

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

The Cisco® 7600 Series Ethernet Services Plus Extended Combination (ES Plus XC) line cards are designed for interface-flexible Ethernet services. They 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 as well as Gigabit Ethernet ports on the same physical line card. This unique form factor allows for configurations with redundant network-to-network 10 Gigabit Ethernet interfaces to reside on separate line card slots for resiliency, while offering user-to-network Gigabit Ethernet interfaces on the same slots for efficiency. Service providers and enterprises benefit from the efficiency gains in power consumption, optimized service scale, and feature capability as well as the flexibility in interface speeds for Ethernet solutions.

The ES Plus XC cards use the ES Plus card family architecture that relies on programmable interface processors, protecting network investments and reducing 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 Series ES Plus XC line cards as shown in Figure 1.

Figure 1. Cisco 7600 Series ES Plus XC line cards: 20G and 40G



Product Overview

Designed for delivering flexible Ethernet services in IP/MPLS provider edge networks, and WAN/MAN and OTN applications, the Cisco 7600 Series ES Plus XC line cards support port densities of 40 Gbps or 20 Gbps varieties. 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 with 10 Gigabit and Gigabit Ethernet ports on the same line card slot. 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 ES Plus XC line cards have the integrated transport capabilities currently found in the ES Plus XT line cards, with WAN PHY and G.709 Generic Forward Error Correction (using the 76-ES+OTN/G.709 license) support on the 10 Gigabit Ethernet interfaces (available in a future software release). The ability to span even greater distances between Cisco 7600 Series Routers is supported with Enhanced Forward Error Correction (EFEC) in the Cisco 7600 Series (back-to-back 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 ASIC and network processor technology for an optimal combination of performance and flexibility. The Cisco 7600 Series ES Plus XC 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 XC 40G line cards) or two (for the ES Plus XC 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 XC line cards

Feature	ES Plus line cards	Benefit
Line card form factor	2x10GE and 20xGE 1x10GE and 10xGE	Offers economical, high-density, high-performance, premium Carrier Ethernet services with excellent scalability for solutions that require uplink redundancy with slot diversity LAN PHY support at FCS. WAN and OTN PHY support in a post FCS software release.
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 has reached 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) 3C/3CXL and RSP720-10GE 3C/3CXL. The ES Plus line cards require dual-channel switch fabric connectivity; therefore, they 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 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 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 12.2SRE or later
Packet memory	512 MB for 200 ms of combined input and output buffering at 10 Gbps

Description	Specification
Link encapsulations	Ethernet II and IEEE 802.1q encapsulations
Hardware queues	ES Plus XC 40G and 20G line cards 128,000 queues per line card Hierarchical QoS (H-QoS)
MAC addresses	Up to 96,000 MAC addresses per ES Plus XC line card 16,000 VLAN IDs per line card (within Flexible QinQ configuration guidelines) Hardware-based MAC learning at wire rate
Environmental conditions	Operating temperature: 32 to 104°F (0 to 40°C) Storage temperature: -40 to 167°F (-40 to 75°C) Relative humidity: 10 to 90 percent, non-condensing Operating altitude: -60 to 2000m
MIBs	Cisco Optical Transport Network MIB (CISCO-OTN-MIB) Cisco Entity MIB (CISCO-ENTITY-MIB) Cisco Entity Asset MIB Cisco Entity Field-Replaceable Unit (FRU) Control MIB Cisco Entity Alarm MIB Interface IF MIB (RFC 2233) Definitions of Managed Objects for Bridges (RFC 1493) Evolution of Interfaces Group of MIB-II (RFC 1573) SNMP MIB II (RFC 1213) Remote Monitoring (RMON) MIB (RFC 1757) Switch Monitoring (SMON) MIB Video Monitoring MIBs: CISCO-FLOW-MONITOR-TC-MIB, CISCO-FLOW-MONITOR-MIB CISCO-MDI-METRICS-MIB, CISCO-IP-CBR-METRICS-MIB Details on the MIBs above can be found at this link: http://www.cisco.com/univercd/cc/td/doc/product/core/cis7600/7600mibs/
Network management	CiscoWorks, CiscoView, and CiscoWorks Resource Manager Essentials (RME), Cisco ANA, Cisco VAMS.
Physical specifications	Occupies one slot in a Cisco 7600 Series Router Up to 8 ES Plus line cards (any type) in a Cisco 7609 or 7609-S 9-slot chassis Requires Cisco Supervisor Engine 720-3B or 3BXL, RSP720 or later Dimensions (H x W x D): 1.75 x 15.375 x 16 in. Weight: • 76-ES+XC-20G3C/XL: 11.8 lb • 76-ES+XC-40G3C/XL: 12.5 lb
Maximum power consumption (watts)	76-ES+XC-20G3C 309.3W 76-ES+XC-20G3CXL 316.8W 76-ES+XC-40G3C 392.3W 76-ES+XC-40G3CXL 427.2W
Indicators	Status: green (operational); orange (faulty)
Regulatory compliance	CE Marking
Safety	UL 60950 CSA C22.2 No. 60950 EN60950 TS001 IEC 60950 AS/NZS3260 ITU-T G.664 (Automatic Laser Shutdown – ALS)

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.958FCC 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 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) Virtual Switch Tagging (VST) Rapid Spanning Tree Protocol (RSTP) Multiple Spanning Tree (MST) Protocol – IEEE 802.1s VLAN ACL (VAACL) VLAN Trunking Protocol (VTP) 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 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

Description	Specification
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 (mVPN) 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
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 (10 Gigabit Ethernet ports only)

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

Description	Specification
Alarms and performance monitoring	<p>Alarm reporting:</p> <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) <p>OTU_SF_BER and OTU_SD_BER alarms are based on monitoring OTU BIP errors with a user-settable threshold crossing.</p> <p>Error counts: OTU BIP, OTU BEI, ODU BIP, and ODU BEI.</p> <p>Threshold crossing alerts (TCAs) for OTU BIP errors (SM-TCA) and ODU BIP errors (PM-TCA) with user-settable threshold.</p>
FEC features	<p>No FEC: ability to turn off error correction for use with non-FEC supporting interfaces.</p> <p>GFEC: standard G.709</p> <p>EFEC: standard G.975.1.4</p> <p>FEC statistics for corrected errors (EC), last second corrected errors (EC), and uncorrected words (UC).</p>

Table 6. DWDM Line Interface Specification (10 Gigabit Ethernet ports only)

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 20dB (λ_{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 (λ_{ac_rx})	1260 nm to 1607 nm
Connector type (Tx/Rx)	LC, duplex

Table 7. Optical Performance (10 Gigabit Ethernet ports only)

DWDM XFP Fixed Wavelength			
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 (10 Gigabit Ethernet ports only)

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 Cards 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)
SFP-GE-S	850 nm	Multimode (MM)	1804 ft (550m)
SFP-GE-L	1310 nm	SM	6.2 miles (10 km)
SFP-GE-Z	1550 nm	SM	43.5 miles (70 km)
SFP-GE-T	-	-	328 ft (100m)

Table 10. Ordering Information for Cisco ES Plus line cards GE Gigabit Interface Converter (GLC) Modules

Product Number	Description
GLC-BX-D	1000BASE-BX10 SFP module for single-strand SMF, 1490-nm TX/1310-nm RX wavelength
GLC-BX-U	1000BASE-BX10 SFP module for single-strand SMF, 1310-nm TX/1490-nm RX wavelength

Table 11. 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
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

Table 12. Cisco ES Plus line cards GE DWDM SFP Modules

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

Product Number	Description	ITU Channel
DWDM-SFP-6141=	1000BASE-DWDM 1561.42 nm SFP (100-GHz ITU grid)	20
DWDM-SFP-6061=	1000BASE-DWDM 1560.61 nm SFP (100-GHz ITU grid)	21
DWDM-SFP-5979=	1000BASE-DWDM 1559.79 nm SFP (100-GHz ITU grid)	22
DWDM-SFP-5898=	1000BASE-DWDM 1558.98 nm SFP (100-GHz ITU grid)	23
DWDM-SFP-5817=	1000BASE-DWDM 1558.17 nm SFP (100-GHz ITU grid)	24
DWDM-SFP-5736=	1000BASE-DWDM 1557.36 nm SFP (100-GHz ITU grid)	25
DWDM-SFP-5655=	1000BASE-DWDM 1556.55 nm SFP (100-GHz ITU grid)	26

Product Number	Description	ITU Channel
DWDM-SFP-5575=	1000BASE-DWDM 1555.75 nm SFP (100-GHz ITU grid)	27
DWDM-SFP-5494=	1000BASE-DWDM 1554.94 nm SFP (100-GHz ITU grid)	28
DWDM-SFP-5413=	1000BASE-DWDM 1554.13 nm SFP (100-GHz ITU grid)	29
DWDM-SFP-5332=	1000BASE-DWDM 1553.33 nm SFP (100-GHz ITU grid)	30
DWDM-SFP-5252=	1000BASE-DWDM 1552.52 nm SFP (100-GHz ITU grid)	31
DWDM-SFP-5172=	1000BASE-DWDM 1551.72 nm SFP (100-GHz ITU grid)	32
DWDM-SFP-5092=	1000BASE-DWDM 1550.92 nm SFP (100-GHz ITU grid)	33
DWDM-SFP-5012=	1000BASE-DWDM 1550.12 nm SFP (100-GHz ITU grid)	34
DWDM-SFP-4931=	1000BASE-DWDM 1549.32 nm SFP (100-GHz ITU grid)	35
DWDM-SFP-4851=	1000BASE-DWDM 1548.51 nm SFP (100-GHz ITU grid)	36
DWDM-SFP-4772=	1000BASE-DWDM 1547.72 nm SFP (100-GHz ITU grid)	37
DWDM-SFP-4692=	1000BASE-DWDM 1546.92 nm SFP (100-GHz ITU grid)	38
DWDM-SFP-4612=	1000BASE-DWDM 1546.12 nm SFP (100-GHz ITU grid)	39
DWDM-SFP-4532=	1000BASE-DWDM 1545.32 nm SFP (100-GHz ITU grid)	40
DWDM-SFP-4453=	1000BASE-DWDM 1544.53 nm SFP (100-GHz ITU grid)	41
DWDM-SFP-4373=	1000BASE-DWDM 1543.73 nm SFP (100-GHz ITU grid)	42
DWDM-SFP-4294=	1000BASE-DWDM 1542.94 nm SFP (100-GHz ITU grid)	43
DWDM-SFP-4214=	1000BASE-DWDM 1542.14 nm SFP (100-GHz ITU grid)	44
DWDM-SFP-4134=	1000BASE-DWDM 1541.35 nm SFP (100-GHz ITU grid)	45
DWDM-SFP-4056=	1000BASE-DWDM 1540.56 nm SFP (100-GHz ITU grid)	46
DWDM-SFP-3977=	1000BASE-DWDM 1539.77 nm SFP (100-GHz ITU grid)	47
DWDM-SFP-3898=	1000BASE-DWDM 1538.98 nm SFP (100-GHz ITU grid)	48
DWDM-SFP-3819=	1000BASE-DWDM 1538.19 nm SFP (100-GHz ITU grid)	49
DWDM-SFP-3739=	1000BASE-DWDM 1537.40 nm SFP (100-GHz ITU grid)	50
DWDM-SFP-3661=	1000BASE-DWDM 1536.61 nm SFP (100-GHz ITU grid)	51
DWDM-SFP-3582=	1000BASE-DWDM 1535.82 nm SFP (100-GHz ITU grid)	52
DWDM-SFP-3504=	1000BASE-DWDM 1535.04 nm SFP (100-GHz ITU grid)	53
DWDM-SFP-3425=	1000BASE-DWDM 1534.25 nm SFP (100-GHz ITU grid)	54
DWDM-SFP-3346=	1000BASE-DWDM 1533.47 nm SFP (100-GHz ITU grid)	55
DWDM-SFP-3268=	1000BASE-DWDM 1532.68 nm SFP (100-GHz ITU grid)	56
DWDM-SFP-3190=	1000BASE-DWDM 1531.90 nm SFP (100-GHz ITU grid)	57
DWDM-SFP-3112=	1000BASE-DWDM 1531.12 nm SFP (100-GHz ITU grid)	58
DWDM-SFP-3033=	1000BASE-DWDM 1530.33 nm SFP (100-GHz ITU grid)	59

Table 13. Cisco ES Plus line cards GE CWDM SFP Modules**Note:** The following CWDM SFP products are orderable as spares only.

Product Number	Description	Color
CWDM-SFP-1470=	Cisco CWDM 1470-nm SFP; Gigabit Ethernet and 1 and 2 Gb Fiber Channel	Gray
CWDM-SFP-1490=	Cisco CWDM 1490-nm SFP; Gigabit Ethernet and 1 and 2 Gb Fiber Channel	Violet
CWDM-SFP-1510=	Cisco CWDM 1510-nm SFP; Gigabit Ethernet and 1 and 2 Gb Fiber Channel	Blue
CWDM-SFP-1530=	Cisco CWDM 1530-nm SFP; Gigabit Ethernet and 1 and 2-Gb Fiber Channel	Green
CWDM-SFP-1550=	Cisco CWDM 1550-nm SFP; Gigabit Ethernet and 1 and 2 Gb Fiber Channel	Yellow
CWDM-SFP-1570=	Cisco CWDM 1570-nm SFP; Gigabit Ethernet and 1 and 2 Gb Fiber Channel	Orange
CWDM-SFP-1590=	Cisco CWDM 1590-nm SFP; Gigabit Ethernet and 1 and 2 Gb Fiber Channel	Red
CWDM-SFP-1610=	Cisco CWDM 1610-nm SFP; Gigabit Ethernet and 1 and 2 Gb Fiber Channel	Brown

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 the use of 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 eight 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 14. Ordering Information

Product Name	Part Number
Cisco 7600 ES+XC Combo 10x1GE/ 1x10GE, DFC3C	76-ES+XC-20G3C
Cisco 7600 ES+XC Combo 10x1GE/ 1x10GE, DFC3CXL	76-ES+XC-20G3CXL
Cisco 7600 ES+XC Combo 20x1GE/ 2x10GE, DFC3C	76-ES+XC-40G3C
Cisco 7600 ES+XC Combo 20x1GE/ 2x10GE, DFC3CXL	76-ES+XC-40G3CXL
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+ OTN PHY (G.709/FEC/EFEC) License (Available in a future software release on 10G ports only)	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)SRE (or later) for use with the 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 Ethernet Services Plus 20G and 40G line cards, visit <http://www.cisco.com/> or contact your local account representative.



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