

Cisco 7600 Series Ethernet Services Plus XT 20G and 40G Line Cards for Carrier Ethernet

The Cisco® 7600 Series Ethernet Services Plus Extended Transport (ES Plus XT) line cards allow service prioritization for voice, video, data, and wireless mobility services and can connect to LAN, WAN, and Optical Transport Network Physical Layer (OTN PHY) interfaces. Service providers and enterprises benefit from the efficiency gains in power consumption, improved economics from higher density, as well as advanced Carrier Ethernet features, which can be transported using G.709 and Forward Error Correction (FEC) across dense wavelength-division multiplexing (DWDM) networks, enabling optical links to span greater distances.

The ES Plus XT cards use an architecture first developed for the Cisco 7600 Series ES Plus card family, with programmable interface processors that protect network investments and reduce total cost of ownership. The extensible design maximizes connectivity options and offers superior service intelligence through programmable interface processors operating at line rate. This data sheet contains the specifications for the Cisco 7600 ES+ Series line cards as shown in Figure 1.

Figure 1. Cisco 7600 Series ES Plus XT line cards: 4-Port 10 GE and 2-Port 10 GE



Product Overview

Designed for interface flexibility and IP-over-DWDM integration in Carrier Ethernet, IP/Multiprotocol Label Switching (MPLS) provider edge, and WAN/MAN applications, the Cisco 7600 Series ES Plus XT line cards support up to 40 Gbps of bandwidth with four ports of 10 Gigabit Ethernet interfaces, or 20 Gbps with two ports of 10 Gigabit Ethernet. The cards feature hierarchical quality of service (QoS), locally significant VLANs, and up to 16,000 VLAN IDs per line card for rich services at scale. The cards provide the unique ability to combine both Layer 2 and Layer 3 services on the same line card. The combination of native Ethernet Layer 2 switching, bridging, Virtual Private LAN Services (VPLS), Ethernet over MPLS (EoMPLS), and Layer 3 IP/MPLS routing distinguishes this line card among other products on the market, particularly in Carrier Ethernet applications.

Additionally, the line cards have integrated G.709 Generic Forward Error Correction (available with the purchase of the 76-ES+OTN/G.709 license) to span regional distances with integration directly into OTN devices such as the Cisco ONS 15454 Multiservice Transport Platform (MSTP) or core routers such as the Cisco CRS-1 Carrier Routing System. The ability to span even greater distances between Cisco 7600 Series Routers is supported with Enhanced Forward Error Correction (EFEC) in the ES Plus XT cards (back-to-back ES Plus XT connections). Operations, administration, and maintenance (OA&M) capabilities are supported in both OTN and WAN PHY interface controller modes, providing insight into link quality and data transmission health.

The ES Plus line cards also include synchronization circuitry enabling them to provide standards-based functions for delivering and deriving transport-class network timing, enabling support of network-synchronized services and applications such as mobile backhaul and time-division multiplexing (TDM) migration.

Recognizing that real-time media dominate next-generation services, Cisco has integrated video monitoring technology into the ES Plus line cards. This multimedia technology enables real-time monitoring and statistics collection for video flows, enabling proactive maintenance and management of today's media-rich services – without the use of additional service modules or external probes. To see a video demonstration of inline video monitoring from Cisco in action, visit <http://www.cisco.com/web/solutions/routingswitching/vidmon.html>

The innovative architecture of these industry-leading, premium Ethernet services line cards is designed to deliver cost-effective high-touch features, combining both application-specific integrated circuit (ASIC) and network processor technology for optimal performance and flexibility. The Cisco 7600 Series ES Plus XT line cards provide distributed forwarding with proven ASIC technology in the forwarding path (routing, switching, NetFlow, access control lists [ACLs]), and queuing and shaping functions to optimize the performance of these foundational features. Additionally, four (for the ES Plus XT 40G line cards) or two (for the ES Plus XT 20G line cards) programmable network processors are included in the forwarding plane to facilitate flexibility and feature growth. This ideal technology combination provides customers with the necessary flexibility for future service deployments and allows them to scale the system capacity as required.

Key Features and Benefits

Table 1. Key Features and Benefits of the Cisco 7600 Series ES Plus XT line cards

Feature	ES+ Plus XT line cards	Benefit
Line card form factor	4-port 10 GE and 2-port 10 GE	Offers economical, high-density, high-performance, premium Carrier Ethernet services with excellent scalability
Performance	Line rate with services enabled	Provides line-rate forwarding performance on GE and 10 GE interfaces with services enabled
Packet memory	512 MB	Up to 200 ms combined bidirectional buffering
Switch fabric connectivity	Two 20-Gbps fabric channels	Utilizes the Cisco 7600 Series 720-Gbps switch fabric for data forwarding; 2 fabric channels are utilized that are not present in slots 1 through 8 on the Cisco 7613 chassis
Online insertion and removal (OIR)	Supports OIR of the line cards	Provides hitless OIR to minimize impact of add/change/remove operations

Product Specifications

Table 2. Product Specifications

Description	Specification
Chassis compatibility	All Cisco 7600 Series Router chassis, except the Cisco 7603, which is end of sale/end of life. The Cisco 7603-S is fully supported.
Central forwarding engine compatibility	Cisco Supervisor Engine 720-3B, 720-3BXL, Route Switch Processor 720 (RSP720) and later. ES Plus line cards require dual-channel switch fabric connectivity; therefore, the cards are not supported with the Supervisor Engine 32 or in slots 1 through 8 of the Cisco 7613 chassis.
Distributed forwarding card (DFC)	Choice of Cisco Distributed Forwarding Card 3C (DFC-3C) or DFC-3CXL Line-rate distributed forwarding with services enabled, up to ~48 Mpps per line card DFC-3C <ul style="list-style-type: none"> • Designed for Carrier Ethernet-based infrastructures • Up to 256,000 hardware-based forwarding entries with DFC-3C • Up to 128,000 NetFlow entries with DFC-3C DFC-3CXL <ul style="list-style-type: none"> • Optimized for IP/MPLS provider edge offering multiple IP services such as Layer 3 VPNs, IPv6, and triple- or quad-play services • Up to 1 million hardware-based forwarding entries with DFC-3CXL • Up to 256,000 NetFlow entries with DFC-3CXL
Minimum software	Cisco IOS® Software Release 12.2SRD1 or later
Packet memory	512 MB for 200 ms of combined input and output buffering at 10 Gbps
Link encapsulations	Ethernet II and IEEE 802.1q encapsulations

Description	Specification								
Hardware queues	<p>ES Plus XT 40G line cards</p> <ul style="list-style-type: none"> • 128,000 ingress queues • 128,000 egress queues <p>ES Plus XT 20G line cards</p> <ul style="list-style-type: none"> • 64,000 ingress queues • 64,000 egress queues <p>Hierarchical QoS (H-QoS)</p>								
MAC addresses	<p>Up to 96,000 MAC addresses per ES Plus XT line card</p> <p>16,000 VLAN IDs per line card (within Flexible QinQ configuration guidelines)</p> <p>Hardware-based MAC learning at wire rate</p>								
Environmental conditions	<p>Operating temperature: 32 to 104°F (0 to 40°C)</p> <p>Storage temperature: -40 to 167°F (-40 to 75°C)</p> <p>Relative humidity: 10 to 90 percent, noncondensing</p> <p>Operating altitude: -60 to 2000m</p>								
MIBs	<p>Cisco Optical Transport Network MIB (CISCO-OTN-MIB)</p> <p>Cisco Entity MIB (CISCO-ENTITY-MIB)</p> <p>Cisco Entity Asset MIB</p> <p>Cisco Entity Field-Replaceable Unit (FRU) Control MIB</p> <p>Cisco Entity Alarm MIB</p> <p>Interface IF MIB (RFC 2233)</p> <p>Definitions of Managed Objects for Bridges (RFC 1493)</p> <p>Evolution of Interfaces Group of MIB-II (RFC 1573)</p> <p>Simple Network Management Protocol (SNMP) MIB II (RFC 1213)</p> <p>Remote Monitoring (RMON) MIB (RFC 1757)</p> <p>Switch Monitoring (SMON) MIB</p> <p>Video Monitoring MIBs:</p> <p style="padding-left: 40px;">CISCO-FLOW-MONITOR-TC-MIB, CISCO-FLOW-MONITOR-MIB</p> <p style="padding-left: 40px;">CISCO-MDI-METRICS-MIB, CISCO-IP-CBR-METRICS-MIB</p> <p>Details on the MIBs above can be found at this link: http://www.cisco.com/univercd/cc/td/doc/product/core/cis7600/7600mibs/</p>								
Network management	CiscoWorks, CiscoView, CiscoWorks Resource Manager Essentials (RME), Cisco ANA, Cisco VAMS.								
Physical specifications	<p>Occupies 1 slot in a Cisco 7600 Series Router</p> <p>Up to 8 ES Plus line cards (any type) in a Cisco 7609 or 7609-S 9-slot chassis</p> <p>Requires Cisco Supervisor Engine 720-3B or 3BXL, Route Switch Processor 720 or later</p> <p>Dimensions (H x W x D): 1.75 x 15.375 x 16 in.</p> <p>Weight:</p> <ul style="list-style-type: none"> • 76-ES+XT-2TG 11.5 lbs • 76-ES+XT-4TG 12.4 lbs 								
Maximum power consumption (watts)	<table> <tbody> <tr> <td>76-ES+XT-2TG3C</td> <td>273W</td> </tr> <tr> <td>76-ES+XT-2TG3CXL</td> <td>301W</td> </tr> <tr> <td>76-ES+XT-4TG3C</td> <td>378W</td> </tr> <tr> <td>76-ES+XT-4TG3CXL</td> <td>406W</td> </tr> </tbody> </table>	76-ES+XT-2TG3C	273W	76-ES+XT-2TG3CXL	301W	76-ES+XT-4TG3C	378W	76-ES+XT-4TG3CXL	406W
76-ES+XT-2TG3C	273W								
76-ES+XT-2TG3CXL	301W								
76-ES+XT-4TG3C	378W								
76-ES+XT-4TG3CXL	406W								
Indicators	Status: green (operational); orange (faulty)								
Regulatory compliance	CE Marking								
Safety	<p>UL 60950</p> <p>CSA C22.2 No. 60950</p> <p>EN60950</p> <p>TS001</p> <p>IEC 60950</p> <p>AS/NZS3260</p> <p>ITU-T G.664 (Automatic Laser Shutdown - ALS)</p>								

Description	Specification
Electromagnetic compatibility	FCC Part 15 Class A ICES-003 Class A VCCI Class A EN55022 Class A CISPR22 Class A AS/NZS3548 Class A EN61000-3-2 EN61000-3-3 EN55024 EN61000-6-1 EN50082-1 EN300 386
Telecommunications standards	ITU-T G.664 (ALS) ITU-T G.691 ITU-T G.707 ITU-T G.709 (OTN) ITU-T G.783 Sections 9-10 ITU-T G.784 ITU-T G.803 ITU-T G.813 ITU-T G.825 ITU-T G.826 ITU-T G.841 ITU-T G.957 Table 3 ITU-T G.958 FCC Part 15 Class A ITU-T G.975.I.4 (EFEC)
Network clock references	GR-253-CORE (SONET) GR-1244-CORE (BITS) G.8261 (No SSM) G.8262 G.8264 (No ESMC)

Table 3. Feature Support

Description	Specification
Carrier Ethernet and IP/MPLS network protocols	IPv4 unicast and multicast IPv6 unicast and multicast Layer 2 multicast MPLS Provider Edge Layer 2 and Layer 3 VPNs MPLS Traffic Engineering (MPLS-TE) MPLS Fast Reroute (FRR) Differentiated Services (Diff-Serv) aware MPLS TE Layer 2 Tunneling Protocol Version 3 (L2TPv3) Generic Routing Encapsulation (GRE) and IP-in-IP tunneling Ethernet Bridging and Ethernet Multipoint Bridging (E-MPB) Ethernet switching Ethernet over MPLS (EoMPLS) Switch port – access and trunk QinQ termination Selective QinQ Flexible QinQ VLAN translation Private VLAN VPLS and H-VPLS VLAN and Spanning Tree Protocols Per VLAN Spanning Tree (PVST)

Description	Specification
Carrier Ethernet and IP/MPLS network protocols (continued)	Virtual Switch Tagging (VST) Rapid Spanning Tree Protocol (RSTP) Multiple Spanning Tree (MST) Protocol – IEEE 802.1s VLAN ACL (VACL) VLAN Trunking Protocol (VTP) Resilient Ethernet Protocol (REP) Ethernet Operations, Administration, and Maintenance (E-OAM), Connection Fault Management (CFM), and Y.1731 802.1ah
QoS	Modular QoS CLI (MQC) Policing granularity down to ingress, egress, physical interfaces, and VLAN Access control lists (ACL) Classification, marking, policing, and queuing Diff-Serv Code Point (DSCP) Complex re-marking of Ethernet and IP/MPLS headers
Congestion avoidance	Weighted Random Early Detection (WRED) based on IP Prec, DSCP, MPLS EXP
Queuing and shaping	Enhanced Class-Based Weighted Fair Queuing (CBWFQ) Egress low-latency queuing (LLQ); traffic inside LLQ may be shaped Two levels of queuing hierarchy Egress shaping
Traffic classification and bandwidth policing	Classification based on: Extended ACL IP Precedence/IP DSCP MPLS Experimental Bits (EXP) VLAN Input VLAN Policer: Ingress single- and dual-rate, three color
ACLs and security	Up to 32,000 access list entries with no forwarding degradation Hardware counters for ACL hits
Layer 2 and Layer 3 VPNs	Layer 2 VPNs EoMPLS with MAC learning H-VPLS (MPLS edge or IEEE 802.1ad edge) Flexible QinQ Layer 3 VPNs MPLS VPN (RFC 2547-bis) Inter-AS and Carrier-Supporting-Carrier Multicast VPN mLDP based Multicast VPN (mVPN) Multicast VPN Extranet 802.1ah
Protection and bundling	MPLS Fast Reroute IEEE 802.3ad and EtherChannel®

Table 4. Inline Video Monitoring Feature Support

Description	Specification
Summary	Supported on all ES+ linecards Supported with supervisor engines Sup720 and RSP720 (1 gigabits and 10 gigabits) Monitoring on both ingress and egress interfaces IP/UDP encapsulated unicast and multicast video streams VBR and CBR video streams Compressed and uncompressed video streams
Metrics	RFC4445 Media Delivery Index (MDI) consisting of Delay Factor (DF), and Media Loss Rate (MLR), plus Media Discontinuity Count (MDC) – for MPEG video within M2TS (SPTS/MPTS) Delay Factor and Media Rate Variation (MRV) MDI:DF, MDI:MLR, MDI:MDC, IP-CBR:DF, and IP-CBR:MRV metrics are supported for CBR flows MDI:MLR and MDI:MDC are supported for VBR flows

Description	Specification
Performance	Flow rates up to 10Gbps and a total of up to 40Gbps per linecard Up to 8000 flows per chassis and 1000 flows per linecard
Management	Media Stop Events (MSE) Threshold Crossing Alerts (TCA) Syslog support SNMP MIBs Full integration with Cisco's Video Assurance Management Solution (VAMS) http://www.cisco.com/en/US/products/ps9518/index.html

Table 5. OTN Feature Support

Description	Specification
Protocol support	OTN G.709 compliant, selectable Mapping of IEEE 802.3ae 10GBASE-R signal into an overclocked OPU1e running at 11.0491 Gbps OPU2e running at 11.0975 Gbps Internal (system) and line (network) loopback Local (internal) or loop (recovered from network) timing ±100 ppm local clock accuracy over operating temperature
Alarms and performance monitoring	Alarm reporting: <ul style="list-style-type: none"> • Loss of signal (LOS) • Loss of OTN frame (LOF) • Loss of OTN multiframe (LOM) • OTU alarm indication signal (OTU-AIS) • OTU backward defect indication (OTU-BDI) • ODU alarm indication signal (ODU-AIS) • ODU open connection indication (ODU-OCI) • ODU locked (ODU-LCK) • ODU backward defect indication (ODU-BDI) • ODU payload type identifier mismatch (ODU-PTIM) • OTU incoming alignment (OTU-IAE) OTU_SF_BER and OTU_SD_BER alarms based on monitoring OTU BIP errors with a user-settable threshold crossing Error counts: OTU BIP, OTU BEI, ODU BIP, and ODU BEI Threshold crossing alerts (TCAs) for OTU BIP errors (SM-TCA) and ODU BIP errors (PM-TCA) with user-settable threshold
FEC features	No FEC: ability to turn off error correction for use with non-FEC supporting interfaces GFEC: standard G.709 EFEC: standard G.975.1.4 FEC statistics for corrected errors (EC), last second corrected errors (EC), and uncorrected words (UC)

Table 6. DWDM Line Interface Specification

Description	Specification
Bit rate	9.953280 Gbps +/- 4.6 ppm 10.3125 Gbps +/- 4.6 ppm 11.049 Gbps +/- 4.6 ppm 11.0957 Gbps +/- 4.6 ppm
Spectral width at 20 dB ($\lambda_{\Delta 20}$)	≤ 30 GHz
Optical Transmitter	
Type	Lithium niobate external modulator
Output power (P_{Tmin} to P_{Tmax})	-1 dBm, + 3 dBm
Required optical return loss, minimum (ORL_{min})	27 dB
Extinction ratio, minimum (reminx)	> 9 dB
Laser safety class	1
Optical Receiver	
Type	Avalanche photo diode (APD)
Chromatic dispersion tolerance (DLR_{max})	Up to 1600 ps/nm
Minimum BER (BER_{min})	
FEC off	10E-12
FEC on	10E-15
E-FEC on	10E-15
Reflectance between far-end Tx and near-end Rx (maximum)	-27 dB
Input wavelength bandwidth ($\lambda_{\Delta c_{rx}}$)	1260 nm to 1607 nm
Connector type (Tx/Rx)	LC, duplex

Table 7. Optical Performance

DWDM XFP Fixed Wavelength			
Long wavelength performance (1570 nm to 1607 nm) applicable at 9.9, 10.3 only			
P_{in} @ 23dB OSNR, $BER < 10^{-12}$		-7 to -22	dBm
Long wavelength performance (1529 nm to 1562 nm C-band)			
No FEC applications (Note b) applicable at 9.9 Gbps, 10.3 Gbps only			
P_{in} @ 23dB OSNR, $BER < 10^{-12}$		-7 to -23	dBm
P_{in} @ 23dB OSNR, $BER < 10^{-12}$	-500 to +1600 ps/nm	-7 to -20	dBm
No FEC applications applicable at 9.9 Gbps, 10.3 Gbps only			
P_{in} @ 17dB OSNR, $BER < 10^{-12}$		-7 to -18	dBm
P_{in} @ 20dB OSNR, $BER < 10^{-12}$	-500 to +1600 ps/nm	-7 to -18	dBm
FEC applications (Note c) applicable at 11.09 Gbps only			
P_{in} @ 11 dB OSNR, $BER < 10^{-5}$		-7 to -18	dBm
P_{in} @ 12 dB OSNR, $BER < 10^{-5}$	-500 to +1100 ps/nm	-7 to -18	dBm
Enhanced-FEC applications (Note c) applicable at 11.09 Gbps only			
P_{in} @ 23dB OSNR, $BER < 7 * 10^{-4}$		-7 to -27	dBm
P_{in} @ 23dB OSNR, $BER < 7 * 10^{-4}$	-500 to +1300 ps/nm	-7 to -24	dBm
Enhanced-FEC applications (Note c) applicable at 11.09 Gbps only			
P_{in} @ 8 dB OSNR, $BER < 7 * 10^{-4}$		-7 to -18	dBm
P_{in} @ 9dB OSNR, $BER < 7 * 10^{-4}$	-500 to +1100 ps/nm	-7 to -18	dBm

Table 8. SONET/SDH WAN PHY Feature Support

SONET/SDH Features and Functions	Ethernet WAN Interface	Comments
Synchronization	Supported	Ethernet WAN interface cannot be used in SONET/SDH rings
Section, line, and path BIP8	Supported	Errors are detected and counted
Section trace	Supported	
Pointer operation/action	Supported	H1, H2 are used to get the location of SPE
Defects or anomalies: LOS, SEF, LOF, S-BIP, L-BIP, AIS-L, RDI-L, AIS-P, LOP-P, P-BIP, PLM-P	Supported	Counters for section, line, and path BIP errors

Table 9. ES Plus Line Card XFP and SFP Modules Supported

Part Number for ES Plus line cards 10-Gbps Small Form-Factor Pluggable (XFP)	Wavelength	Mode	Distance
XFP-10GZR-OC192LR, LAN-PHY	1550 nm	Single mode (SM)	49.7 miles (80 km)
XFP-10GER-OC192IR+, LAN-PHY	1550 nm	SM	24.8 miles (40 km)
XFP-10GLR-OC192SR, LAN-PHY	1310 nm	SM	6.2 miles (10 km)

Table 10. Ordering Information for Cisco ES Plus line cards 10 GE Dense Wavelength-Division Multiplexing (DWDM) XFP Modules

Note: The following DWDM XFP products are orderable as spares only.

Product Number	Description	ITU Channel
DWDM-XFP-60.61=	10GBASE-DWDM 1560.61 nm XFP (100-GHz ITU grid)	21
DWDM-XFP-59.79=	10GBASE-DWDM 1559.79 nm XFP (100-GHz ITU grid)	22
DWDM-XFP-58.98=	10GBASE-DWDM 1558.98 nm XFP (100-GHz ITU grid)	23
DWDM-XFP-58.17=	10GBASE-DWDM 1558.17 nm XFP (100-GHz ITU grid)	24
DWDM-XFP-56.55=	10GBASE-DWDM 1556.55 nm XFP (100-GHz ITU grid)	26
DWDM-XFP-55.75=	10GBASE-DWDM 1555.75 nm XFP (100-GHz ITU grid)	27
DWDM-XFP-54.94=	10GBASE-DWDM 1554.94 nm XFP (100-GHz ITU grid)	28
DWDM-XFP-54.13=	10GBASE-DWDM 1554.13 nm XFP (100-GHz ITU grid)	29
DWDM-XFP-52.52=	10GBASE-DWDM 1552.52 nm XFP (100-GHz ITU grid)	31
DWDM-XFP-51.72=	10GBASE-DWDM 1551.72 nm XFP (100-GHz ITU grid)	32
DWDM-XFP-50.92=	10GBASE-DWDM 1550.92 nm XFP (100-GHz ITU grid)	33
DWDM-XFP-50.12=	10GBASE-DWDM 1550.12 nm XFP (100-GHz ITU grid)	34
DWDM-XFP-48.51=	10GBASE-DWDM 1548.51 nm XFP (100-GHz ITU grid)	36
DWDM-XFP-47.72=	10GBASE-DWDM 1547.72 nm XFP (100-GHz ITU grid)	37
DWDM-XFP-46.92=	10GBASE-DWDM 1546.92 nm XFP (100-GHz ITU grid)	38
DWDM-XFP-46.12=	10GBASE-DWDM 1546.12 nm XFP (100-GHz ITU grid)	39
DWDM-XFP-44.53=	10GBASE-DWDM 1544.53 nm XFP (100-GHz ITU grid)	41
DWDM-XFP-43.73=	10GBASE-DWDM 1543.73 nm XFP (100-GHz ITU grid)	42
DWDM-XFP-42.94=	10GBASE-DWDM 1542.94 nm XFP (100-GHz ITU grid)	43
DWDM-XFP-42.14=	10GBASE-DWDM 1542.14 nm XFP (100-GHz ITU grid)	44
DWDM-XFP-40.56=	10GBASE-DWDM 1540.56 nm XFP (100-GHz ITU grid)	46
DWDM-XFP-39.77=	10GBASE-DWDM 1539.77 nm XFP (100-GHz ITU grid)	47
DWDM-XFP-38.98=	10GBASE-DWDM 1538.98 nm XFP (100-GHz ITU grid)	48
DWDM-XFP-38.19=	10GBASE-DWDM 1538.19 nm XFP (100-GHz ITU grid)	49
DWDM-XFP-36.61=	10GBASE-DWDM 1536.61 nm XFP (100-GHz ITU grid)	51
DWDM-XFP-35.82=	10GBASE-DWDM 1535.82 nm XFP (100-GHz ITU grid)	52
DWDM-XFP-35.04=	10GBASE-DWDM 1535.04 nm XFP (100-GHz ITU grid)	53

Product Number	Description	ITU Channel
DWDM-XFP-34.25=	10GBASE-DWDM 1534.25 nm XFP (100-GHz ITU grid)	54
DWDM-XFP-32.68=	10GBASE-DWDM 1532.68 nm XFP (100-GHz ITU grid)	56
DWDM-XFP-31.90=	10GBASE-DWDM 1531.90 nm XFP (100-GHz ITU grid)	57
DWDM-XFP-31.12=	10GBASE-DWDM 1531.12 nm XFP (100-GHz ITU grid)	58
DWDM-XFP-30.33=	10GBASE-DWDM 1530.33 nm XFP (100-GHz ITU grid)	59

Licensing Information

Cisco 7600 Series ES Plus Basic IP License

The ES Plus line cards have two feature license options, with the following part numbers: 76-ES+BASIC-LIC (Basic license, including IPv6) and 76-ES+ADVIP-LIC (Advanced IP license).

The Basic license entitles you to use the Cisco IOS Software Release 12.2SR or Release 15S functions on the Cisco 7600 ES Plus line cards with the following exceptions:

- Multicast VPN (MVPN)
- Layer 3 IP/MPLS VPN/6VPE
- Cisco Intelligent Services Gateway (ISG)
- Optical Transport Network (OTN) – IPoDWDM
- Inline Video Monitoring (Vidmon)

Cisco 7600 Series ES Plus Advanced IP License

The Advanced IP license entitles you to use Cisco IOS Software Release 12.2SR or Release 15S on the Cisco 7600 Series ES Plus line cards with the following functions in addition to the Basic license:

- 6VPE
- Layer 3 IP/MPLS VPN
- MVPN
- One Advanced IP license is needed for each of the ES Plus line cards in the system where these features are enabled.

The Advanced IP license does not entitle you to use features contained in the Optical Transport Network, Intelligent Services Gateway, or Video Services Licenses on the Cisco 7600 Series ES Plus line cards.

Cisco 7600 Series ES Plus Optical Transport Network License

The Optical Transport Network license (part number 76-ES+OTN-LIC) is available for purchase when the OTN capability (G.709/FEC/EFEC) is to be used, and is required on each line card where OTN will be enabled.

Cisco 7600 Series ES Plus Intelligent Services Gateway License

The Intelligent Services Gateway license (part number 76-ES+ISG-LIC) entitles use of the BNG features of Cisco IOS Software Release 12.2SR or Release 15S on the Cisco 7600 Series ES Plus line cards.

- The 76-ES+ISG-LIC is purchased per chassis in increments of 8000 subscribers requiring BNG features with 8 MPLS VPNs per license.

Cisco 7600 Series ES Plus Video Monitoring License

- The ES Plus Video Monitoring license (part number 76-ES+VIDEO-LIC) is available for purchase when the Video Monitoring capability is to be used, and is required on each chassis where Video Monitoring will be performed.

Ordering Information

Table 11. Ordering Information

Product Description	Part Number
Cisco 7600 Series ES Plus XT, LAN/WAN PHY, OTN/G.709, 2x10GE, XFP, DFC3C	76-ES+XT-2TG3C
Cisco 7600 Series ES Plus XT, LAN/WAN PHY, OTN/G.709, 2x10GE, XFP, DFC3CXL	76-ES+XT-2TG3CXL
Cisco 7600 Series ES Plus XT, LAN/WAN PHY, OTN/G.709, 4x10GE, XFP, DFC3C	76-ES+XT-4TG3C
Cisco 7600 Series ES Plus XT, LAN/WAN PHY, OTN/G.709, 4x10GE, XFP, DFC3CXL	76-ES+XT-4TG3CXL
Cisco 7600 Series Ethernet Services Plus Basic License	76-ES+BASIC-LIC
Cisco 7600 Series Ethernet Services Plus Advanced License	76-ES+ADVIP-LIC
Cisco 7600 Series ES Plus OTN PHY (G.709/FEC/EFEC) License	76-ES+OTN-LIC
Cisco 7600 Series Ethernet Services Plus Intelligent Services Gateway License	76-ES+ISG-LIC
Cisco 7600 Series Ethernet Services Plus Video Monitoring License	76-ES+VIDEO-LIC

To Download the Software

Visit the [Cisco Software Center](#) to download Cisco IOS Software Release 12.2(33)SRD1 (or later) for use with the Cisco 7600 Series Supervisor Engine 720 or Route Switch Processor 720.

Service and Support

Cisco offers a wide range of services programs to accelerate customer success. These innovative services programs are delivered through a unique combination of people, processes, tools, and partners, resulting in high levels of customer satisfaction. Cisco services help you to protect your network investment, optimize network operations, and prepare the network for new applications to extend network intelligence and the power of your business. For more information about Cisco Services, see [Cisco Technical Support Services](#) or [Cisco Advanced Services](#).

For More Information

For more information about the Cisco 7600 Series ES Plus XT 20G and 40G line cards, visit <http://www.cisco.com/> or contact your local account representative.



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