The PME-412 is a highly scalable Ethernet switching and transport module for Ciena's Z-Series Packet-Optical Platform.

The PME-412 is optimized for high-capacity Ethernet aggregation and transport, where it complements the Z-Series PME-216i module to provide a robust, end-to-end packet transport solution. Supported in the Z22, Z33, and Z77 platforms, the PME-412 provides the following interfaces:

- 4 XFP-based 10GbE LAN/WAN ports, two of which can be configured for OTU2 connectivity
- 12 SFP-based GbE ports

The PME-412 module supports standards-based Connection-Oriented Ethernet (COE) for increased network performance and scale, as well as integrated Optical Transport Network (OTN) capabilities.

In addition, the PME-412 module provides full-featured Ethernet switching via MAC, VLAN, or stacked VLAN (Q-in-Q), with granular traffic policing/shaping to enable the delivery of advanced Ethernet services.

Key features and benefits

- Z22-, Z33-, and Z77-compatible for scalable investment protection, common sparing/inventory and operational consistency
- Simplified A-Z provisioning of Ethernet services with Blue Planet’s Planet Operate
- Certified compliant with MEF 9 for EPL, E-Line and E-LAN service definitions and MEF 14 for QoS and Traffic Management
- Supports line-rate, non-blocking L2 switching (80 Gb/s capacity) with COE for guaranteed Ethernet performance and QoS
- Ethernet switch functionality provides the flexibility to augment or replace existing switches
  - Upgrading capacity and functionality
  - Allowing legacy switches to leverage strength in more basic, lower-speed GbE services
Applications

• Fiber reclamation and capacity scaling through the aggregation of multiple new and existing Ethernet services into high-speed 10G OTN DWDM

• High-capacity aggregation and transport of GbE and 10GbE MEF E-Line and E-LAN Ethernet services
  - Cap and grow expansion of Ethernet switch functionality working in combination with existing equipment

• Carrier grade packet transport with guaranteed SLAs as an alternative to SONET/SDH

Features and benefits (continued)

• Full duplex 20 Gb/s connectivity between PME cards allows for capacity expansion and protection across the backplane

• Reclaim precious transport fibers and dramatically expand capacities by aggregating multiple lower speed transport services into more fiber efficient 10G DWDM wavelengths

• Integrated G.709 OTN mapping (OTU2) for enhanced performance and management
  - G.975 generic forward error correction (GFEC) on DWDM trunk (5-6dB link improvement)
  - OTU2 trail trace identifier on DWDM trunks for granular tracking and visibility
  - Span by span, per-service transmit and receive performance monitoring with 15 min and 24 hr PM statistics for trending

• Supports removable SFPs/XFPs for pay-as-you-grow wavelength additions
Technical Information

System Requirements
Z22, Z33 or Z77 chassis

Interfaces
4 XFP-based 10 Gb/s ports:
  2 of which can be configured for 10GbE or OTN OTU2
  2 of which can be configured for 10GbE LAN
12 SFP-based GeGb ports

Ethernet Services
MEF Certified E-Line and E-LAN Services
  EPL and EVPL
  EP-LAN and EVP-LAN

Protection
Ethernet Protection
  Ethernet Linear Protection ITU-T G.8031
  Ethernet Ring Protection ITU-T G.8032
Client (UNI) Protection
  Ethernet Ring Protection (ITU-T G.8032)
  Link Aggregation (802.1AX), single- or cross- card
  Rapid Spanning Tree (802.1w)
Equipment Protection
  1+1 protection across the backplane
Provider Backbone Bridging - Traffic Engineering (PBB-TE) IEEE 802.1Qay
Spanning tree (IEEE 802.1D)
Multiple Spanning Tree (IEEE 802.1s)
Rapid Spanning Tree (IEEE 802.1w)
Link OAM (IEEE 802.3ah Clause 57)
Connectivity Fault Management (IEEE 802.1ag)

Optical Transport
Up to 2 10GbE rings per module, or
Up to 2 10G OTU2s per module
G.975 Generic forward error correction (GFEC)

Management
G.709 and OTN support on all DWDM interfaces
SNMP v3, CLI, TL1
EMS based integration creates end-to-end OAM regardless of topology or packet/OTN mixed links
Guarantees and verifies SLA conformance

OAM
Link OAM 802.3ah and OTN
Service OAM 802.1ag
  UP and Down MEPs

Capacity
80 Gb/s switching capacity per module
32K MAC Addresses
4,096 VLANs with independent VLAN learning
4K VLAN translation (Ingress + Egress)
8 Ports in a LAG group

QoS
Ethernet Ingress Policing (per-Service)
  Two Rate Three Color Marker
  Granularity in 1 Mb/s increments
  Ethernet P-bit priority to CoS Mapping
  DSCP to CoS Mapping
Ethernet Egress Shaping (per-Aggregated Service)
  Granularity in 1 Mb/s increments
Ethernet Egress Policing
  8 class of service queues per port
  Strict Priority Scheduling

Synchronization
Sync-E, Synchronous Ethernet

Standards
MAC bridging (IEEE 802.1D)
VLANs (IEEE 802.1Q)
Q-in-Q (IEEE 802.1ad)
Provider Backbone Bridging (PBB) IEEE 802.1ah

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