

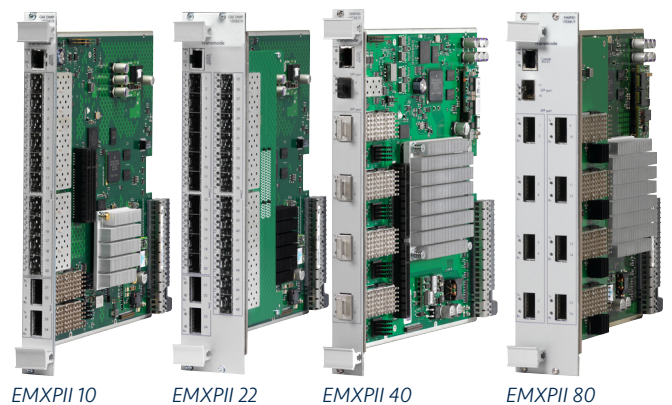
# Ethernet Muxponder II

## Delivering Ethernet services in transport networks

### Key benefits:

- Compact and cost efficient switching, demarcation and aggregation of FE/GbE and 10GbE LAN services
- Provides E-LINE, E-LAN or E-TREE services
- Ultra low latency and zero jitter
- Connection-oriented services through MPLS-TP
- Flexible network resilience options through ring protection, point-to-point protection and MPLS pseudowires over redundant LSPs
- Efficient video distribution enabled by Source Specific IP Multicast
- Synchronous Ethernet for efficient network synchronization
- Tunable optics on line side for maximum flexibility
- Provides seamless Layer 1 and Layer 2 integration with Ethernet services into flexible CWDM and DWDM networks
- Low Power Design ensures low total cost of ownership

The Ethernet Muxponder II (EMXP II) family is a powerful part of Transmode's TM-Series platform. Its seamless integration of Layer 1 transport and Layer 2 Metro Ethernet functionality enables cost efficient transport of Ethernet services over flexible CWDM and DWDM networks. The units included in the EMXP II family are the EMXP II 10, the EMXP II 22, the EMXP II 40 and the EMXP II 80.



deployed to provide transport of Ethernet for a variety of services in a scalable way in a backhaul network.

### Ethernet Access

The EMXP II units provide powerful UNI and E-NNI interfaces enabling port based or fully service multiplexed E-LINE, E-LAN or E-TREE services, certified by the Metro Ethernet Forum. The EMXP II offers a strong classification and policy engine to better define extended and flexible Ethernet Services and QoS classifications. There are bandwidth profiles allowing service providers to offer services using less than full port speed.

### OAM

The Ethernet services provided by the EMXP II units are constantly monitored for interruption and performance with Ethernet Service OAM, and the MPLS paths are monitored with BFD. There are in-service surveillance for connectivity and measurement that are standards based and fully interoperable.

### In-band management

The EMXP II units offer standard methods for in-band management. Transmode's Intelligent WDM (iWDM™) technology combined with the standard in-band access methods can be used for easy and flexible in-band management across the entire network.

### Quality of Service

The EMXP II units provide a flexible toolkit of traffic management features. The toolkit includes features such as strict and weighted scheduling, bandwidth profiles and shaping of min and max bandwidth. Traffic can be classified either per port (for EPL, EP-LAN and EP-Tree services) or it can be classified per VLAN for service multiplexed services (EVPL and EVP-LAN).

### Resiliency

The EMXP II units offer various methods to provide resiliency. The simplest method is to utilize IEEE 802.3ad Link aggregation.

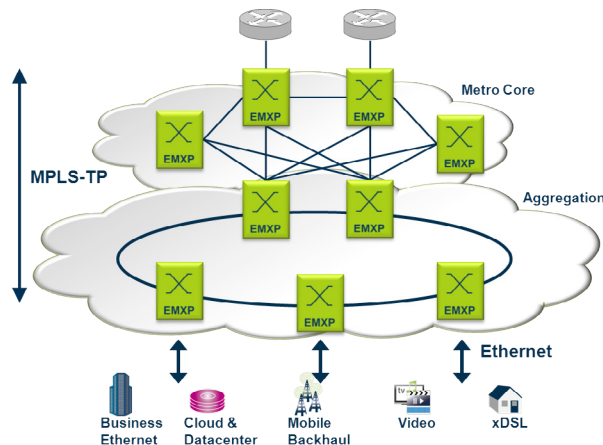


Fig. 1 EMXP units in an Ethernet Backhaul Network using MPLS-TP

### Ethernet Transport

The EMXP II units are especially designed to deliver an optimized Ethernet transport solution. They create a Layer 2 optimized transport architecture using selective integration of Layer 2 and MPLS functions.

Scaling Ethernet services over larger networks can be done by taking advantage of the MPLS-TP capabilities of the EMXP. Transporting Ethernet over MPLS-TP pseudowires encapsulates the user traffic allowing services to scale in large networks, and lets the Ethernet service be carried with protection over any type of topology.

The following example shows how the EMXP II units can be

If any of the units in the EMXP II family are deployed in a ring topology, then ITU-T G.8032 Ethernet Ring Protection Switching also becomes an option. Protection switching is performed with carrier class sub 50 ms protection using either of these 2 protection schemes.

For Ethernet transported over MPLS-TP pseudowires, the protection function uses pre-defined back-up paths that will ensure service continuity if the primary path fails. One of the benefits with MPLS is that it is possible to provide protection over any type of topology including ring, full mesh or partial mesh without involving a control plane.

### Source Specific Multicast for video distribution

The EMXP II units offer IGMPv3 and Source Specific Multicast (SSM), features that are unique in transport networks. These features allow the distribution of video traffic to be highly optimized and efficient as a destination only receives the traffic intended for it.

### Technical specifications (Valid for EMXP II 10, EMXP II 22, EMXP II 40 and EMXP II 80):

<b>Interfaces</b> EMXP II 10: 10 x GbE + 2 x 10G EMXP II 22: 22 x GbE + 2 x 10G EMXP II 40: 4 x 10G + 1GbE EMXP II 80: 8 x 10G + 1GbE	10G interfaces (XFP): <ul style="list-style-type: none"> <li>• Uncolored Multimode and Singlemode</li> <li>• CWDM up to 8 channels, DWDM up to 40 channels or Tunable XFP up to 80 channels</li> </ul> GE/FE interfaces (SFP): <ul style="list-style-type: none"> <li>• Uncolored Multimode and Singlemode</li> <li>• CWDM up to 16 channels or DWDM up to 40 channels</li> <li>• Single-strand fiber solution</li> <li>• Electrical 10/100/1000BASE-T</li> </ul>
<b>Resilience</b>	ITU-T G.8032 Ethernet Ring Protection IEEE 802.3ad Link Aggregation MPLS-TP Linear Protection with Protection State Coordination (PSC) RFC6378
<b>Ethernet Services</b>	E-LINE (EPL and EVPL), E-LAN (EP-LAN and EVP-LAN), E-TREE (EP-Tree) MEF 9+14 Certification
<b>Quality of Service</b>	Policing using bandwidth profiles Flexible Traffic Classification, e.g. based on DSCP, CoS, port and inner/outer VLAN 8 Strict priority queues / WRR queues, Min and Max Shaping. WRED
<b>Latency</b>	1.9 $\mu$ s delay for all packet sizes using RFC1242 store and forward metric Frame Delay variation below 0.05 $\mu$ s
<b>Performance Monitoring &amp; OAM</b>	IEEE 802.1ag Continuity Check and Loopback, Port Mirroring MPLS G-ACh channel for OAM RFC5586 BFD for MPLS Label Switched Paths (LSPs) RFC5884 Management VLAN for in-band management Port isolation using Private VLAN technique
<b>Synchronous Ethernet</b>	ITU-T G.8262 Synchronous Ethernet Equipment Clocks (EEC) ITU-T G.8264 Ethernet Synchronization Messaging Channel (ESMC) ITU-T G.781 Synchronization Status Messages (SSM)
<b>Source Specific Multicast</b>	RFC4607 Source-Specific Multicast for IP RFC4541 IGMP Snooping RFC2236 IGMPv2, RFC3376 IGMPv3
<b>L2 Switching</b>	Selectable learning enabled per VLAN, 4,094 VLAN IDs, 32K MAC-addresses Storm Control IEEE 802.1ad Q-in-Q SVLAN Flexible VLAN tag handling: push, pop, swap, pop-swap Super Jumbo Frames up to 10248 Bytes
<b>MPLS</b>	LER and LSR operation 512 LSPs, 512 Pseudowires MPLS Transport Profile RFC5960
<b>Power consumption (including optics)</b>	Max 30W for EMXP II 10, max 45W for EMXP II 22, max 50W for EMXP II 40, max 65W for EMXP II 80



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