

Cisco 7600 Series Ethernet Services Plus Transport 20G and 40G Line Cards

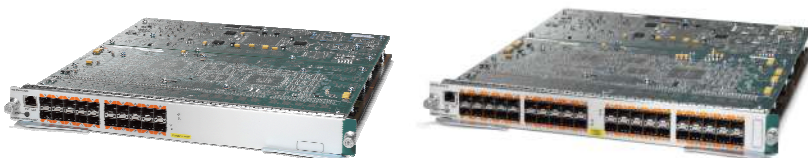
The Cisco® 7600 Series Ethernet Services Plus Transport Line Cards are designed for cost-efficient Carrier Ethernet service delivery. The cards allow service prioritization for voice, video, data, and wireless mobility services and can connect to LAN, WAN, and OTN PHY interfaces. Service providers and enterprises benefit from the efficiency gains in power consumption, improved economics from higher density, and service scalability and feature capability optimized for cost-sensitive transport Ethernet solutions.

The Ethernet Services (ES) Plus Transport cards utilize 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 Transport Line Cards as shown in Figures 1 and 2.

Figure 1. Cisco 7600 Series ES Plus Transport Line Cards: 4-Port 10 GE and 2-Port 10 GE



Figure 2. Cisco 7600 Series ES Plus Transport Line Cards: 20-Port GE and 40-Port GE



Product Overview

Designed for delivering flexible transport Ethernet services in IP/MPLS provider edge networks, as well as WAN/MAN and optical transport network (OTN) applications, the Cisco 7600 Series Ethernet Services Plus Transport Line Cards support port densities of 40 Gbps or 20 Gbps in 10 Gigabit Ethernet and Gigabit Ethernet port varieties. The cards feature hierarchical quality of service (QoS) supporting 16 queues per physical port, 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 Transport cards (back-to-back ES Plus Transport or ES Plus Extended Transport 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 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 optimal performance and flexibility. The Cisco 7600 Series ES Plus Transport Line Cards provide distributed forwarding with proven ASIC technology in the forwarding path (routing, switching, NetFlow, ACLs) and queuing and shaping functions to optimize the performance of these foundational features. Additionally, four (for the ES Plus Transport 40G line cards) or two (for the ES Plus Transport 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 Transport Line Cards

Feature	ES Plus Line Card	Benefit
Line card form factor	20-port GE 40-port GE 2-port 10GE 4-port 10GE	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 100 ms combined bidirectional buffering
Switch fabric connectivity	Two (2), 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 life and end of sale. 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 the cards are not supported with the Supervisor Engine 32 or in slots 1 thru 8 of the Cisco 7613 chassis.
Distributed forwarding card (DFC)	Line-rate distributed forwarding with services enabled, up to ~48 Cisco Distributed Forwarding Card 3CXL (DFC-3CXL) Optimized for IP/MPLS PE 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 12.2SRD4 and SRE1 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
Hardware queues	Cisco 7600 Series ES Plus Transport 40G and 20G Line Cards Supporting up to 16 level 4 queues per physical port Hierarchical QoS (H-QoS)

Description	Specification
MAC addresses	Up to 96,000 MAC addresses per ES Plus Transport 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 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 to be supported in the future
Physical specifications	Occupies 1 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, or Route Switch Processor 720 or later Dimensions (H x W x D): 1.75 x 15.375 x 16 in. Weight: <ul style="list-style-type: none"> • 76-ES+T-2TG: 11.5 lbs • 76-ES+T-4TG: 12.4 lbs • 76-ES+T-20G: 11.7 lb • 76-ES+T-40G: 12.9 lb
Maximum power consumption (watts)	76-ES+T-20G: 305W 76-ES+T-40G: 419W 76-ES+T-2TG: 301W 76-ES+T-4TG: 406W
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)
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

Description	Specification
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 Multiprotocol Label Switching (MPLS) Provider Edge (PE) Layer 2 and Layer 3 VPNs Multiprotocol Label Switching Traffic Engineering (MPLS-TE) MPLS Fast Reroute (FRR) Diff-Serv aware MPLS TE 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 VACL and VTP 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

Description	Specification
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 802.1ah
Protection and Bundling	MPLS Fast Reroute IEEE 802.3ad and EtherChannel®

Table 4. Feature Scale

Feature	ES Plus Transport Card with 20 GE Ports ES Plus Transport Card with 2 10GE Ports	ES Plus Transport Card with 40 GE Ports ES Plus Transport Card with 4 10GE Ports
Layer 3 Routed Interface	2048	4096
Dot1q/QinQ subinterface	2048	4096
EVC (all types)	4096	8192
L2TPv3 (tunnel, sessions)	(256, 4096)	(512, 8192)
Layer 3 Access Interface	4096	8192
MTP EVC	4096	8192
H-QoS (Level 4 Queues, Level 3 Shaper, Level 2 Shaper)	(16, 8, 4) per port	(16, 8, 4) per port
Policers	24000	48000

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 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 (10 Gigabit Ethernet ports only)

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 (1529nm to 1562nm 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 11.09Gbps 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. Cisco 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)
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 functions on the ES Plus line cards with the following exceptions:

- Multicast VPN (MVPN)
- Layer 3 IP/MPLS VPN/6VPE
- Cisco Intelligent Services Gateway (ISG)

Cisco 7600 Series ES Plus Advanced IP License

The Advanced IP license entitles you to use Cisco IOS Software Release 12.2SR on the Cisco 7600 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.

Ordering Information

Table 14. Ordering Information

Product Description	Part Number
Cisco 7600 Series ES Plus Transport, 20xGE ports, SFP	76-ES+T-20G
Cisco 7600 Series ES Plus Transport, 40xGE ports, SFP	76-ES+T-40G
Cisco 7600 Series ES Plus Transport, LAN/WAN PHY, OTN/G.709, 2x10GE, XFP	76-ES+T-2TG
Cisco 7600 Series ES Plus Transport, LAN/WAN PHY, OTN/G.709, 4x10GE, XFP	76-ES+T-4TG
Cisco 7600 Series Ethernet Services + Basic License	76-ES+BASIC-LIC
Cisco 7600 Series Ethernet Services + Advanced License	76-ES+ADVIP-LIC
Cisco 7600 Series ES Plus OTN PHY (G.709/FEC/EFEC) License (10 GE line cards only)	76-ES+OTN-LIC

To Download the Software

Visit the [Cisco Software Center](#) to download Cisco IOS Software Release 12.2(33)SRD4 and SRE1 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 Services Ethernet Services Plus 20G and 40G Line Cards, visit <http://www.cisco.com/> or contact your local account representative.



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