Overview of the ML-Series Card

This chapter provides an overview of the ML-100T-8 card for Cisco ONS 15310-CL and the Cisco ONS 15310-MA. It lists Ethernet and SONET capabilities and Cisco IOS and Cisco Transport Controller (CTC) software features, with brief descriptions of selected features.

The CE-100T-8 card for the Cisco ONS 15310-CL and the Cisco ONS 15310-MA is covered in Chapter 17, "CE-100T-8 Ethernet Operation." For Ethernet card specifications, refer to the *Cisco ONS 15310-CL and Cisco ONS 15310-MA Reference Manual*. For step-by-step Ethernet card circuit configuration, hard-reset, and soft-reset procedures, refer to the *Cisco ONS 15310-CL and Cisco ONS 15310-MA Procedure Guide*. Refer to the *Cisco ONS SONET TL1 Command Guide* for TL1 provisioning commands. For specific details on ONS 15310-CL Ethernet card interoperability with other ONS platforms, refer to the "POS on ONS Ethernet Cards" chapter of the *Ethernet Card Software Feature and Configuration Guide for the ONS 15454 SDH, ONS 15454, and ONS 15327*.

This chapter contains the following major sections:

ML-Series Card Description

The ML-Series card is a module in the Cisco ONS 15310-CL and the Cisco ONS 15310-MA. It is an independent Fast Ethernet switch with eight RJ-45 interfaces. The ML-Series card uses Cisco IOS Release 12.2(28)SV, and the Cisco IOS command-line interface (CLI) is the primary user interface for the ML-Series card. Most configuration for the card, such as Ethernet and packet-over-SONET (POS) port provisioning, bridging, VLAN, and Quality of Service (QoS), can be done only with the Cisco IOS CLI.

However, CTC—the ONS 15310-CL graphical user interface (GUI)—and Transaction Language One (TL1) also support the ML-Series card. SONET circuits must be configured through CTC or TL1 and cannot be provisioned through Cisco IOS. CTC also offers ML-Series card status information, SONET alarm management, Cisco IOS Telnet session initialization, provisioning, inventory, and other standard functions.

The ML-Series card features two virtual ports, which function in a manner similar to OC-N card ports. The SONET circuits are provisioned through CTC in the same manner as standard OC-N circuits.

For detailed card specifications, refer to the *Cisco ONS 15310-CL and Cisco ONS 15310-MA Reference Manual*.

ML-Series Feature List

The ML-100T-8 has the following features:

- Layer 1 data features:
  - 10/100BASE-TX half-duplex and full-duplex data transmission
  - IEEE 802.3x compliant flow control
- SONET features:
  - High-level data link control (HDLC) or frame-mapped generic framing procedure (GFP-F) framing mechanisms for POS
  - GFP-F supports LEX (default), Cisco HDLC, and Point-to-Point Protocol/Bridging Control Protocol (PPP/BCP) encapsulation for POS
  - HDLC framing supports LEX encapsulation only
  - Two POS virtual ports
  - Virtual concatenated (VCAT) circuits with Link Capacity Adjustment Scheme (LCAS) or without LCAS
  - ONS 15310 ML-Series LCAS is compatible with ONS 15454 ML-Series SW-LCAS
- Layer 2 bridging features:
  - Transparent bridging
  - MAC address learning, aging, and switching by hardware
  - Protocol tunneling
  - Multiple Spanning Tree (MST) protocol tunneling
  - 255 active bridge group maximum
  - 8,000 MAC address maximum per card
  - Integrated routing and bridging (IRB)
  - IEEE 802.1P/Q-based VLAN trunking
  - IEEE 802.1Q VLAN tunneling
  - IEEE 802.1D Spanning Tree Protocol (STP) and IEEE 802.1W Rapid Spanning Tree Protocol (RSTP)
  - IEEE 802.1D STP instance per bridge group
  - Resilient packet ring (RPR)
  - VLAN-transparent and VLAN-specific services (Ethernet Relay Multipoint Service [ERMS])
- Fast EtherChannel (FEC) features:
  - Bundling of up to four Fast Ethernet ports
  - Load sharing based on source and destination IP addresses of unicast packets
  - Load sharing for bridge traffic based on MAC addresses
  - IRB
  - IEEE 802.1Q trunking
  - Up to 4 active FEC port channels
- POS channel:

  - Bundling the two POS ports
  - LEX encapsulation only
  - IRB
  - IEEE 802.1Q trunking
- Layer 3 static routing:
  - Default routes
  - IP unicast and multicast forwarding
  - Reverse Path Forwarding (RPF) multicast (not RPF unicast)
  - Load balancing among equal cost paths based on source and destination IP addresses
  - Up to 350 IP routes per card
  - Up to 350 IP hosts per card
  - IRB routing mode support
- QoS features:
  - Multicast priority queuing classes
  - Service level agreements (SLAs) with 1-Mbps granularity
  - Input policing
  - Guaranteed bandwidth (weighted round-robin [WDRR] plus strict priority scheduling)
  - Low latency queuing support for unicast voice over IP (VoIP)
  - Class of service (CoS) based on Layer 2 priority, VLAN ID, Layer 3 Type of Service/DiffServ Code Point (TOS/DSCP), and port
  - CoS-based packet statistics
  - Up to 350 QoS entries per card
  - Up to 350 policers per card
  - IP SLA network monitoring using Cisco IP SLA (formerly Cisco Service Assurance Agent)
- Security features
  - Cisco IOS login enhancements
  - Secure Shell connection (SSH Version 2)
  - Disabled console port
  - Authentication, Authorization, and Accounting/Remote Authentication Dial-In User Service (AAA/RADIUS) stand alone mode
  - AAA/RADIUS relay mode
- Additional protocols:
  - Cisco Discovery Protocol (CDP) support on Ethernet ports
  - Dynamic Host Configuration Protocol (DHCP) relay
  - Hot Standby Router Protocol (HSRP) over 10/100 Ethernet, FEC and Bridge Group Virtual Interface (BVI)
  - Internet Control Message Protocol (ICMP)
- Management features:

  - Cisco IOS Release 12.2(28)SV
  - CTC
  - Remote monitoring (RMON)
  - Simple Network Management Protocol (SNMP)
  - TL1
- System features:
  - Network Equipment Building Systems 3 (NEBS3) compliant
- CTC features:
  - Standard synchronous transport signal (STS) and VCAT circuit provisioning for POS virtual ports
  - SONET alarm reporting for path alarms and other ML-Series card specific alarms
  - Raw port statistics
  - Standard inventory and card management functions
  - J1 path trace
  - Cisco IOS CLI Telnet sessions from CTC
  - Cisco IOS startup configuration file management from CTC

Key ML-Series Features

This section describes selected key features and their implementation on the ML-Series cards.

Cisco IOS

Cisco IOS controls the data functions of the ML-Series cards. Users cannot update the ML-Series Cisco IOS image in the same manner as the Cisco IOS system image on a Cisco Catalyst Series. An ML-Series Cisco IOS image upgrade is available only as part of the Cisco ONS 15310-CL or the Cisco ONS 15310-MA software release and accomplished only through CTC or TL1. The image is not available for download or shipped separately.

GFP-F Framing

GFP defines a standard-based mapping of different types of services onto SONET/SDH. The ML-Series and CE-Series support frame-mapped GFP (GFP-F), which is the protocol data unit (PDU)-oriented client signal adaptation mode for GFP. GFP-F maps one variable length data packet onto one GFP packet.

GFP is composed of common functions and payload specific functions. Common functions are those shared by all payloads. Payload-specific functions are different depending on the payload type. GFP is detailed in the ITU recommendation G.7041.

Link Aggregation (FEC and POS)

The ML-Series offers Fast EtherChannel and POS channel link aggregation. Link aggregation groups multiple ports into a larger logical port and provides resiliency during the failure of any individual ports. The ML-Series supports a maximum of four Ethernet ports in Fast EtherChannel, and two SONET virtual ports in POS channel. POS channel is only supported with LEX encapsulation.

Traffic flows map to individual ports based on MAC source address (SA)/destination address (DA) for bridged packets and IP SA/DA for routed packets. There is no support for policing or class-based packet priorities when link aggregation is configured.

RMON

The ML-Series card features RMON that allows network operators to monitor the health of the network with an NMS. ONG RMON is recommended for the ML-100T-8. The ONG RMON contains the statistics, history, alarms, and events MIB groups from the standard RMON MIB. The standard Cisco IOS RMON is also available. A user can access RMON threshold provisioning through TL1 or CTC. For more information on RMON, refer to the "SNMP Remote Monitoring" section in "SNMP" chapter of the *Cisco ONS 15310-CL and Cisco ONS 15310-MA Reference Manual*.

RPR

RPR is an emerging network architecture designed for metro fiber ring networks. This new MAC protocol is designed to overcome the limitations of STP, RSTP, and SONET in packet-based networks. RPR convergence times are comparable to SONET and much faster than STP or RSTP. RPR operates at the Layer 2 level and is compatible with Ethernet and protected or unprotected SONET circuits.

SNMP

The Cisco ONS 15310-CL, the Cisco ONS 15310-MA, and the ML-Series cards have SNMP agents and support SNMP Version 1 (SNMPv1) and SNMP Version 2c (SNMPv2c) sets and traps. The Cisco ONS 15310-CL and the Cisco ONS 15310-MA accept, validate, and forward get/getNext/set requests to the ML-Series through a proxy agent. Responses from the ML-Series are relayed by the Cisco ONS 15310-CL and the Cisco ONS 15310-MA to the requesting SNMP agents.

The ML-Series card SNMP support includes:

- STP traps from Bridge-MIB (RFC 1493)
- Authentication traps from RFC 1157
- Export of QoS statistics through the CISCO-PORT-QOS-MIB extension

For more information on how the ONS 15310-CL implements SNMP, refer to the "SNMP" chapter of the *Cisco ONS 15310-CL and Cisco ONS 15310-MA Reference Manual*. For more information on specific MIBs, refer to the Cisco SNMP Object Navigator at http://www.cisco.com.

TL1

TL1 on the ML-Series cards can be used for card inventory, fault and alarm management, card provisioning, and retrieval of status information for both data and SONET ports. TL1 can also be used to provision SONET STS circuits and transfer a Cisco IOS startup configuration file to the card memory. For specific TL1 commands and general TL1 information, refer to the *Cisco ONS SONET TL1 Command Guide*.