runs on the network. You need the latest software fixes.	Migrate to Cisco NX-OS Release 6.1.0, where x is the next (or later) maintenance revision of Cisco IOS XR Release 6.1.1.
Cisco IOS NX-OS Release 6.0.4 runs on the network. You need one or more new features or software fixes.	Migrate to Cisco NX-OS Release 6.x.0, where x is the next minor release of Cisco IOS XR Release 4. For example, migrate from Cisco IOS XR Release 6.0.0 to 6.1.0.
Cisco IOS NX-OS Release 5.1.6 runs on the network. You need major new capabilities.	Migrate to the next major Cisco IOS NX-OS release. For example, migrate from Cisco IOS NX-OS Release 5.1.6 to Release 6.1.0.

Cisco IOS Software Life Cycle

The Cisco IOS Software Release Policy is a structured plan that addresses the Cisco IOS Software life cycle from First Commercial Shipment (FCS) through End of Life (EoL). The Release Policy addresses life cycle guidelines and migration planning for IOS T and IOS S releases, such as Cisco IOS Software Release 12.4 and 12.4T, and Cisco IOS Software Release 12.2SG, as well as Cisco IOS Software Release 12.0S.

These acronyms are associated with life cycle milestones:

- **FCS**—First Customer Shipment

  Cisco makes the release available to customers on Cisco.com.

- **EoS**—End of Sale

  Customers can no longer order a release from Cisco manufacturing, but maintenance releases are available to download from the Software Center. An announcement six months prior to EoS provides advanced notice of the milestone.

- **EoE**—End of Engineering

  Cisco no longer builds Cisco IOS Software images, no new software fixes are provided by Cisco IOS Engineering, and no new functionality is added. Cisco Technical Support continues to offer customer support for the release.

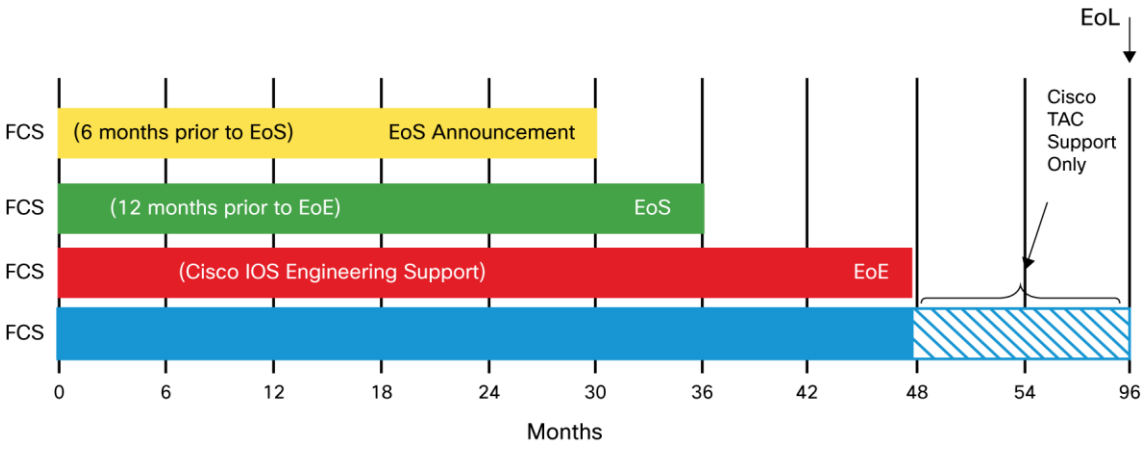
- **EoL**—End of Life

  Cisco Technical Support ends customer support for the release and only opens a case to recommend an upgrade to a newer Cisco IOS Software release.

Refer to Cisco IOS Software Product Life Cycle Dates & Milestones, Product Bulletin No. 2214 for more information.

Cisco IOS Software Life Cycle Time Frames

Figure 6. Cisco IOS Software Life Cycle Time Frames—IOS T and IOS S, and Release 12.0S



Note:

- The End of Engineering (EoE) schedule is up to 48 months from FCS.
- The End of Sales (EoS) and EoL milestones are based on EoE time frames.
- Cisco recommends that release review and migration planning start at 36 months.

Life Cycle of Cisco IOS XE Software Releases

Figure 7. Cisco ASR 1000 Series Router Standard-Support Software End-of-Life Timeline

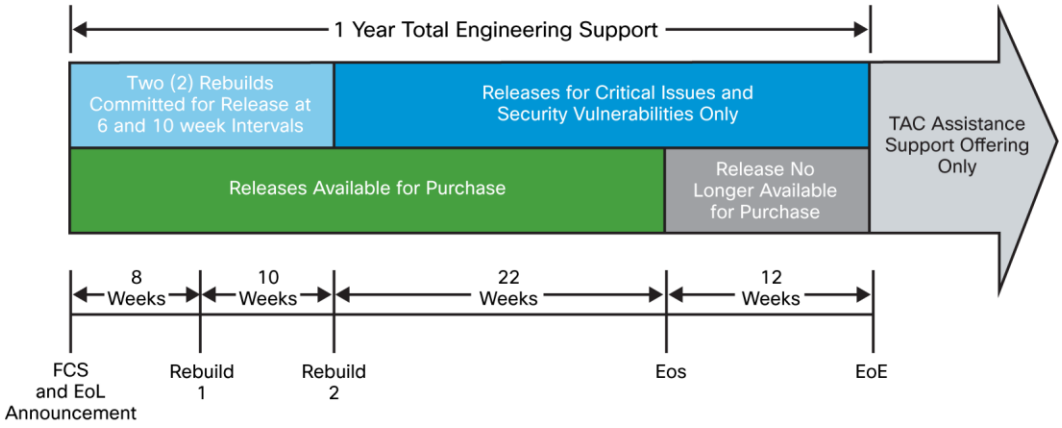
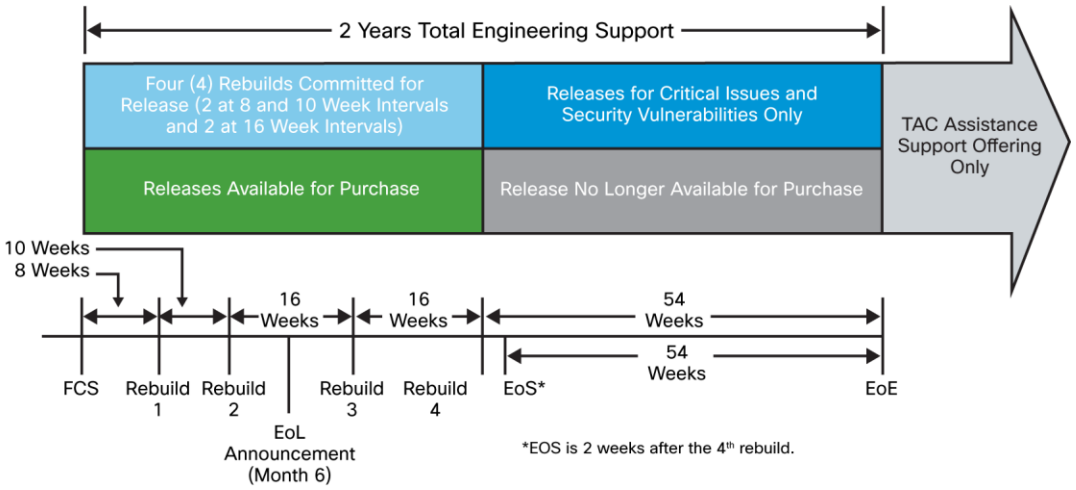


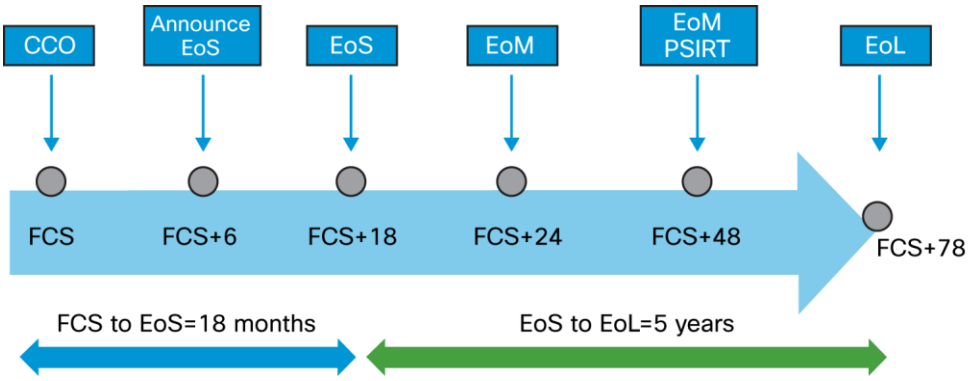
Figure 8. Cisco ASR 1000 Series Router Extended-Support Software End-of-Life Timeline



Life Cycle of Cisco IOS XR Software Releases

This figure illustrates primary milestones of a feature release life cycle, including the end-of-sale announcement, the end of sale, the end of maintenance support, and the end of maintenance through migration timeframes.

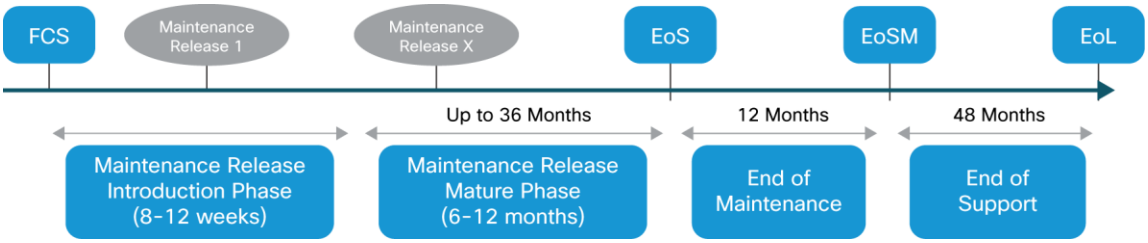
Figure 9. Cisco IOS XR Software Feature Release Life Cycle (not to scale)



Life Cycle of a Cisco NX-OS Software Release

The life cycle of a major release spans several minor and maintenance releases. Figure 2 below illustrates the life cycle of a long-lived release.

Figure 10. Life Cycle of a Long-Lived NX-OS Software Release

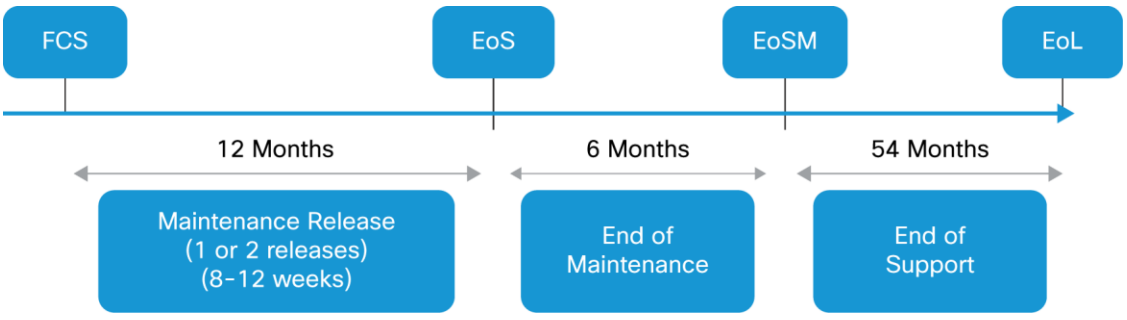


The life cycle of a major long-lived release starts with the First Customer Shipment (FCS) of the first minor release. It represents the date of the first shipment of a software release to customers for revenue.

The major release then enters the maintenance release introduction phase, in which several releases are made available to address product defects.

After the code integrity and stability is established, the long-lived release achieves maturity and broad adoption. At this stage, the major release has been proven with extensive market exposure in diverse deployment scenarios and has passed rigorous metrics analyzing quality, stability, and problem trends. Afterward, the major release transitions to the mature maintenance phase. In this phase, the release receives defect repairs only for severity 1 and severity 2 defects that the customer finds. Problems found internally are addressed on a case-by-case basis.

Figure 11. Life Cycle of a Short-Lived Software Release



After FCS of each short-lived minor release, there is an initial deployment phase in which product defects are addressed in maintenance releases.

To preserve the integrity, stability, and quality of a minor release, one or two maintenance releases will be provided primarily to address product defects. Few or no new features or functions, which can potentially be destabilizing, are added to the maintenance release. Subsequent maintenance releases will be provided on an as needed basis.

Short lived releases reach the End-of-Sale (EoS) milestone about 12 months after FCS, which represents the last date that the product can be ordered through Cisco customer service or manufacturing. Cisco will generally provide a 6-month notice of a product's EoS date or the last day when the affected product can be ordered. The software release will still be available through Cisco.com and remain fully supported by Cisco.

After the EoS milestone, a release achieves End-of-Maintenance (EoM) status, which represents the last potential date for maintenance software to be released. Engineering will no longer actively apply any defect repairs to the release. Software defects are addressed by upgrading to a subsequent release. The product will still be available through Cisco field support offices and Cisco.com.

Finally, the release reaches End-of-Life (EoL) status, in which the software image is no longer supported by Cisco and is removed from Cisco.com.

Software Retirement

Cisco IOS Software placed on the Cisco IOS Software Center remains available for customer download for eighteen months. After eighteen months, the software is eligible for retirement and removal from the Cisco IOS Software Center. The software retirement policy applies to numbered versions of IOS T and IOS S releases, such as Cisco IOS Software Release 12.4(25a), 12.4(24)T1, 12.2(31)SG1, and Cisco IOS Software Release 12.0S.

Software on the Cisco IOS Software Center is not retired unless a viable migration path exists. A viable migration path does not cross critical memory boundaries for supported hardware and, if applicable, has a similar internal or external certification. Cisco IOS Software is subject to deferral at any time should a widespread, catastrophic software defect be discovered.

Software retirement is not a formal life cycle milestone, but it does underscore the recommendation from Cisco that you implement current versions of Cisco IOS Software. Cisco does not recommend new deployments of retired software.

Cisco IOS Software is retired based on age. If the Cisco IOS Software that runs in a customer network is retired, it does not mean the software must be automatically replaced. If the software meets customer needs, then the customer can continue to use it. Cisco supports retired software until it reaches End of Life.

Regardless of its status on the Cisco IOS Software Center, Cisco recommends that you maintain copies of all Cisco IOS Software in the network.

Important Communications About Cisco IOS Software Releases

Cisco issues many software advisories to customers for informational purposes only. Often, software advisories describe problems with Cisco IOS Software that are hardware-specific or occur under unusual circumstances, and therefore do not affect most customers. Often, no action is required by the customer.

These critical software release communications from Cisco do require customers to evaluate the impact of the underlying problem on their networks and take appropriate action:

- **Security Advisory**—Product Security Incident Response Team (PSIRT) issues a security advisory to alert customers to security issues that directly impact Cisco products and to help customers repair the Cisco product.
- **Security Notices**—Cisco issues Security Notices about issues that require a response to information posted to a public forum, or to make recommendations to mitigate general problems that affect network stability.
- **Deferral Advisory**—Cisco issues a deferral advisory to announce the removal of a Cisco IOS image from the offerings of Cisco and to introduce a replacement image. A deferral advisory is most often issued to correct a critical defect. At the time that the deferral of a Cisco IOS image is advised, customers are strongly urged to migrate from the affected image to the replacement image.

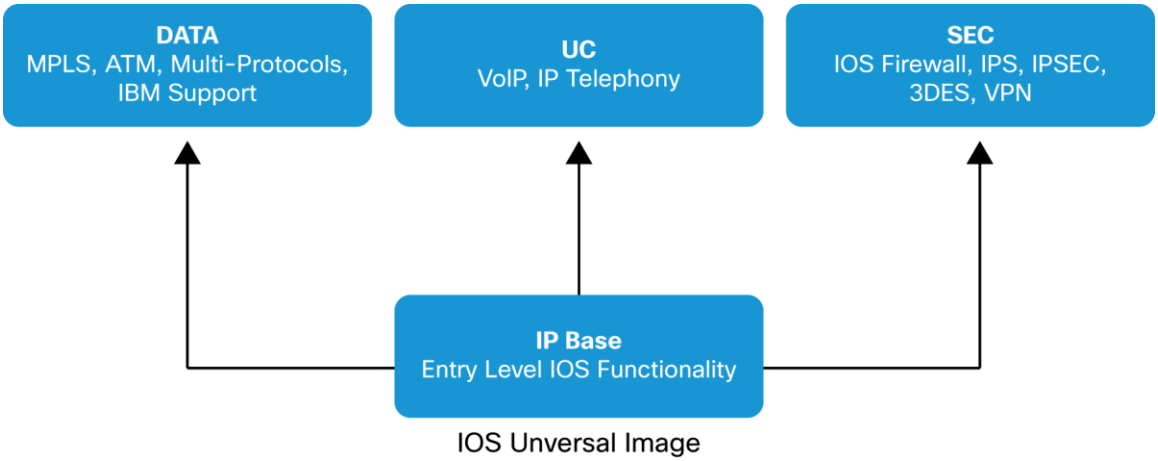
Cisco IOS Packaging

The Cisco ISR 1900, 2900 and 3900 Series adopt the universal IOS image model enabling customers to future proof their networks. This revolutionary software module offers a simplified choice of software technology packages providing operational efficiencies and reduced test cycles to enable faster deployment of services. Unlocking of feature sets in the universal image is supported by using Cisco Software license keys.

The simplified packaging model will simplify software management through four IOS enforceable technology package licenses that enable full suite of IOS software functionality. IOS technology package upgrades can be done by enabling a new license key, reducing the need for truck-rolls to remote offices. The model supports the "pay as you grow" model by allowing purchase of an upgrade as you need it via Cisco Software Licensing.

The universal IOS image is loaded by Cisco manufacturing on all shipped routers. An IOS universal image contains all IOS features. Feature sets in the universal image are unlocked using licensing keys, i.e. the level of IOS functionality available is determined by the license applied to the device. A new license only needs to be applied to upgrade IOS functionality on the router. Maintenance upgrades of IOS, i.e. moving from one IOS universal image version to another, does not require a new licensing key. Reboot of a router is also licensing transparent.

Figure 12. IOS Packaging Model for 1900, 2900 and 3900 ISRs



Each device ships with universal image, IPBase, DATA, Unified Communications (UC) and Security (SEC) technology packages are enabled in the universal image via Cisco Software Activation licensing keys. Each licensing key is unique to a particular device and is obtained from Cisco by providing the product ID and serial number of the router and a Product Activation Key (PAK), which is provided by Cisco at time of software purchase. Cisco installs license key(s) for software specified at the time of initial router purchase.

On each shipped device, an IPBase software activation key is installed by default. Additional keys are installed by manufacturing depending on the customer order.

The details of each technology package license can be found in the table below. The new ISR routers also offer a Software Activation feature license and right to use feature licenses. The Software Activation feature licenses use the same Software Activation model as the technology package licenses, while right to use feature licenses are not

enforced. Feature licenses work in conjunction with technology package licenses, e.g. the SSLVPN feature license requires a SEC technology package license.

Table 10.

Technology Package	Details	Software Activation Feature Licenses	Right to Use Feature Licenses
IPBaseK9	Offers features found in IPBase IOS image on ISR 1900,2900 and 3900 + Flexible NetFlow + IPV6 parity for IPV4 features present in IPBase. Some of the key feature are AAA BGP, OSPF, EIGRP, ISIS, RIP PBR IGMP, Multicast DHCP HSRP, GLBP NHRP HTTP HQF QoS ACL, NBAR GRE CDP, ARP NTP PPP PPPoA PPPoE RADIUS TACACS SCTP SMDS SNMP STP VLAN DTP IGMP Snooping SPAN WCCP ISDN ADSL over ISDN NAT-Basic X.25, RSVP, NTP, Flexible NetFlow etc.	None	None
SECK9	Offers the security features found in the advanced security IOS image on the ISR 1900,2900 and 3900 e.g. IKE v1 / IPsec / PKI, IPsec/GRE, Easy VPN w/ DVTI, DMVPN, Static VTI, Firewall, Network Foundation Protection,GETVPN etc.	SSLVPN (Counted) Intrusion Prevention (Subscription) Content Filtering (Subscription)	None
UC	Offers the UC features found in IPVoice IOS image on the ISR 1900,2900 and 3900 e.g. TDM/PSTN Gateway, Video Gateway[H320/324],Voice Conferencing, Codec Transcoding, RSVP Agent (voice), FAX T.37/38, CAC/QoS, Hoot-n-Holler etc.	Gatekeeper	Land Mobile Radio CME: Voice & Video (Counted) SRST: Voice & Video (Counted) VXML/IVR Gateway (Counted) CUBE [IPIP Gateway] (Counted)
Data	Data features found in SP services and enterprise services IOS image on the ISR 1900,2900 and 3900 e.g. MPLS, BFD, RSVP ,L2VPN, L2TPv3 ,Layer 2 Local Switching , Mobile IP, Multicast Authentication,FHRP-GLBP ,IP SLAs, PfR ,DECnet, RSRB, BIP, DLSw+, FRAS, Token Ring ,ISL, IPX ,STUN, SNTP, SDLC, QLLC etc.	SNA Switching	None

Migration to Simplified Packaging

The table below outlines the suggested migration from reformation packaging in ISRs to simplified packaging on next generation ISRs. The transition matrix outlines transition with feature parity in mind across transitions.

Table 11.

IOS Reformation Packaging	Suggested Transition
IPBase	IPBase
IP Voice	UC
Enterprise Base	DATA
Enterprise Services	DATA + UC
SP Services	DATA + UC (for feature Parity and Enterprise Features)
Advanced Security	SEC
Advanced IP Services	SEC + UC + DATA (for feature Parity and Enterprise Features)
Advanced Enterprise Services	SEC + UC + DATA

Cisco IOS XR Packaging

The IOS XR equivalent of feature sets is called packages. Each package contains many features. Go to the Cisco IOS XR Software selector in order to determine the feature content of each package: http://www.cisco.com/en/US/partner/products/ps5763/products_product_indices_list.html

Cisco IOS and IOS XR Images

A Cisco IOS image is a binary executable file of a feature set for specific hardware. A Cisco IOS XR image is a tar or pie file, which contains a package oset of packages, respectively. Multiple images exist for Cisco IOS and Cisco IOS XR releases. The images represent supported hardware and feature set (IOS) or package (IOS XR) combinations.

Image Naming

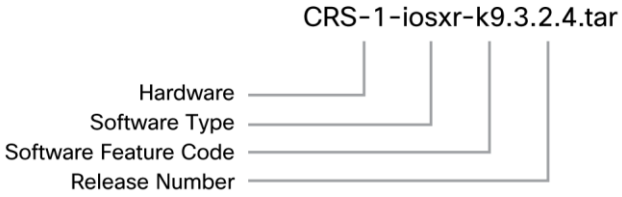
The Cisco IOS software image name represents the hardware, feature set, format and other information about the image file. The following figure shows the image name of a 12.4(6)T Release with the enterprise base feature set for the Cisco 3725.

Figure 13. Example of a Cisco IOS Image Name

Refer to the image naming conventions section of loading and maintaining system images for information about how to identify the platform or board for which the binary software is built, the package feature content of the image, and the area of memory used by the image at run time.

The following figure shows the image name of an IOS XR Release 3.2.4 with the IP/MPLS core software 3DES package for the CRS-1.

Figure 14. Example of a Cisco IOS XR Image Name (TAR)



The following figure shows the image name of an IOS XR Release 3.2.4 with the Cisco IOS/XR diagnostics package for the CRS-1. The acronym hfr was an early name for the IOS XR.

Figure 15. Example of a Cisco IOS XR Image Name (PIE)

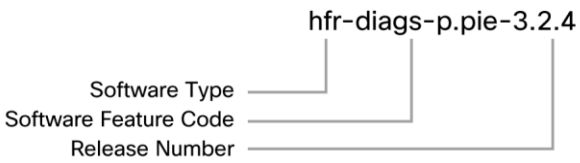


Table 12. IOS XE Naming Conventions

Naming Convention Parts	Description
cat4500e	Platform Designator
universal	Feature Set Designator
k9	Crypto Designator if crypto code is present in IOSd package
SPA	Indicates image is digitally signed
03.01.00.SG	Release Version number
150.01.XO	IOSd package version number—this will allow you to correlate the version of IOSd to another platform running classic IOS

Figure 16. Examples:

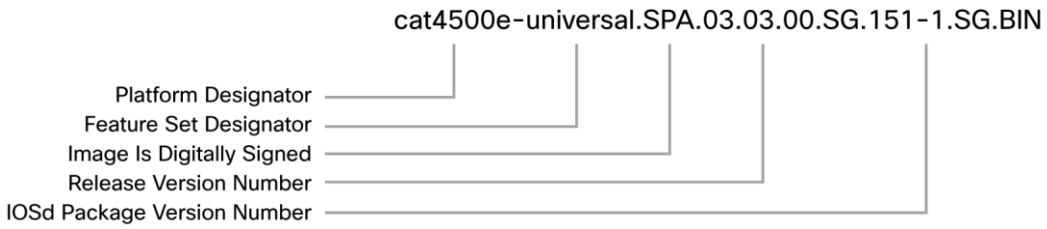


Table 13. IOS NX-OS Naming Conventions

Cisco NX-OS Software Release Type	Description
Major release or software train	A major release or software train introduces significant new features, functions or hardware platforms. **Examples:** Releases 4 and 5.
Minor release	Each major release consists of multiple minor releases. Each minor release enhances a major release with new features. **Examples:** Releases 4.2 and 5.1.
Maintenance release	A maintenance release primarily resolves product defects in a minor release. Helping ensure that each maintenance release addresses product defects preserves the integrity and stability of the minor release. No new features are added in a maintenance release, except on an exception basis. **Examples:** Releases 4.2(6) and 5.1(3).

Images That Run on a Router

The show version command displays the name of the Cisco IOS image or a Cisco IOS XR image that is running.

Figure 17. Cisco IOS Software Release 12.4(6)T Output from the show version Command

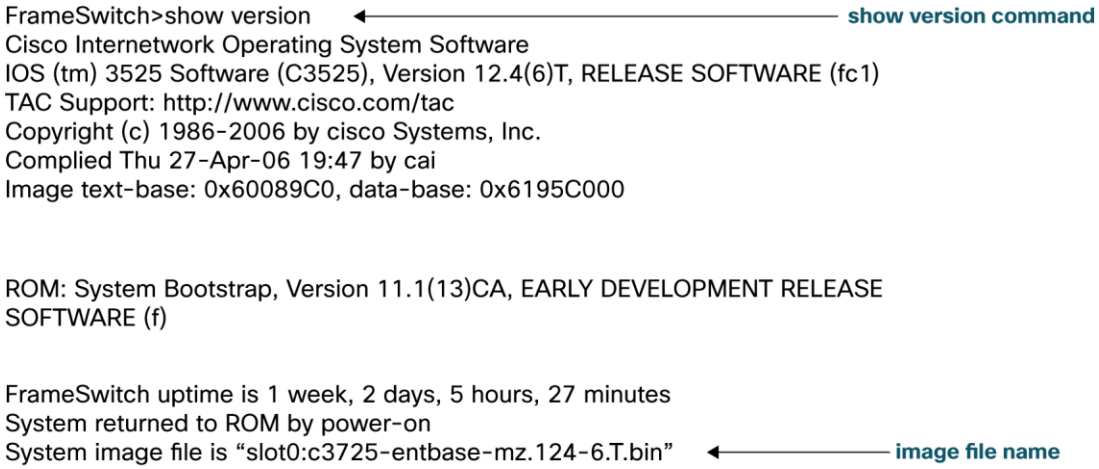
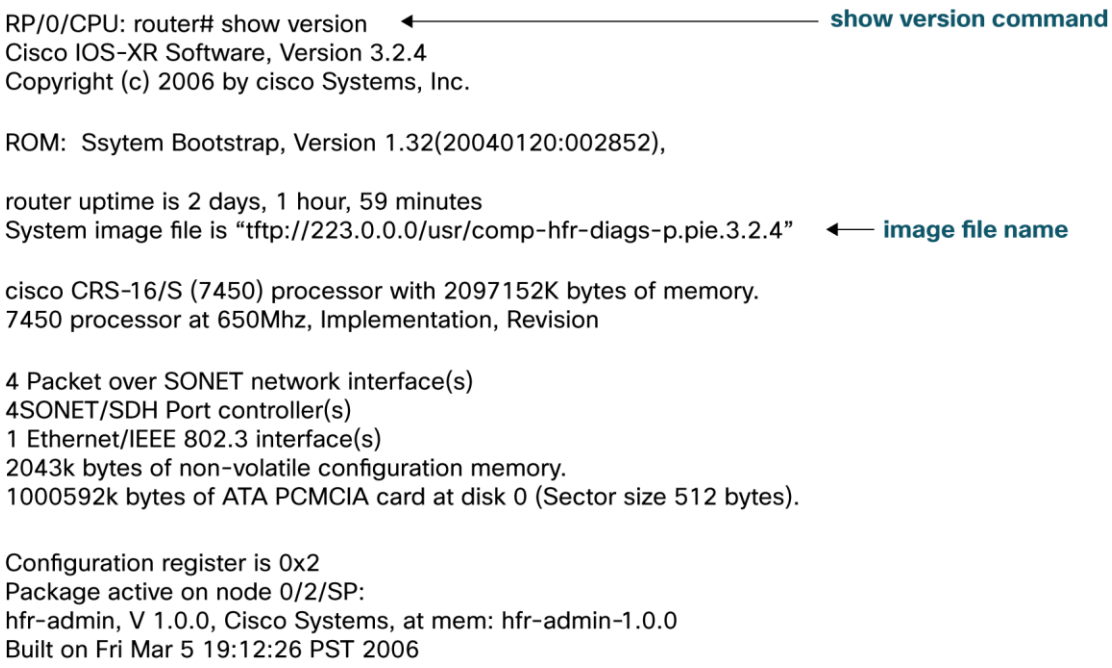


Figure 18. Cisco IOS XR 3.2.4 Output from the show version Command



The following table briefly describes some of the most useful Cisco tools for planning a Cisco IOS release migration.

Table 14. Tools and Resources

Tool	Description
Bug Search Tool (registered customers only)	Searches for known bugs based on software version, feature set and keywords.
Software Research	View Cisco suggested software for supported products. Research for software versions based on your needs.
Cisco IOS Software Documents	Documentation for each release of Cisco IOS Software.
Feature Navigator (registered customers only)	Finds releases that support a set of software features, platforms and compares releases.
Software Center	Download software releases from this site.
Support and Downloads	Support documentation and tools.

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