

Cisco ONS 15454 ML-Series 10-Port Multirate Ethernet Card

The ML-Series 10-port Multirate Ethernet card for the Cisco® ONS 15454 Multiservice Provisioning Platform (MSPP) enables the delivery of true carrier-class Carrier Ethernet services.

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

Product Overview

The Cisco ML-Series cards for the Cisco ONS 15454 MSPP (Figure 1) are industry-leading Ethernet 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 10-Port Ethernet Multirate Card 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 ONS 15454 ML-Series 10-Port Multirate Ethernet Card (ML-MR-10) is the newest addition to the Cisco ML-Series card portfolio, and provides the flexibility to deploy multirate Ethernet services (10,100, 1000 Mbps) over a single card by supporting 10 Small Form-Factor Pluggable (SFP)-based multirate ports.

The Cisco ML-Series 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-MR-10 card supports standard-based IEEE 802.17b Resilient Packet Ring (RPR), which supports increased bandwidth usage over a SONET/SDH ring. 802.17b RPR features also include steering, shortest-path selection, advanced quality of service (QoS), fairness, and spatial reuse for bridging.

In addition to RPR, the Cisco ML-MR-10 card supports 26 Packet over SONET (PoS) ports that enable aggregation of 26 point-to-point Ethernet-over-SONET/SDH circuits.

The advanced set of QoS features on the Cisco ML-MR-10 card allows the network administrator to fine-tune the network and create and support a wide range of SLAs. Table 1 lists some of the features and benefits.

Ethernet Virtual Connection (EVC): The Cisco ML-MR-10 card adopts the Metro Ethernet Forum (MEF) Ethernet Services Framework using EVC Infrastructure/Ethernet Infrastructure (EI). Connectivity between User-Network Interfaces (UNIs) is specified by the Ethernet Virtual Connection (EVC). An EVC represents a conceptual "service pipe" within the service provider network. EVC architecture supported by Cisco IOS Software provides a common framework for service provisioning Carrier Ethernet devices. In Cisco ONS 15454 Software Release 8.5, the Cisco ML-MR-10 card supports Ethernet Virtual Private Line services over an RPR ring.

Table 1. Features and Benefits for QoS

Feature	Benefit
Flexible packet classification	Classifies packets per EVC or per input port based on 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	Policing per EVC or per input port, allows the service provider to contain a user to the SLA bandwidth requirements, reducing the likelihood that a user will flood the network. Policing is supported on aggregated bandwidth of a link-aggregated group.
Priority marking	Provides a mechanism, when using either .1Q or QinQ 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.
Scheduling	Adds weighting capabilities to Weighted Deficit Round Robin scheduling to provide fair access to excess bandwidth as well as throughput to each class. Supports strict priority queue for low latency traffic.

The Cisco ML-MR-10 card offers important advantages in service provider network architectures, supporting new, profitable services as well as simplifying service activation. Table 2 outlines some of these capabilities.

Table 2. Features and Benefits for Service Provider Network Architectures

Feature	Benefit
Admission control	During service provisioning, the Cisco ML-MR-10 card verifies that QoS resources have not been accidentally overcommitted.
Network scaling and flexibility	The Cisco ML-MR-10 card supports 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 IEEE 802.17B RPR over SONET/SDH provides sub-50-ms recovery times 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.
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.

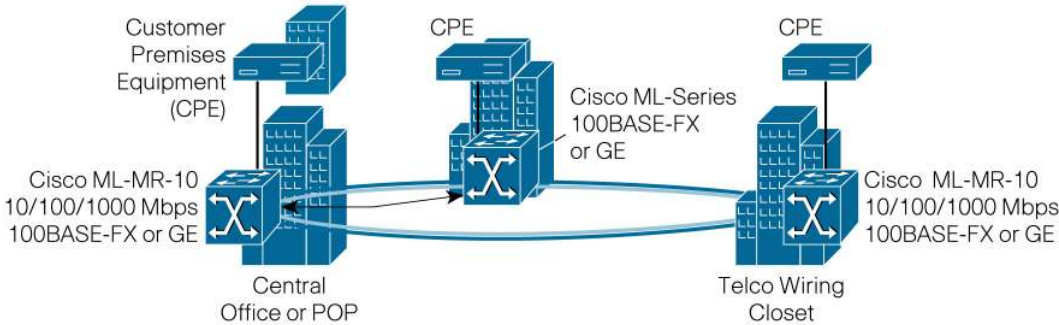
Applications

The Cisco ML-MR-10 card provides 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 ML-MR-10 cards.

Ethernet Service Delivery

The Cisco ONS 15454 with ML-MR-10 cards can be used for any service delivery based on the type of SFP module plugged into the Ethernet port. The platform supports 10/100/1000 BASE-T, 100BASE-FX/LX/BX, and 1000-BASE SX/LX/ZX. Customers can use the Cisco ML-MR-10 cards to offer a wide range of Ethernet services with Layer 2 switching, RPR, and advanced QoS capabilities.

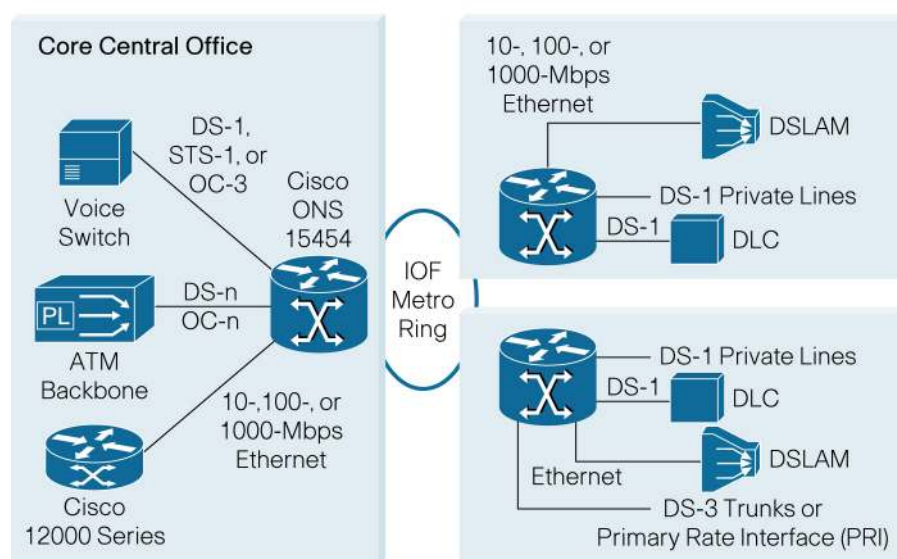
Figure 2. Ethernet Service Delivery



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-MR-10 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

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. The Cisco ML-MR-10 card supports two efficient architectures with RPR rings (refer to Figure 4) and point-to-point port aggregation (see Figure 5). Data services delivery, through EVCs, is supported by the Cisco ML-MR-10 card 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-MR-10 card offers integrated 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 with RPR Rings

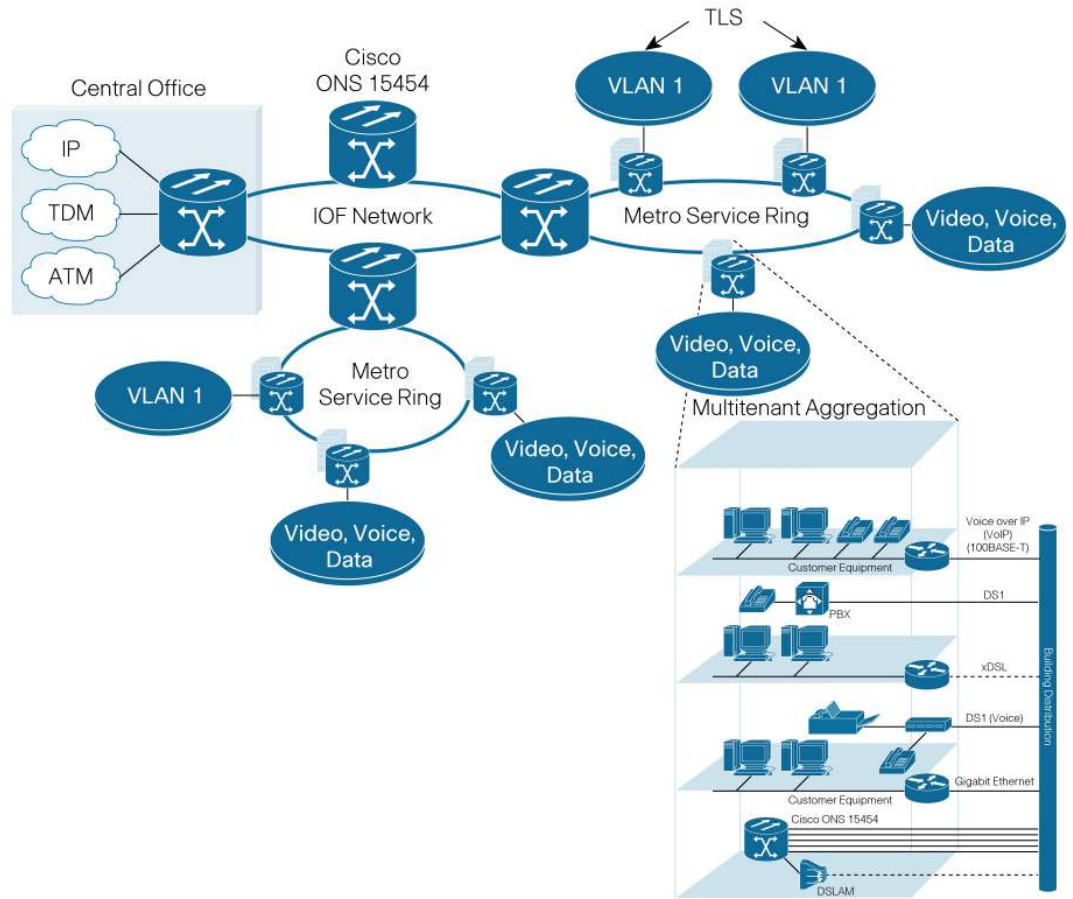
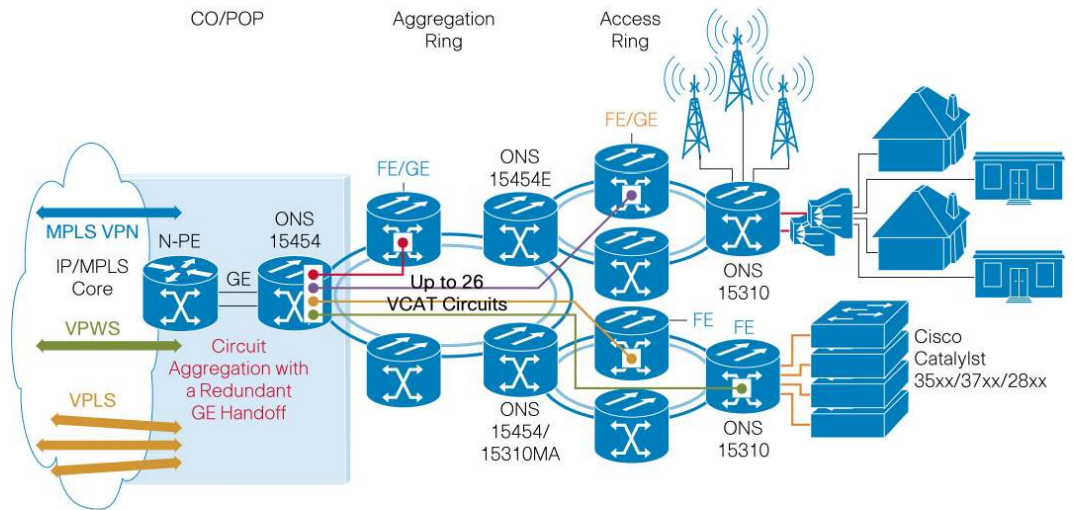


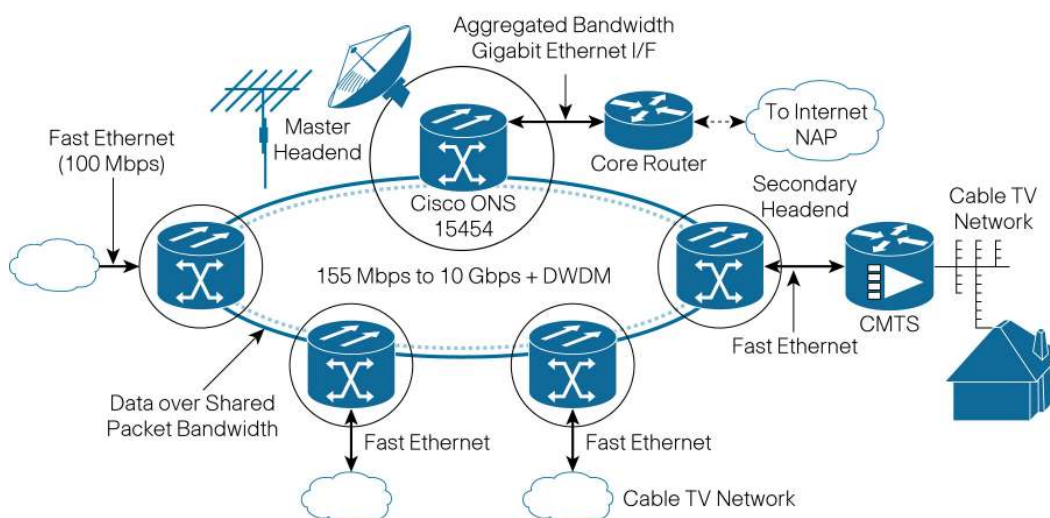
Figure 5. Metro Data Service Network with Point-to-Point Ethernet-over-SONET/SDH Circuit Aggregation



Cable Television Data Transport

Cable television operators are experiencing rapid growth of subscribers to their data services. The Cisco ONS 15454 with ML-MR-10 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-MR-10 cards, from multiple secondary headends and statistically multiplex it onto shared transport bandwidth for handoff to a core router at the master 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-MR-10 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-MR-10 cards allow the user to build traffic queues and associate priority and bandwidth with each queue type, to meet the transport demands of each service. 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), thereby easily accommodating growth.

Figure 6. 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/E1, DS-3/E3, 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 2- or 4-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-MR-10 card 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 equipment 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-MR-10 card incorporates 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.

Features and Specifications of Cisco ML-MR-10 Card

Compact Design

- Single-width card-slot design for increased shelf flexibility and scalability
- Up to 10 Cisco ML-MR-10 cards per shelf assembly

Data Architecture Options

- 802.17b standard RPR
- Port aggregation over hub-and-spoke architecture with point-to-point circuits

Fully Redundant Network and Services

- Client-side redundancy with link aggregation (Cisco EtherChannel® technology or 802.3ad)
- Card redundancy with 1:1 protection
- Network redundancy with 802.17b RPR rings
- Network redundancy for point-to-point circuits with LCAS or SONET/SDH protection

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 <ul style="list-style-type: none"> • Canada • United States • Mexico • Korea • Japan • European Union 	SDH System <ul style="list-style-type: none"> • European Union • Australia • New Zealand • Singapore • China • Mexico • Hong Kong • Korea
EMC Emissions (Radiated, Conducted) <ul style="list-style-type: none"> • ICES-003 • GR-1089-CORE • 47CFR15 • VCCI V-3/2000.04 • CISPR24 	<ul style="list-style-type: none"> • EN 300 386-TC • EN50081-1 • EN55022 • AS/NZS3548, Amendment 1 + 2 1995
EMC Immunity <ul style="list-style-type: none"> • GR-1089-CORE • CISPR24 • EN50082-2 	<ul style="list-style-type: none"> • EN300-386-TC • EN55024
Safety <ul style="list-style-type: none"> • CAN/CSA-C22.2 No. 60950-00 Third Ed., 12/ 1/2002 • GR-1089-CORE • GR-63-CORE • TS001 	<ul style="list-style-type: none"> • UL 1950 Third Ed., 12/1/2000 • EN60950 (to A4) • IEC60950/EN60950, 3rd Ed. • AS/NZS3260 Supplement 1, 2, 3, 4, 1997
Environmental <ul style="list-style-type: none"> • GR-63-CORE • AT&T Network Equipment Design Specification 	<ul style="list-style-type: none"> • ETS 300-019 (Class 3.1E) (Note 2)
Structural Dynamics <ul style="list-style-type: none"> • GR-63-CORE • AT&T Network Equipment Design Specification 	<ul style="list-style-type: none"> • ETS 300-019 (Class 3.1E) (Note 2)
Power and Grounding <ul style="list-style-type: none"> • SBC (TP76200MP) • ETS 300-132-1 (DC power) 	<ul style="list-style-type: none"> • 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	TCC2P or TCC2	TCC2P or TCC2
Cross-connect	Cisco 15454 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	Revision 8.5 or later	Revision 8.5 or later
Slot compatibility	Slots 1 to 6 and 12 to 17	Slots 1 to 6 and 12 to 17

Specifications

Table 5 lists the specifications for the Cisco ML-MR-10 card.

Table 5. Specifications for Cisco ML-MR-10 Cards

Attribute	Cisco ML-MR-10
Ports	10 SFP ports
Port speed	10/100/1000 Mbps
SFP types	10/100/1000 Mbps BASE-T; 100 Mbps BASE-FX, LX, BX; 1000 Mbps BASE-SX, LX, ZX
<ul style="list-style-type: none"> Shelf (maximum 10 cards) 	Up to 120
<ul style="list-style-type: none"> Rack (maximum four shelves) 	Up to 480
Logical Packet-over-SONET/SDH (PoS) ports	2 ports for one RPR ring 26 ports for point to point circuits
Autonegotiation of duplex mode	Yes
Transport bandwidth allocation on "virtual" POS (VCG) ports	SONET: STS-1-nv (n = 1 to 21), STS-3C-nv (n = 1 to 7), vt1.5-nv (n = 1 to 64), STS-1, -3c, -6c, -9c, -12c, -24c, -48c, 96c SDH: VC-4-nv (n = 1 to 7), VC3-nv (n = 1 to 21), vc12-nv (n = 1 to 63), VC-4, -4-2c, -4-3c, -4-4c, -4-8c, -4-16v, -4-32c
Maximum card bandwidth	10 Gbps in Cisco ONS 15454 slots 5,6,12,13 2.5 Gbps in Cisco ONS 15454 slots (1–4, 14–17)
Ethernet-over-SONET encapsulation	ITU-T G.7041 GFP-F
Transport bandwidth adjustment Ethernet-over-SONET encapsulation	ITU-T G.7042 LCAS (dynamic addition and removal of bandwidth) ITU-T G.7041 GFP-F
Classifiers (ingress: up to 4,000 EVCs) transport bandwidth adjustment	EVC IP Precedence Priority (802.1p) DSCPs Combination of EVC + 802.1p/IP Precedence/DSCP ITU-T G.7042 LCAS (dynamic addition and removal of bandwidth)
Policing classifiers (ingress: up to 4,000 EVCs)	1-Mbps rate limiting (sustained rate and burst) Dual CIR and peak information rate (PIR) leaky bucket (port) Admission control to prevent over-commitment EVC IP Precedence Priority (802.1p) DSCPs Combination of EVC + 802.1p/IP Precedence/DSCP

Attribute	Cisco ML-MR-10
Queuing policing	<p>4 physical queues for each Gigabit Ethernet port</p> <p>8 physical queues for each RPR ringlet:</p> <p>1 PTQ, 1 STQ, 1 Class A add-queue, 1 Class B Add-queue, and 4 Class C add-queues</p> <p>Each queue has preconfigured Green, Yellow, and Red color thresholds</p> <p>One low-latency queue per port</p> <p>1-Mbps rate limiting (sustained rate and burst)</p> <p>Dual CIR and peak information rate (PIR) leaky bucket (port)</p> <p>Admission control to prevent over-commitment</p>
Schedulers Queuing	<p>Weighted Deficit Round Robin (WDRR) and Strict Priority scheduling</p> <p>4 physical queues for each Gigabit Ethernet port</p> <p>8 physical queues for each RPR ringlet:</p> <p>1 PTQ, 1 STQ, 1 Class A add-queue, 1 Class B Add-queue, and 4 Class C add-queues</p> <p>Each queue has preconfigured Green, Yellow, and Red color thresholds</p> <p>One low-latency queue per port</p>
Cisco Modular QoS command-line interface (CLI) Schedulers	Supported Weighted Deficit Round Robin (WDRR) and Strict Priority scheduling
Number of VLANs/services Cisco Modular QoS command-line interface (CLI)	4,000 supported
Hierarchical VLANs (.1Q in .1Q)	4K
Maximum-transmission-unit (MTU) sizes Hierarchical VLANs (.1Q in .1Q)	64 to 9000 bytes 4K
Link aggregation Maximum-transmission-unit (MTU) sizes	<p>Cisco Fast EtherChannel links, IEEE 802.3ad</p> <p>Bundle up to 10 members in a single link aggregation group 64 to 9000 bytes</p>
1:1 card port protection Link aggregation	<p>Provides card protection for ports and port aggregated group.</p> <p>Note: Complete link aggregation group is protected with 1:1 protection. Link aggregation group members should be on a single card. Cisco Fast EtherChannel links, IEEE 802.3ad</p> <p>Bundle upto 10 members in a single link aggregation group</p>
SNMP MIB, traps and RMON support 1:1 card port protection	<p>Yes. Provides card protection for ports and port aggregated group.</p> <p>Note: Complete link aggregation group is protected with 1:1 protection. Link aggregation group members should be on a single card.</p>
Transport (SONET/SDH) SNMP MIB, traps and RMON support	Yes
Console port Transport (SONET/SDH)	RS232 over mini USB physical connection
SecurityConsole port	RS232 over mini USB physical connection
Card LEDs <ul style="list-style-type: none"> Failure (FAIL) Status (ACT) Port LEDs (per port) <ul style="list-style-type: none"> Link (LINK) Activity (ACT) Security 	<p>Red</p> <p>Green</p> <p>Green</p> <p>Amber (flash)</p>
SONET (virtual ports) card LEDs <ul style="list-style-type: none"> Failure (FAIL) Status (ACT) Port LEDs (per port) <ul style="list-style-type: none"> Link (LINK) Activity (ACT) 	<p>Red</p> <p>Green</p> <p>Green</p> <p>Amber (flash)</p>
SNMP traps SONET (virtual ports)	
Card power draw (including SFPs) Typical Maximum	<p>70W</p> <p>100W</p>

Attribute	Cisco ML-MR-10
Temperature	23 to 131°F (–5 to 55°C)
Weight	1.2 kg
Humidity	5 to 95%, noncondensing
Temperature	23 to 131°F (–5 to 55°C)
Temperature	–40 to 185°F (–40 to 85°C)
Humidity	5 to 95%, noncondensing
Humidity temperature	5 to 95%, noncondensing –40 to 185°F (–40 to 85°C)
Humidity	5 to 95%, noncondensing

Ordering Information

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

Table 6. Ordering Information

Product Description	Part Number
Cisco ML-Series 10/100/1000-Mbps multirate Ethernet card, 10 ports, SONET system	15454-ML-MR-10=
Cisco ML-Series 10/100/1000-Mbps multirate Ethernet card, 10 ports, SDH system	15454E-ML-MR-10=
SFP – 10/100/1000 Ethernet BASE-T multirate copper RJ-45	ONS-SE-ZE-EL=
SFP – 10/100/1000 Ethernet BASE-T multirate copper RJ-45	ONS-SE-ZE-EL
SFP – 1000BASE-SX Gigabit Ethernet, 850 nm, MM, I-TEMP	ONS-SI-GE-SX=
SFP – 1000BASE-SX Gigabit Ethernet, 850 nm, MM, I-TEMP	ONS-SI-GE-SX
SFP – 1000BASE-LX Gigabit Ethernet, 1310 nm, SM, I-TEMP	ONS-SI-GE-LX=
SFP – 1000BASE-LX Gigabit Ethernet, 1310 nm, SM, I-TEMP	ONS-SI-GE-LX
SFP – 1000BASE-ZX Gigabit Ethernet, 1550 nm, SM, I-TEMP	ONS-SI-GE-ZX=
SFP – 1000BASE-ZX Gigabit Ethernet, 1550 nm, SM, I-TEMP	ONS-SI-GE-ZX
SFP – 100 Mbps Short Reach – 1310 nm, MM, LC, I-TEMP	ONS-SI-100-FX=
SFP – 100 Mbps Short Reach – 1310 nm, MM, LC, I-TEMP	ONS-SI-100-FX
SFP – 100 Mbps Long Reach – 1310 nm, SM, LC, I-TEMP	ONS-SI-100-LX10=
SFP – 100 Mbps Long Reach – 1310 nm, SM, LC, I-TEMP	ONS-SI-100-LX10
SFP – 10/100 BX-U, EXT	ONS-SE-100-BX10U=
SFP – 10/100 BX-U, EXT	ONS-SE-100-BX10U
SFP – 10/100 BX-D, EXT	ONS-SE-100-BX10D=
SFP – 10/100 BX-D, EXT	ONS-SE-100-BX10D



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