CISCO SYSTEMS

Data Sheet

Cisco ML-Series for the Cisco ONS 15454 Multiservice Provisioning Platform: Providing Multilayer Services for Metro Optical Ethernet

The Cisco® ML-Series interface cards provide exceptional Ethernet switching and IP routing capabilities for multiservice provisioning platforms (MSPPs). Cisco Systems® has coupled the market-leading optical capabilities of the Cisco ONS 15454 MSPP with proven Cisco IOS® Software to deliver profitable Metro Ethernet and IP solutions over a multiservice network architecture.

BACKGROUND

Information connectivity is becoming ubiquitous as businesses and consumers look for ways to improve their productivity. Access to this information can be over a wide variety of networks, including the many forms of wire-line (DSL, T1, E1, dialup, cable modem, fiber to the premises, and so on) and wireless (cell, 802.11, WiMAX, and so on) vehicles. The main benefit of this information connectivity is user access to a wide variety of information that can be located anywhere in the world.

Ethernet technology has become the protocol of choice for the LAN environment. It is also becoming increasingly commonplace in metropolitan-area networks (MANs) with the release of Fast Ethernet and Gigabit Ethernet (GE) interfaces on DSL access multiplexers (DSLAMs), fixed wireless, and private branch exchanges (PBXs). Thus, service providers are creating tariffs to efficiently interconnect to and transport users' data traffic using Ethernet handoffs, and they must deploy metropolitan (metro) transport equipment that will permit them to deliver these services cost-effectively and with the reliability required by their service-level agreements (SLAs). Although Ethernet-based services are growing, they are still not the dominant share of the market demand. Therefore, the service provider's metro networking equipment must support both traditional time-division multiplexing (TDM) services as well as newer Ethernet services without a major upgrade – this explains why the multiservice provisioning platform has taken hold in the metro marketplace.

PRODUCT OVERVIEW

The Cisco ML-Series cards for the Cisco ONS 15454 MSPP (Figure 1) are industry-leading Ethernet and IP switching modules for integration into a SONET/SDH optical transport platform. The cards extend the multiservice capabilities and flexibility offered by the Cisco ONS 15454 platform.

Figure 1.   Cisco ML-Series Cards for Cisco ONS 15454 MSPP

Through the integration of the industry's most widely deployed and tested Ethernet and IP technology, Cisco IOS Software, with the industry's most successful multiservice provisioning platform, the Cisco ONS 15454, service providers and enterprise customers are provided with a single integrated platform for delivering true carrier-class Metro Ethernet, TDM, and optical transport services and applications.

The Cisco MultiLayer-Series (ML-Series) for the Cisco ONS 15454 consists of three interface cards: the Cisco MultiLayer (ML) 100X-8, MultiLayer (ML) 100T-12, and MultiLayer (ML) 1000-2 models. The Cisco ML100X-8 is an 8-port, 100-Mbps Ethernet interface card that supports the 100BASE-FX short-reach Small Form-Factor Pluggable (SFP) and 100BASE-LX long-reach SFP. The Cisco ML100T-12 is a 12-port, 10/100-Mbps Ethernet module. The Cisco ML1000-2 is a 2-port Gigabit Ethernet module using SFP optical interface modules. The Cisco ML-Series cards use a common hardware and software base, providing the same Layer 2 and Layer 3 feature set. These single-slot cards can be installed in any of the 12 multiservice interface slots in a Cisco ONS 15454 shelf assembly and can be mixed and matched within the assembly or network to provide flexible architectures to meet the user's application needs. Each card has virtual interfaces that are mapped to SONET/SDH optical interfaces for transport with other services between network elements over 155-Mbps to 10-Gbps optical line rates. Packet transport bandwidth over the chosen optical interface is provisionable, allowing efficient matching and scalability of ingress to transport traffic requirements, based upon oversubscription requirements.

The Cisco ML-Series cards support proprietary Resilient Packet Ring (SW-RPR), which provides increased bandwidth usage over a SONET/SDH ring. SW-RPR features also include shortest-path selection and spatial reuse for bridging. The Cisco ML-Series offers standards-based 802.17b RPR. In addition to the features of SW-RPR, 802.17b RPR benefits include steering protection and standardized ring fairness.

The Cisco ML-Series cards offer an advanced set of quality-of-service (QoS) features to allow the network administrator to fine-tune the network and create and support a wide range of SLAs. Some of the features and benefits are listed in Table 1.

Table 1. Features and Benefits for QoS

Feature	Benefit
Flexible packet classification	Classifies packets based on input port, VLAN, class of service (CoS), IP Precedence, or IP-differentiated services code points (DSCPs), allowing the service provider to tailor packet handling based on the user's traffic
Policing	Through highly granular per-flow and input port policing, allows the service provider to contain a user to the SLA bandwidth requirements, reducing the likelihood that a user will flood the network
Priority marking	Provides a mechanism, when using either .1Q or Q, in Q features for a service provider to reclassify (mark) a packet with a wrapper Ethernet 802.1p value, allowing downstream nodes to treat the packet differently and transparently transporting the original CoS bits of the packet across a service provider network
Per-class queuing	Provides fair access to excess network resources, allows allocation of bandwidth to support SLAs, and helps ensure that applications with high network resource requirements are adequately serviced
Weighted Deficit Round-Robin (WDRR) scheduling	Adds weighting capabilities to deficit round-robin scheduling to provide fair access to excess bandwidth as well as throughput to each class

The Cisco ML-Series cards offer important advantages in service provider network architectures, permitting new, profitable services as well as simplifying service activation. Some of these capabilities are outlined in Table 2.

Table 2. Features and Benefits for Service Provider Network Architectures

| Feature	Benefit
Admission control	During service provisioning, the Cisco ML-Series card verifies that QoS resources have not been accidentally overcommitted.
Network scaling and flexibility	The Cisco ML-Series cards support VLAN-ID translation. This capability allows the service provider to change the ingress VLAN tags (802.1Q or 802.1Q in .1Q) to avoid VLAN collisions within the network (resulting from the use of the same VLAN ID by different customers) and translate them back at the egress of the network.
Network resiliency	Support for RPR or SONET/SDH provides resiliency of less than 50 ms for data services, depending on the service offering.
Efficient bandwidth use	The use of RPR technology allows full use of the network bandwidth during normal network operation of a properly designed network.
SLA management	The Cisco IOS Software IP SLA tool monitors packet latency, jitter, and loss over metro optical networks or a combination of metro optical and IP and Multiprotocol Label Switching (MPLS) networks. The IP SLA tool can be used with Cisco IOS Software devices and other vendor devices. Comprehensive performance management statistics are provided at the interface or subinterface level (VLAN) for proactive SLA tracking and network problem identification.
Packet over SONET/SDH (PoS) virtual ports support	PoS support allows the service provider to transport Ethernet traffic originating on a Cisco ML-Series card over an optical interface and terminate the signal on an optical port of existing Layer 2 and Layer 3 equipment, eliminating the need to bookend the Cisco ML-Series cards within the network.
Reduced interface costs	The use of the Cisco ML-Series cards and shared bandwidth transport allows the service provider to benefit from statistically multiplexing the edge traffic before handing off a more efficiently filled interface to the core router or switch.

APPLICATIONS

The Cisco ONS 15454 ML-Series cards provide the flexibility to meet the demands of a wide variety of network applications found within many service providers' transport networks. The following figures show a few of the applications that can be cost-effectively deployed using the Cisco ONS 15454 with the Cisco ML-Series cards.

Ethernet Service Delivery

The Cisco ONS 15454 with either the Cisco ML100X-8 or ML1000-2 Cisco ML-Series cards can be used for efficient 100BASE-FX and Gigabit Ethernet service delivery over fiber to better reach customers from a central office or point of presence (POP), refer to Figure 2. In addition, when the Cisco ONS 15454 with the Cisco ML-Series cards is placed in a telco wiring closet in the basement of a customer building, fiber from the riser can be used to more efficiently deliver 100BASE-FX and Gigabit Ethernet services. Customers can use the Cisco ML-Series cards to offer a wide range of Ethernet services with Layer 2 switching, RPR, and advanced QoS capabilities.

Figure 2. Ethernet Service Delivery
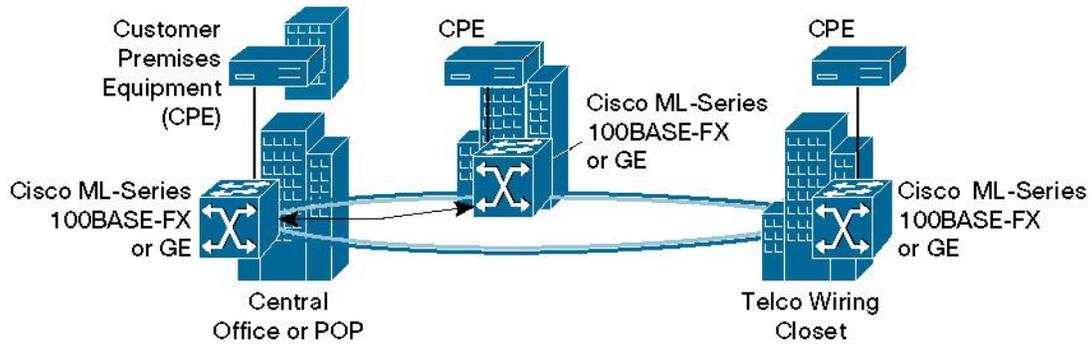
Interoffice Facility Networks

All traditional local exchange carriers (LEC) have used SONET/SDH technology to interconnect their central offices. With the explosion of data-related services and the growth of termination equipment with integrated Ethernet interfaces and protocols, these carriers increasingly need to transport data traffic more efficiently. Using the Cisco ML-Series cards to interconnect data traffic between the remote terminal equipment and the central core router provides transport bandwidth efficiency by statistically multiplexing and aggregating traffic for efficient router port use, reducing the quantity of core router interfaces. Management benefits are garnered through the integration of data switching into the optical platform, reducing the number of data-communication-network (DCN) ports. Figure 3 shows an interoffice facility (IOF) transport network.

Figure 3. IOF Transport Network
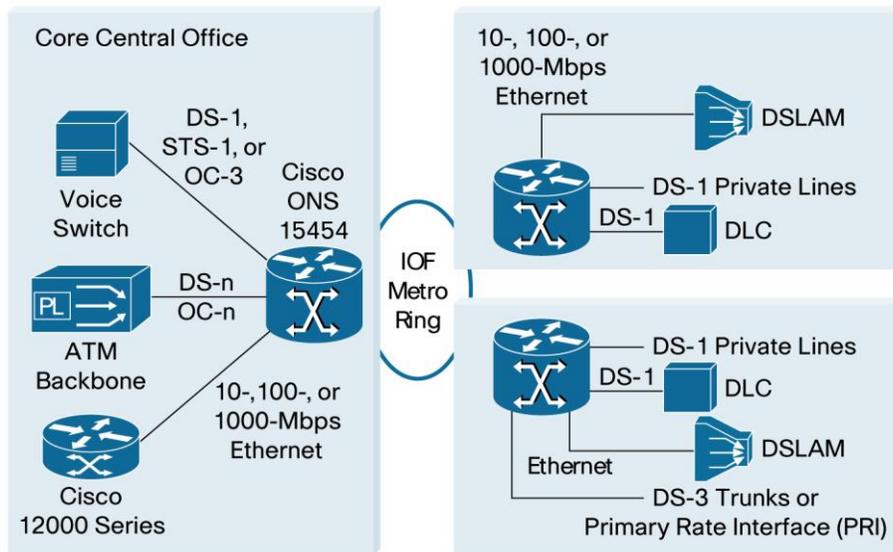
Metro Data Services Network

Metropolitan networks deliver services to end-user customers. A metropolitan network that supports a wide range of service capabilities allows the service provider to offer a tariff mix to meet customer needs. The Cisco ONS 15454 provides the foundation for building an advanced multiservice network over an extremely reliable SONET/SDH infrastructure (refer to Figure 4). Data services delivery, such as transparent LAN services (TLS) or Internet access, are supported by the Cisco ONS 15454 ML-Series cards through the use of 802.1Q in the .1Q VLAN protocol, VLAN translation, input rate limiting, and advanced QoS features, including queue bandwidth control and traffic

priority marking. These flexible features allow the service provider to build, control, and guarantee the delivery of the SLAs offered for each service type. To help service provider technicians manage and use the network, the Cisco ML-Series cards integrate Cisco IOS Software, the industry's best-known Layer 2 and Layer 3 technology, reducing training time and cost.

Figure 4.   Metro Data Services Network TLS
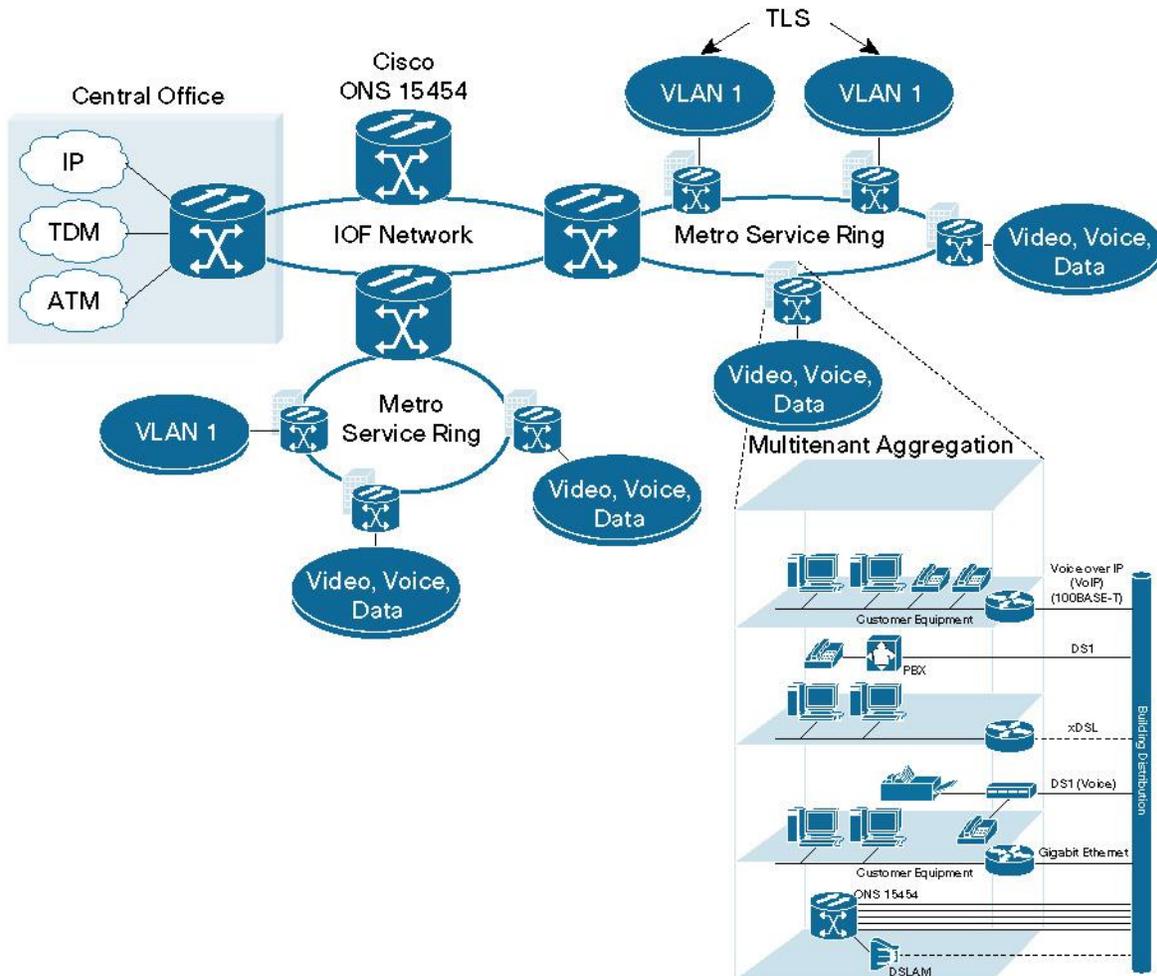
Cable Television Data Transport

Cable television operators are experiencing rapid growth of subscribers to their data services. The Cisco ONS 15454 with Cisco ML-Series cards provides a solution to efficiently transport the increasing data on cable television networks. The Cisco solution allows the cable operator to aggregate data traffic, using the Cisco ML-Series cards, from multiple secondary headends and statistically multiplex it onto shared transport bandwidth for handoff to a core router at the primary headend (Figure 5). Cable modem traffic is bursty, and the sharing of bandwidth allows better use of optical transport resources compared to dedicated point-to-point connections. The advanced QoS capabilities of the Cisco ML-Series cards allow the cable network engineer to design the network to support the committed information rate (CIR) necessary for the types of services being offered, such as Web browsing, VoIP, and video on demand (VoD). The Cisco ML-Series cards allow the user to build traffic queues and associate priority and bandwidth with each queue type, allowing the transport demands of each service to be met. The Cisco ONS 15454 platform supports in-service bandwidth upgrades and allows the transport network to scale from 155 Mbps to 320 Gbps using dense wavelength-division multiplexing (DWDM) so that growth demands should be easily met.

Figure 5.   Cable Television Data Networking
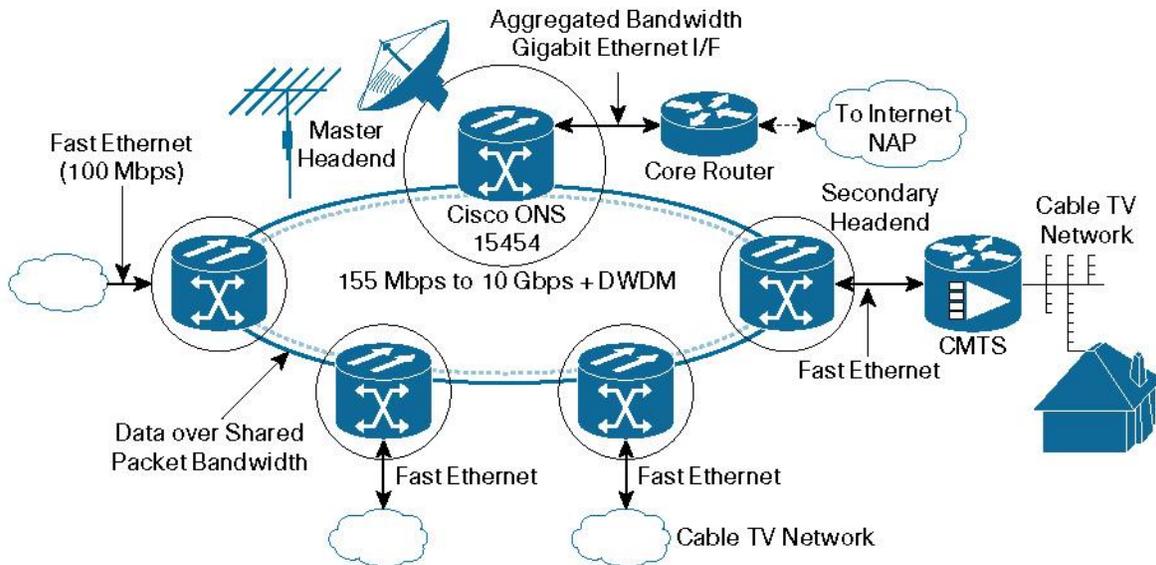
THE CISCO ADVANTAGE

The Cisco ONS 15454 MSPP solution offers significant advantages over traditional optical network elements combined with external Layer 2 and Layer 3 devices. These advantages are summarized as follows.

Integrated Multiservice Capabilities

The Cisco ONS 15454 MSPP solution supports traditional TDM-based, private-line services (for example, DS-1/E-1, DS-3/E-3, and OC-*n*/STM-*n*) along with advanced Ethernet-based services, simplifying service provider migration to new data tariffs and interface flexibility for enterprise users.

Flexible Architectures

The Cisco ONS 15454 platform supports two- or four-fiber bidirectional line switched ring (BLSR) or multiplex section-shared protection ring (MS-SPR), unidirectional path switched ring (UPSR) or multiplex section protection (MSP), linear automatic protection switching (APS) or subnetwork connection (SNC), and path-protected mesh networking (PPMN) architectures. The Cisco ML-Series services cards can be deployed over any of these architectures and protection schemes, allowing the service provider to build a network that meets the customer's SLA requirements. The platform facilitates in-service optical bandwidth expansion using card upgrades, allowing customers to expand their networks to match demand without major replacement, and allowing network expenditures to better match revenue and bandwidth requirements.

Efficient Network Management

Management is simplified through a common DCN network connection and user access for Ethernet and optical functions.

Unified Software Load

One software load supports transport and data capabilities, eliminating unnecessary guesswork from ordering, installation, and upgrades.

Familiar, Proven Cisco IOS Software Technology

The Cisco ML-Series cards incorporate Cisco IOS Software technology, the leading Ethernet and IP delivery vehicle. Most data networking professionals are well trained on Cisco IOS Software, reducing the need for additional training and improving service deployment timelines.

The Cisco ONS 15454, the industry-leading metro optical transport platform, delivers supercharged SONET/SDH transport, integrated optical networking, outstanding multiservice interfaces, and competitive economic benefits.

CISCO ML-SERIES ETHERNET CARDS FOR CISCO ONS 15454 FEATURES AND SPECIFICATIONS

Compact Design

- Single-width card slot design for increased shelf flexibility and scalability
- Up to 12 Cisco ML-Series cards per shelf assembly

Data Architecture Options

- Hub and spoke
- Point to point
- RPR with optional Dual RPR Interconnect (DRPRI) or Redundant Interconnect for fail-safe ring-to-ring networking
- 802.17b standard RPR with optional Redundant Interconnect for fail-safe ring-to-ring and ring-to-node networking

Optical Transport Options

- UPSR or subnetwork connection protection (SNCP)
- Two-fiber and four-fiber BLSR or MS-SPR
- APS or MSP (1 + 1 unidirectional or bidirectional)
- Path-protected mesh network (PPMN)
- Unprotected (0 + 1)

Network Architecture Flexibility

- Ring
- Multiple rings
- Linear add-drop multiplexer
- Terminal

REGULATORY COMPLIANCE

Table 3 summarizes regulatory compliance for the Cisco ONS 15454 MSPP solution.

Table 3.   Regulatory Compliance

Countries	
SONET System • Canada • USA • Mexico • Korea • Japan • EU	**SDH System** • EU • Australia • New Zealand • Singapore • China • Mexico • Hong Kong • Korea
EMC Emissions (Radiated, Conducted) • ICES-003 • GR-1089-CORE • 47CFR15 • VCCI V-3/2000.04 • CISPR24	• EN 300 386-TC • EN50081-1 • EN55022 • AS/NZS3548, Amendment 1 + 2 1995
EMC Immunity • GR-1089-CORE • CISPR24 • EN50082-2	• EN300-386-TC • EN55024
Safety • CAN/CSA-C22.2 No. 60950-00 Third Ed., 12/ 1/2002 • GR-1089-CORE • GR-63-CORE • TS001	• UL 1950 Third Ed., 12/1/2000 • EN60950 (to A4) • IEC60950/EN60950, 3rd Ed. • AS/NZS3260 Supplement 1, 2, 3, 4, 1997
Environmental • GR-63-CORE • AT&T Network Equipment Design Specification	• ETS 300-019 (Class 3.1E) (Note 2)
Structural Dynamics • GR-63-CORE • AT&T Network Equipment Design Specification	• ETS 300-019 (Class 3.1E) (Note 2)
Power and Grounding • SBC (TP76200MP) • ETS 300-132-1 (DC power)	• ETS 300-253 (grounding)

SYSTEM REQUIREMENTS

Table 4 lists system requirements for the Cisco ONS 15454 MSPP solution.

Table 4.   System Requirements

Component	Cisco ONS 15454 SONET	Cisco ONS 15454 SDH
Processor	TCC+or TCC2	TCC2
Cross-connect	Cisco 15454 XC[1], XC-VT, XC-10G, or XC-VXC-10G	Cisco 15454 XC-10G, XC-VXL-10G, XC-VXL-2.5G, or XC-VXC-10G
Shelf assembly	Network Equipment Building Standards (NEBS), NEBS3E, and ANSI versions with appropriate fan tray assembly	European Telecommunications Standards Institute (ETSI) version with SDH 48V fan tray assembly
System software	Cisco ML100T-12 and ML1000-2: Revision 4.0.0 or greater Cisco ML100X-8: Revision 6.0.0 or greater	Cisco ML100T-12 and ML1000-2: Revision 4.0.0 or greater Cisco ML100X-8: Revision 6.0.0 or greater
Slot compatibility	Cisco 15454 XC and XC-VT: Slots 5, 6, 12, and 13 Cisco 15454 XC-10G and XC-VXC-10G: Slots 1 to 6 and 12 to 17	Cisco 15454 XC-10G, XC-VXL-2.5G, XC-VXL-10G, and XC-VXC-10G: Slots 1 to 6 and 12 to 17

1. The Cisco ML100X-8 card is not compatible with the Cisco 15454 XC cross-connect.

SPECIFICATIONS

Table 5 lists the specifications for the Cisco ML-Series cards.

Table 5.   Specifications for Cisco ML-Series Cards

Attribute	Cisco ML100T-12 and ML100X-8	Cisco ML1000-2
Client Interfaces		
Ports		
• Card	Cisco ML100T-12: 12 RJ-45 Cisco ML100X-8: Eight SFPs (100BASE-FX or 100BASE-LX)	Two SFP slots (SX or LX SFP)
• Shelf (maximum 12 cards)	Up to 144	Up to 24
• Rack (maximum four shelves)	Up to 576	Up to 96
Speed	Cisco ML100T-12: 10/100 Mbps Cisco ML100X-8: 100 Mbps	1000 Mbps
Autonegotiation of duplex mode	Cisco ML100T-12: Yes Cisco ML100X-8: Fixed at 100 Mbps	Yes
Flow control pause	Yes	Yes
SONET/SDH Virtual Interfaces		
Ports	Two	Two
Circuit size	SONET: STS-1, -3c, -6c, -9c, -12c, and -24c (virtual concatenation: STS-1-2v, STS-3c-2v, and STS-12c-2v) SDH: VC-3, -4, -4-2c, -4-3c, -4-4c, and -4-8c (virtual concatenation: VC-3-2v, VC-4-2v, and VC-4-4c-2v)	SONET: STS-1, -3c, -6c, -9c, -12c, and -24c (virtual concatenation: STS-1-2v, STS-3c-2v, and STS-12c-2v) SDH: VC-3, -4, -4-2c, -4-3c, -4-4c, and -4-8c (virtual concatenation: VC-3-2v, VC-4-2v, and VC-4-4c-2v)
Maximum card bandwidth	SONET: STS-48 SDH: VC-4-16	SONET: STS-48 SDH: VC-4-16
Encapsulation	Generic framing procedure framing (GFP-F) and virtual concatenation (VCAT) Cisco High-Level Data Link Control (HDLC) Point-to-Point Protocol (PPP) (RFC 2615) and Bridge Control Protocol (BCP) (RFC 2878) LAN extension (LEX) (Cisco G-Series compatible)	GFP-F and VCAT Cisco HDLC PPP (RFC 2615) and BCP (RFC 2878) LEX (Cisco G-Series compatible)

Attribute	Cisco ML100T-12 and ML100X-8	Cisco ML1000-2
Protocols		
Layer 3 switching	IP switching, static routes, Routing Information Protocol Version 2 (RIPv2), Enhanced Interior Gateway Routing Protocol (EIGRP), Open Shortest Path First (OSPF), Border Gateway Protocol (BGP), Intermediate System-to-Intermediate System (IS-IS), Hot Standby Router Protocol (HSRP), VPN routing and forwarding (VRF-lite with OSPF, BGP, and RIP), QoS, IP Multicast (Protocol Independent Multicast dense mode [PIM-DM], PIM sparse mode [PIM-SM], PIM-SM-DM, Internet Group Management Protocol [IGMP], Source Specific Multicast [SSM], and Multiprotocol BGP [MBGP])	
Layer 2 switching	Ethernet switching and bridging (802.1D), VLAN (802.1Q), priority (802.1p), spanning tree (802.1D), rapid spanning tree (Rapid Spanning Tree Protocol [RSTP], 802.1w), flow control (802.3x), Cisco Fast EtherChannel® technology, Cisco Gigabit EtherChannel technology, PoS Channel (PEC), 802.1Q in 802.1Q, per VLAN rapid spanning tree (PVRSTP) switching	
QoS		
Classifiers (ingress: 254 classes)	IP Precedence Input interface (port) Bridge group (VLAN) Priority (802.1p) DSCPs	IP Precedence Input interface (port) Bridge group (VLAN) Priority (802.1p) DSCPs
Policing	1-Mbps rate limiting (sustained rate and burst) Dual CIR and peak information rate (PIR) leaky bucket (port) Admission control to prevent overcommitment	1-Mbps rate limiting (sustained rate and burst) Dual CIR and PIR leaky bucket (port) Admission control to prevent overcommitment
Queuing	400+ scheduling queues Load and committed bandwidth-based buffer control, 4000 packet buffers, and tail drop Low-latency queues	400+ scheduling queues Load and committed bandwidth-based buffer control, 4000 packet buffers, and tail drop Low-latency queues
Schedulers	WDRR	WDRR
Cisco Modular QoS command-line interface (CLI)	Supported	Supported
Statistics		
Ethernet ports		
• Receive	Bytes, packets, unicast packets, multicast packets, broadcast packets, giants, frame-check-sequence (FCS) errors, runts, jabber, and alignment errors	
• Transmit	Bytes, packets, unicast packets, multicast packets, broadcast packets, giants, and collisions	
Virtual ports (PoS)		
• Receive	Pre-HDLC bytes, post-HDLC bytes, packets, short, runts, long, cyclic-redundancy-check (CRC) errors, input drop packet, and input abort packet	
• Transmit	Pre-HDLC bytes, post-HDLC bytes, packets, and port drop counter	
Security		
Access control list (ACL)	Standard IP on input and output of routed packets Standard IP on input of bridged packets Extended IP to limit control-plane access 4000 entries per card	
Ethernet		
Bridge groups (card)	255	255
Supported 802.1Q VLAN range	1 to 4095	1 to 4095
Hierarchical VLANs (.1Q in .1Q)	255	255
Spanning-tree instances (802.1D)	255	255
Per-VLAN rapid spanning tree (PVRST) instances	255	255
Maximum-transmission-unit (MTU) sizes	64 to 9000 bytes	64 to 9000 bytes
Link aggregation	Cisco Fast EtherChannel links (maximum four links per	Cisco Gigabit EtherChannel links (maximum 2 links per

Attribute	Cisco ML100T-12 and ML100X-8	Cisco ML1000-2
• Client interfaces • Virtual interfaces (Pos channel)	group), 2 ports per link or 1 link	group), 2 ports per link or 1 link
Cable	Cisco ML100T-12: Shielded twisted-pair (STP) Ethernet cable, RJ-45 plug connector (NEBS locations) Cisco ML100X-8: Optical fiber, LC connector, single- or multimode (refer to Table 6)	Optical fiber, LC connector, single- or multimode (refer to Table 6)
Performance		
Layer 2 and Layer 3 switching	Up to 5.0 Mbps	Up to 5.0 Mbps
Management Interfaces		
Data	Cisco IOS Software CLI through console port, Telnet, configured user (client) port, or Cisco transport controller window Simple Network Management Protocol (SNMP) traps	
Transport (SONET/SDH)	Cisco transport controller or Transaction Language One (TL-1) using Telnet or serial port SNMP traps and TL-1 autonomous messages	
Cisco ML-Series card • Console port	RJ-11 jack and data communications equipment (DCE)	RJ-11 jack and DCE
TCC card • LAN access and Cisco transport	RJ-45 jack and 10BASE-T	RJ-45 jack and 10BASE-T
Controller • Serial port	DB-9 jack	DB-9 jack
Security	Multilevel access control, data, and transport planes	
Card LEDs • Failure (FAIL) • Status (ACT) Port LEDs (per port) • Link (LINK) • Activity (ACT)	Red Green Green Amber (flash)	Red Green Green Amber (flash)
Performance Monitoring		
SONET (virtual ports)	Path terminating equipment (PTE); the following SONET/SDH path alarms are supported: • Alarm indication signal (AIS) • Loss of pointer (LoP) • Unequipped (UNEQ) • Remote failure indicator (RFI) • Trace identifier mismatch (TIM) • Bit error rate signal fail/signal degrade (SF/SD) • Path trace (J1 byte) – Transmit and receive	
SNMP traps	Spanning Tree Protocol traps: Bridge-MIB (RFC 1493) Authentication trap: RFC 1157 Link-up and Link-down traps for Ethernet ports: IF-MIB (RFC 1573) and SONET/SDH MIB (RFC 2558)	
Power		
Card	53W	49W
Physical		
Size	Single card slot 12.65 H x 0.72 W x 9.00 D (in.) 32.13 H x 1.83 W x 22.86 D (cm)	Single card slot 12.65 H x 0.72 W x 9.00 D (in.) 32.13 H x 1.83 W x 22.86 D (cm)
Weight	2.59 lb (1.17 kg)	2.48 lb (1.12 kg)
Operating Environment		
Temperature	23 to 131°F (–5 to 55°C)	23 to 131°F (–5 to 55°C)
Humidity	5 to 95%, noncondensing	5 to 95%, noncondensing
Storage Environment		

Attribute	Cisco ML100T-12 and ML100X-8	Cisco ML1000-2
Temperature	–40 to 185°F (–40 to 85°C)	–40 to 185°F (–40 to 85°C)
Humidity	5 to 95%, noncondensing	5 to 95%, noncondensing

ORDERING INFORMATION

Table 6 lists ordering information for the Cisco ONS 15454 MSPP solution.

Table 6. Ordering Information

Part Number	Description
15454-ML100X-8	100 Mbps BASE-FX/LX Ethernet card, eight SFP connections, Layer 2 and Layer 3 switching, SONET (ANSI) system
15454E-ML100X-8	100 Mbps BASE-FX/LX Ethernet card, eight SFP connections, Layer 2 and Layer 3 switching, SDH (ETSI) system
ONS-SE-100-LX10	SFP – 100-Mbps Long Reach – 1310 nm – SM – LC, EXT-TEMP
ONS-SE-100-FX	SFP – 100-Mbps Short Reach – 1310 nm – MM – LC, EXT-TEMP
15454-ML100T-12	10/100-Mbps Ethernet card, 12 ports, RJ-45, Layer 2 and Layer 3 switching, SONET (ANSI) system, includes console cable
15454E-ML100T-12	10/100-Mbps Ethernet card, 12 ports, RJ-45, Layer 2 and Layer 3 switching, SDH (ETSI) system, includes console cable
15454-ML1000-2	1000-Mbps Ethernet card, 2 SFP slots, Layer 2 and Layer 3 switching, SONET (ANSI) system
15454E-ML1000-2	1000-Mbps Ethernet card, 2 SFP slots, Layer 2 and Layer 3 switching, SDH (ETSI) system
15454-CONSOLE-02	Cable, console, Cisco ML-Series, RJ-11 plug to RJ-45 jack, 22 in. (55.9 cm) long, SONET (ANSI) system
15454E-CONSOLE-02	Cable, console, Cisco ML-Series, RJ-11 plug to RJ-45 jack, 22 in. (55.9 cm) long, SDH (ETSI) system

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