

New Features for Cisco 7600 Series with Cisco IOS Software Release 15.0(1)S

Cisco® IOS Software Release 15.0(1)S for the Cisco 7600 Series introduces more than 40 new features for service providers and advanced enterprise customers. The release provides more new capabilities to drive the transformation to the Cisco IP NGN. With Cisco IOS® Software Release 15.0(1)S, service providers can increase scale, improve operations, strengthen network resiliency, and create new services.

Features and Benefits

The feature richness and flexibility of the Cisco 7600 Series make it uniquely suited to meet the requirements of a wide range of markets and applications. Benefits extend across mobility, video, and triple-play (voice, video, and data) services. The benefits apply to residential, business, and wholesale markets.

New features include:

- **IEEE 1588-2008 and Synchronous Ethernet (SyncE) Ethernet Synchronization Messaging Channel (ESMC) and Synchronization Status Messages (SSM)** to give mobile operators the clocking solutions they need to migrate to an all-Ethernet third-generation (3G) and fourth-generation (4G) mobile network
- **Inline Video Monitoring** to improve service-level agreements (SLAs) for video delivery and lower management costs
- **Border Gateway Protocol (BGP) peering enhancements** to ease BGP configuration, optimize network operation, and reduce downtime.

Cisco IOS Software Release 15.0(1)S includes the proven capabilities of Cisco IOS Software Release 12.2(33)SRE. The release numbering is changing to present a simplified approach that aligns with a range of quality enhancements, including:

- Faster time to market – feature release planned every 4 months
- Improved quality – production-ready releases sooner
- Broadened operational consistency of features and advanced technologies
- Predictable schedule for new features and rebuilds
- Proactive communication on software selection, support lifecycle, and migration

New Features

Cisco 7600 Series customers can take advantage of the new features listed in Table 1. For a complete list of all features delivered in Cisco IOS Release 15.0(1)S, please visit the [Release Notes](#) homepage.

Table 1. Features and Benefits

Feature	Benefit
Hardware	
Support for 2-port gigabit Synchronous Ethernet (SyncE) shared port adapter (SPA)	Customers achieve an increased ROI with an integrated timing solution on the Cisco 7600 Series Routers; the solution provides IEEE1588-2008 and SyncE SPA support.
Support for second-generation ATM SPAs	Hardware improvements enable customers to continue deploying ATM services with improved flexibility and stability.

Feature	Benefit
WAN physical layer (PHY) and Optical Transport Network (OTN) support on Cisco 7600 Series Ethernet Services Plus Extended Combination (ES+XC) line cards	ES+XC line cards now support WAN PHY and IP over Dense Wave Division Multiplexing (IPoDWDM) to provide more configuration options that may lower transmission costs and improve management.
Tunable DWDM XFP (small form factor pluggable) for ES+ line cards	Enables tunable DWDM XFP on the Cisco 7600 Series. One part ID (PID) covers all wavelengths for ease of configuration and lowered operating expenses. Support is available on Cisco ES+XT, ES+XC, and ES+T line cards.
10-gigabit multimode short-reach XFP transceiver modules for ES+ line cards	Provides a low-cost solution for connecting the Cisco 7600 Series to other platforms when collocated in the same office. Support is available on Cisco ES+XT, ES+XC, and ES+T line cards.
Electrical Synchronous Transport Module Level-1 (STM1) for first- and second-generation ATM SPAs	The STM1E and SFP support on the Cisco OC3 SPA deliver connectivity when only electrical transport is available.
Mobile Transport	
IEEE 1588-2008 Precision Clock Synchronization Protocol support	Supports convergence to an all-Ethernet 3G and 4G mobile network, including time-of-day synchronization.
Synchronization messaging with Synchronization Status Messages and Ethernet Synchronization Messaging Channel (SSM/ESMC)	Integrates synchronization management on an all-Ethernet 3G and 4G mobile network. Achieve a greater ROI with an integrated SyncE timing solution on the Cisco 7600 platform with ESMC support and SSM integration. Available on ES+ line cards and on the 2-port gigabit SynchE SPA.
Bidirectional Forwarding Detection (BFD) Virtual Circuit Connectivity Verification (VCCV) for ATM access circuits	Extends the benefit of BFD for fault detection to ATM pseudowires. Customers who have ATM services can realize better convergence with fast fault detection.
BFD over port channel	Extends the benefit of BFD to port channel for better convergence with fast fault detection.
Bridged Routed Encapsulation (BRE) and Automatic Protection Switching (APS) support on Cisco 7600 Series SPA Interface Processor-400 (SIP400) and SIP200	Conserves valuable VLAN resources with a simplified configuration for BRE with SONET/SDH APS.
Video and Multicast	
Inline Video Monitoring	Video Monitoring support on ES+ line cards allows inline monitoring of unicast or multicast streams.
Support for static pseudowires over Point-to-Multipoint (P2MP) Traffic Engineering (TE) tunnels	Provides option to configure static pseudowires over P2MP-TE tunnels to enable P2MP Layer 2 VPN service (Metro Ethernet Forum E-Tree).
P2MP MPLS-TE Nonstop Forwarding (NSF) and Stateful Switchover (SSO)	NSF and SSO awareness supports P2MP MPLS-traffic engineering tunnels.
Service Provider Edge Services and Carrier Ethernet	
802.1ad full compliance	Improves interoperability for multivendor environments.
Resilient Ethernet Protocol (REP) configurable timers (REP Fast Hellos)	Allows the configuration of very short intervals for REP hellos to permit faster convergence.
BGP peering enhancements	New enhancements ease BGP configuration, optimize network operation, and reduce downtime.
BGP local convergence for IPv6 VPN Provider Edge and IPv6 Provider Edge	Reduces the downtime of a provider-edge-to-customer edge link failure.
DHCP RADIUS proxy enhancements	Improves performance and operational scale and simplifies address pool management.
General Packet Radio Service (GPRS) Tunneling Protocol Session Load Balancing (GTP-SLB) IPv6 Support	Supports IPv6 with Long Term Evolution (LTE) services on the Cisco Service and Application Module for IP (SAMI).
Quality of Service	
802.3 Link Aggregation with weighted load balancing	Improves link utilization to lower operating costs when taking advantage of the service scale and flexibility of the Cisco Ethernet Virtual Connection (EVC) infrastructure.
Class-Based-QOS MIB for EVC	Improves manageability with flexible tag mapping and services scaling.

Hardware

2-Port Gigabit Synchronous Ethernet SPA Support

This new half-height SPA, with a variety of physical input interfaces, fits into the SIP-400 of the Cisco 7600 Series to provide timing services. The SPA is capable of accepting inputs from GPS, building integrated timing supply (BITS), and the Gigabit Ethernet interfaces while providing both SyncE and IEEE 1588-2008 support. Customers can achieve the flexibility of SyncE, IEEE 1588, or hybrid solutions to realize the financial benefits of an integrated timing solution.

The 2-Port Gigabit SynchE SPA is the main vehicle that provides IEEE 1588-2008 on the Cisco 7600 Series. The SPA can also function in a service SPA mode to provide highly scaleable full clocking functionality.

For more information, please refer to the [Release Notes](#) and the Cisco 2-Port Gigabit Synchronous Ethernet SPA [data sheet](#).

PID: SPA-2X1GE-SYNCE

Support

Available on the 7600-SIP-400. Compatible with all chassis, route switch processors (RSPs), and supervisors (SUPs).

ATM Second-Generation SPAs

The second generation of ATM SPAs offers the same great functionality and flexibility for ATM services on the Cisco 7600 Series platform, while improving stability and investment protection.

For more details, see the datasheet for the Cisco [ATM Second-Generation SPAs](#).

PIDs: SPA-1xOC3-ATM-V2, SPA-3xOC3-ATM-V2 and SPA-1xOC12-ATM-V2

Support

Available on the SIP-200 and SIP-400. Compatible with all chassis, RSPs, and SUPs.

WAN PHY and OTN Support on ES+XC Combination Line Cards

This feature provides software support for OTN (IPoDWDM) and WAN PHY modes on 10GE ports on the ES+XC line cards, including:

- OTN mode (available with the purchase of the 76-ES+OTN-LIC license): Enables interconnect with G.709/OTN equipment (for example, the Cisco ONS15454 Multiservice Transport platform, Cisco CRS-1, and Cisco ASR 9000 IPoDWDM). Includes support for G.709 Generic Forward Error Correction (G-FEC) and G.975.1.4 Enhanced Forward Error Correction (E-FEC).
- WAN PHY mode: Enables interconnect with OC-192 SONET or STM-64 SDH equipment.

For more details, see the [ES+XC Line Card data sheet](#).

Support

Available with Cisco 7600 Series ES+XC line cards (feature compatibility with ES+XT and ES+T line cards).

Licensing

OTN mode is available with the purchase of the 76-ES+OTN-LIC license.

Tunable DWDM XFP for ES+

Enables pluggable and tunable 10G DWDM capabilities in the C band on Cisco Ethernet Services ES+XT, ES+XC, and ES+T line cards to support IPoDWDM solutions. One PID covers all wavelengths, reducing the cost of inventory and sparing at the customer site.

Support

Available with Cisco ES+XT, ES+XC, and ES+T line cards.

XFP-10G-MM-SR for ES+

The 10GBASE-SR XFP is dedicated to Ethernet applications and LAN PHY only. It supports a link length of 26m on standard FDDI-grade MMF. Up to 300m link lengths are possible when using 2000 MHz/km MMF (OM3). For further information, see:

www.cisco.com/en/US/prod/collateral/modules/ps5455/ps6574/product_data_sheet0900aecd802a61b9.html and www.cisco.com/en/US/docs/routers/7600/Hardware/12.2SR_supported_hw/7600_hwd.html.

Support

Available with Cisco ES+XT, ES+XC, and ES+T line cards.

Electrical STM1 for v1 and v2 ATM SPAs

The STM1E-SFP allows customers to connect to a Cisco 7600 Series Router in situations where only electrical transport facilities are available.

Support

Table 2. SIP and SPA support for STM1E-SFPs

PID	SIP200		SIP400	
ONS-SC-OC3-EL	SPA-1XCHSTM1/OC3	SPA-2XOC3-ATM	SPA-1ChOC3-CE-ATM SPA-1XCHSTM1/OC3	SPA-2XOC3-ATM
		SPA-4XOC3-ATM		SPA-4XOC3-ATM
		SPA-1XOC3-ATM-V2		SPA-1XOC3-ATM-V2
		SPA-3XOC3-ATM-V2		SPA-3XOC3-ATM-V2
		SPA-2XOC3--POS		SPA-2XOC3--POS
		SPA-4XOC3-POS		SPA-4XOC3-POS
IOS Release	12.2(33)SRD2	15.0(1)S	12.2(33)SRD2	15.0(1)S

Mobile Transport**Support for IEEE 1588-2008 Precision Clock Synchronization Protocol**

IEEE 1588-2008 is one of the new standards to deliver timing services over the packet network efficiently and reliably. The standard offers the flexibility of requiring only the end nodes to participate in the timing services, allowing customers to leave an existing network untouched in the middle. The standard also offers support for phase and time-of-day (TOD) synchronization, which will be critical for 4G LTE services for the mobile market. Customers can now deploy IEEE 1588-2008 with the Cisco 7600 Series to capture the opportunities associated with the rapid growth in the mobile market.

The initial release supports Ordinary Clock and Boundary Clock modes with the capability to support Unicast and Multicast. Transparent Clock mode is planned.

Support

Available on the Cisco 2-Port Gigabit Synchronous Ethernet SPA, which requires the SIP-400 line card.

SyncE: ESMC and SSM

SyncE is one of the recent standards to deliver timing services over the packet network efficiently and reliably. SyncE provides frequency synchronization accuracy on Gigabit Ethernet greater than that of time-division multiplexing (TDM) networks, because its transmission is directed from the Ethernet PHY. The Cisco 7600 Series supports Layer

1 SyncE in earlier releases. With ESMC and SSM support, customers can take full advantage of the benefits of SyncE to capture the opportunities offered by the rapid growth in the mobile market.

Support

Available on ES+ line cards as well as the 2-Port Gigabit Synchronous Ethernet SPA with SIP-400 line card.

BFD Control Channel over VCCV: Support for ATM Pseudowire

BFD provides fast fault detection for many services. With the introduction of BFD VCCV for ATM AC, customers can use the BFD feature in ATM pseudowires and gain the benefits of a fast detection mechanism to ensure that their networks converge quickly, helping protect mission-critical services and fulfilling SLAs.

Support

Available with SIP-400 and ATM services.

BFD over Port Channel

With the introduction of BFD over port channels, customers can make use of the high-availability benefits of a fast detection mechanism to help their networks converge quickly.

Support

Available on ES+ line cards, ES20 line cards, WS-6700 series line cards, and all RSPs and SUPs.

BRE plus Sonet/SDH APS Enhancements

This feature improves the BRE connections command-line interface (CLI) to allow two virtual connections per VLAN, doubling the available VLAN resources. The virtual connections must belong to the same APS group.

Support

This feature is supported on the SIP-400 and SIP-200 line cards.

Video

Inline Video Monitoring

Video monitoring support on Cisco ES+ line cards provides inline monitoring against SLAs that directly correspond to the quality of the video that the viewer sees. Without the use of external probes, inline video monitoring delivers:

- Up to 40 Gbps per slot
- Both ingress and egress ports
- Unicast or Multicast streams
- Compressed and uncompressed streams
- Variable-bit-rate (VBR) and constant-bit-rate (CBR) streams

Inline video monitoring supports the following metrics:

- Media Delivery Index (MDI), consisting of delay factor, media loss rate (MLR) and media discontinuity count (MDC) for MPEG audio and video within Multiprogram Transport Streams (MTPSs).
- Delay factor and media rate variation (MRV) for IP CBR streams.

For management purposes, media stop events (MSEs) and threshold crossing alerts are reported. Syslog support, full integration with the Cisco Video Assurance Management Solution, as well as SNMP MIB support is provided.

Media Delivery Index (DF: MLR) is defined in [RFC 4445](#). MDC is a Cisco extension to this metric.

Cisco Video Assurance Management Solution: www.cisco.com/en/US/products/ps9518/index.html.

To see a video demonstration of inline video monitoring from Cisco in action, visit www.cisco.com/web/solutions/routingswitching/vidmon.html.

Support

This feature is available on Cisco 7600 Series ES+ line cards.

Licensing

Inline video monitoring is available with the purchase of the 76-ES+VIDEO-LIC license.

Support for Static Pseudowires over P2MP TE Tunnels

Static pseudowires to allow P2MP Layer 2 VPN service (Metro Ethernet Forum E-Tree) are now supported. The static pseudowires are built over P2MP MPLS TE /RSVP tunnels from a single headend router to multiple tail end routers for predictable high-performance resiliency and improved SLAs.

P2MP MPLS-TE NSF/SSO

NSF and SSO awareness now supports P2MP MPLS-TE tunnels.

Service Provider Edge Services and Carrier Ethernet

802.1ad Full Compliance

Cisco 7600 Series supports Q-in-Q, which is a Cisco solution for double tagging to address VLAN scalability in the provider network. The Cisco 7600 Series also supports Cisco Layer 2 Protocol Tunneling (L2PT), which is used for tunneling of customer control packets. IEEE 802.1ad addresses the VLAN scalability in the same manner as Q-in-Q and L2PT in provider networks, using standard protocols. IEEE 802.1ad is standardized Q-in-Q. It provides the same functionality as Q-in-Q and L2PT. This enhancement improves interoperability for multivendor environments.

Support

This feature is supported on Cisco ES+, ES20, and LAN line cards and not supported on SIP-400 line cards.

REP Configurable Timers (REP Fast Hellos)

This enhancement allows shorter configurable intervals for REP hello timers, to deliver REP hellos with intervals as short as 40ms (120ms age-out timer) for faster convergence, particularly for copper SFPs.

BGP Peering Enhancements

A set of BGP enhancements allows to simplified and optimized BGP network design and operation, as well as enhanced resiliency.

BGP: Remove/Replace Private Autonomous System Filter

Often network operators use private BGP AS numbers, especially with MPLS VPN networks. This practice leads to a mixture of private and public AS numbers in the AS-PATH. Previously, Cisco IOS Software only allowed for the removal of private AS numbers from the AS-PATH in cases where only private numbers are included in the path.

With this enhancement, you can remove private AS numbers out of AS-PATH that includes a mixture of private and public numbers. Now you can remove the private AS numbers and also replace the private AS number entries in the AS-PATH with the local router's public AS number; this enhancement lets you maintain the AS-PATH length.

BGP Dynamic Neighbors

Before this enhancement, you had to specify BGP neighbors explicitly one by one. Network operators who either have a lot of "trusted" BGP peers (such as iBGP [internal BGP] peers inside the operator's operational boundary) to

which they want to establish BGP sessions, or even want to establish BGP sessions to servers, the BGP neighbor configuration can become an administrative burden.

This enhancement allows you to establish BGP sessions in a dynamic way from sources in a configurable IP subnet, without issuing neighbor commands for each BGP peer; this method greatly reduces the number of configuration lines necessary and simplifies the network provisioning effort.

BGP NSR (with SSO and ISSU)

In case of a SUP or RSP failure, BGP NSR allows a stateful switchover to the standby SUP or RSP without requiring any special capability from the BGP peers that are connected to the router running BGP NSR and experiencing the failure. This feature is especially useful for external BGP (eBGP) peering, where the network operator may not have an influence on the router configuration and product capabilities of the eBGP peers.

BGP Slow Peer

BGP update groups can help optimize BGP update generation for BGP peers with identical output policies, by grouping them together and sharing BGP update formatting and generation processing. In case some BGP peers (referred as “slow peers”) fall behind in accepting BGP updates, other BGP peers in the same update group will wait, and slow BGP convergence will be the consequence.

The BGP Slow Peer enhancement overcomes this disadvantage of update groups by detecting slow peers and dynamically moving them to a dedicated update group; this way, other BGP peers in the update group do not wait. The slow peers are monitored, and when they accept updates normally, slow peers are moved back into the original update group. The enhancement also allows for static configuration of slow peers.

MPLS VPN: BGP Local Convergence for 6VPE/6PE

This functionality originally applied to IPv4 MPLS VPNs and reduces downtime in case of a provider-edge-to-customer-edge link failure. It does so by rerouting provider edge egress traffic onto a backup path to the CE before BGP has reconverged. This enhancement extends support to IPv6.

For more details, please refer to [Cisco documentation](#).

DHCP RADIUS Proxy Enhancement

The DHCP RADIUS Proxy is enhanced to allow assigning addresses or pools to a host through RADIUS. When a DHCP discovery packet comes to the edge router, an authorization request is sent to RADIUS. RADIUS returns attributes that allow the assignment of the IP address and DHCP pool. Accounting start and stop messages are also generated. The feature works in a sessionless context only.

Benefits include improved performance, operational scale, and simplified address pool management.

GPRS Tunneling Protocol (GTP)-Session Load Balancing (SLB) IPV6 Support

Next-generation mobile applications defined in LTE require support for IPv6 addresses. To enable LTE Release 1.5, SLB now supports GTP tunnel creation for a request packet that comes from IPv6. Tunnel creation based on IPv6 provides for the load balancing to be based on IPv6 so that traffic can be delivered to/from the Cisco SAMI service modules for LTE with IPv6 that are resident on the Cisco 7600.

Quality of Service

802.3ad Link Aggregation with Weighted Load Balancing

Load balancing for EVC over port-channel and Link Aggregation Control Protocol (LACP) is performed on each EVC. This feature introduces configurable weights that you can use to select the member link for each EVC. Traffic splits more evenly than before across member links, because chosen weights are proportional to the expected load.

Customers benefit from improve link utilization to lower operating costs when taking advantage of the service scale and flexibility of the Cisco EVC infrastructure.

Support

Available on ES+, ES20, and SIP400 line cards.

Class-Based-QoS MIB for EVC

The Cisco Class-based-QoS-MIB is a valuable management MIB that allows polling of Modular QoS CLI (MQC) policy-map statistics through SNMP. This feature introduces support for this MIB in the EVC infrastructure. Benefits include improved manageability with flexible tag mapping and services scale.

Support

Available on ES+, ES20, and SIP400 line cards.

Ordering Information

Customers can upgrade their Cisco 7600 Series Routers from Cisco IOS Software Release 12.2 SR to Cisco IOS Software Release 15.0(1)S.

Cisco IOS Software Release 15.0(1)S inherits the features of Cisco IOS Software Release 12.2(33) SRE and earlier releases for upgrades without affecting existing services. For additional details, see the Release Notes for Cisco IOS Software at www.cisco.com/cisco/web/psa/default.html

To place an order, visit the Cisco Ordering Home Page. To download software, visit the [Cisco Software Center](#).

Table 3. Ordering Information

Product Name	Part Number
Cisco 7600-RSP720 IOS Advanced Enterprise Services SSH	S764AEK9-15001S
Cisco 7600-RSP720 IOS Advanced IP Services SSH	S764AIK9-15001S
Cisco 7600-RSP720 IOS Advanced IP Services	S764AIS-15001S
Cisco 7600-RSP720 IOS IP Services SSH	S764ISK9-15001S
Cisco 7600-RSP720 IOS IP Services	S764IS-15001S
Cisco 7600-SUP720 IOS Advanced Enterprise Services SSH	S763AEK9-15001S
Cisco 7600-SUP720 IOS Advanced IP Services SSH	S763AIK9-15001S
Cisco 7600-SUP720 IOS Advanced IP Services	S763AIS-15001S
Cisco 7600-SUP720 IOS IP Services SSH	S763ISK9-15001S
Cisco 7600-SUP720 IOS IP Services	S763IS-15001S
Cisco 7600-SUP32 Advanced Enterprise Services SSH	S732AEK9-15001S
Cisco 7600-SUP32 Advanced IP Services SSH	S732AIK9-15001S
Cisco 7600-SUP32 Advanced IP Services SSH	S732AIS-15001S
Cisco 7600-SUP32 IOS IP Services SSH	S732ISK9-15001S
Cisco 7600-SUP32 IOS IP Services	S732IS-1500S

Cisco Services

Cisco Services span each phase of the network lifecycle, leverage extensive expertise unique to Cisco, and assist service providers with risk mitigation, lowered costs, and accelerated time to market for new services.

The unique Cisco Lifecycle approach to services defines the requisite activities to help ensure service excellence at each phase of the network lifecycle: prepare, plan, design, implement, operate, and optimize. Among the many Advanced Services offered by Cisco, Test and Validation Services, in particular, can be very helpful in a transition to Cisco IOS Software Release 15.0(1)S. These services are tailored to the service provider's specific needs. Test

engineering expertise and Cisco lab environments provide service verification, supporting adherence to end-customer SLAs. Services include validation of features, scale, and multi-vendor solutions that result in higher availability, increased capacity, risk mitigation, and reduced cycle times to accelerate deployments.

In addition, Cisco Upgrade and Refresh Services are helpful when moving to a new software release or for any product, technology, or service migration. These services also work with the service provider's specific attributes and provide a cost-effective methodology to prepare, plan, design, and implement an IP Next-Generation Network (NGN) transition for optimal business agility, high availability, security, and subscriber acquisition and retention. Cisco intellectual capital, automation tools, and cumulative migration expertise help make the network transition predictable, as well as accelerating time to adoption of new services.

By using the extensive tools, best practices, and experts offered through Cisco Services, you mitigate risks, bring new services to market faster, lower your costs, improve your customer experience through service assurance, and maximize the value of your investment. With a collaborative delivery methodology that joins the forces of Cisco, our highly skilled network of partners, and our customers, we achieve the best results.

For More Information

Contact your local account representative, or:

To learn more about the Cisco 7600 Series Router, visit www.cisco.com/en/US/products/hw/routers/ps368/index.html.

For more information on Cisco Services visit our [Advanced Services Routing and Switching](#) webpage or the [Cisco Services for Service Provider](#) page.

Additional information on Cisco IOS Software Releases is available at www.cisco.com/go/ios.



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