

# Ethernet Demarcation Unit

*Seamless aggregation of Ethernet services into CWDM / DWDM networks*

## Key benefits:

- Zero delay and jitter wire-speed performance for unprecedented QoS and SLA fulfillment
- Provides MEF certified E-LINE, E-LAN or E-TREE services
- Highly accurate and precise OAM and Performance Monitoring through microsecond resolution
- Per service visibility for all key OAM and SLA parameters enabling individual SLA monitoring and service differentiation
- Provides a seamless integration of Ethernet services into flexible CWDM and DWDM networks

Transmode provides a range of Ethernet Demarcation Units (EDUs) which are a powerful part of the TM-Series platform. Their seamless integration of Ethernet services into Transmode’s widely deployed CWDM and DWDM networks provides operators with the most cost effective transport of Layer 2 Ethernet services.

## High performance silicon design eliminating delay and jitter issues

Transmode’s EDUs are built on a unique hardware-based design that provides advanced performance testing and service creation capabilities in a compact, cost efficient and carrier-grade in-line network element.

Unlike store-and-forward architectures, the silicon design provides wire-speed pass-through performance without adding jitter or delay, while at the same time providing microsecond measurement resolution and real-time processing for every packet flowing through the unit.

## Certified and true Carrier Class

With MEF 9+14 & NEBS Level 3 certification, 3-way redundant power, 1+1 protection, no moving parts and failover-bypass circuitry make the EDUs truly carrier-grade. In addition to rubber-feet tabletop placement there are a variety of mounting options such as wallmount, 1U horizontal rackmount (1 or 2 EDUs) or a 4U vertical rackmount shelf (upto 12 EDUs).



Fig 1. Rack mount options

## Flexible setup of client ports and traffic classification

The range of EDUs contains a dedicated 2 port unit with 1 client port and 1 line port and optional electrical and optical interfaces per port. The range also contains 5 port variants that can be configured in a 2 port mode or can aggregate traffic from up to 4 client ports onto a single line port. This 5 port mode provides real-time Switch-Free Aggregation. The EDU could be setup to combine



traffic from up to four client ports into a single GbE line port, or aggregate traffic from 2 or 3 GbE client ports into a 1+1 protected line port.



Fig 2. EDU Flexible setup thanks to Switch Free Aggregation functionality

Classification of traffic could be made on VLAN, MAC / IP addresses, or sophisticated Layer 2-4 packet selection criteria.

## End-to-End OAM overlay

As hardware-based devices, EDUs can maintain up to 100 Y.1731 & 802.1ag OAM sessions per unit, enabling highly accurate and precise OAM Performance Monitoring for large-scale wireless backhaul and business service applications.

With such a well bounded network, service providers can establish service-, connectivity- and link layer OAM for their Ethernet services end-to-end, fully compliant to IEEE 802.1ag, 802.3ah and ITU-T Y.1731. This is a valuable parameter in SLA monitoring and helps operators differentiate between individual SLAs.

## Performance Monitoring

The Performance Monitoring function generates a sparse but continuous stream of time-stamped Y.1731 test packets between EDUs. This provides two-way or synchronized one-way end-to-end delay and jitter measurements with microsecond accuracy.

Advanced throughput and RFC-2544 test capabilities allow service providers to perform fully automated and documented tests. This technique tests services under real-world traffic conditions and therefore provides a true picture of the customer’s QoS experience.

## Advanced network troubleshooting

The EDUs accept loop-up commands sent in-band by leading packet, VoIP & IPTV test sets and monitoring systems. Using this functionality, network technicians can continue testing with equipment they already have without requiring far-end test sets at remote sites.

The units also support full wire-speed Y.1731 loopbacks from any compliant network element, monitoring probe or test set. Advanced Layer 1-4 Loopbacks can be established by VLAN, source or destination address, TCP/UDP port, service level, or any combination thereof. Furthermore, it can be controlled by industry-standard Y.1731 in-band commands and most 3rd-party test sets.

## Service mapping

Service mapping allows providers to quickly create Ethernet Virtual Circuits (EVCs) for E-Line, E-LAN, and E-Tree services. Services can be mapped with advanced bandwidth policies that establish

committed and excess throughput and burst rates (CIR, EIR, EBS, CBS), as well as defined Ethernet & IP service priorities.

Mapping is performed by classifying traffic based on a rich frame-characteristic filter set, and then selectively pushing VLAN tags, ensuring complete Layer 1, 2, 2.5 and 3 transparency over the entire service provider network.

The Transmode EDU offers zero-latency traffic shaping, a fully hardware-based packet processing that passes high-priority, real-time traffic through the Fast-Thru passing lane without adding jitter or latency. Lower priority traffic is buffered, then forwarded in priority sequence when bandwidth is available.

## Service provider integration

The EDUs offer standard methods for inband management. Transmode's Intelligent WDM (iWDM™) technology can therefore be used combined with your standard inband access methods for easy and flexible inband management across your entire network.

## Technical specifications:

<b>Service mappings</b>	<ul style="list-style-type: none"> <li>Identifies traffic flows based on frame characteristics <ul style="list-style-type: none"> <li>Source or destination MAC or IP addresses, masks, Ethertype, Port(s), DSCP, IP Precedence or PCP</li> <li>Customer and providers VLAN ID (C-VLAN, S-VLAN)</li> </ul> </li> <li>Applies one or more actions <ul style="list-style-type: none"> <li>C / S-VLAN tagging (selective push) and VLAN overwrite</li> <li>CoS mapping (set C/S-VLAN tag priority based on DSCP, IP Precedence or PCP, Drop Eligibility)</li> </ul> </li> </ul>
<b>Pure hardware data-path (Fast-Thru architecture)</b>	<ul style="list-style-type: none"> <li>Throughput: wire-speed (1000 Mbps at 100% utilization)</li> <li>Intrinsic Pass-through Traffic Latency: &lt; 3.3 μs, with Traffic Jitter : &lt; 0.1 μs</li> <li>Intrinsic Latency for Intelligent Loopback: &lt; 0.8 μs, with Jitter: &lt; 0.1 μs</li> </ul>
<b>Resilience:</b>	<ul style="list-style-type: none"> <li>IEEE 802.1w Rapid STP (RSTP)</li> <li>IEEE 802.3ad Link Aggregation (LAG / LACP)</li> </ul>
<b>Ethernet services</b>	<ul style="list-style-type: none"> <li>E-LINE (EPL and EVPL), E-LAN (EP-LAN and EVP-LAN) E-TREE (EP-Tree)</li> <li>MEF9+14 Certified</li> <li>Jumbo Frames support for all features (up to 10,240 bytes)</li> </ul>
<b>Policing and shaping</b>	<ul style="list-style-type: none"> <li>CIR/EIR by filtering criteria or for all traffic.</li> <li>Zero-Latency Traffic Shaping no delay added to highest-priority traffic.</li> </ul>
<b>Performance Monitoring &amp; OAM</b>	<ul style="list-style-type: none"> <li>IEEE 802.3ah Ethernet OAM</li> <li>IEEE 802.1ag Service Layer OAM (Connectivity Fault Management)</li> <li>ITU-T Recommendation Y.1731</li> <li>Dying Gasp (via 802.3ah or SNMP traps)</li> <li>Continuous in-service monitoring of Layer 2 &amp; 3 SLA parameters, unicast or multicast <ul style="list-style-type: none"> <li>Packet loss, One-way and Round-Trip Latency (Delay) and Jitter (Delay Variation)</li> <li>Continuous End-to-End path continuity check, Availability (SES)</li> </ul> </li> <li>IGMP Group join / leave delays</li> <li>High Precision measurements: 1 μs resolution</li> <li>Stats per VLAN, per Ethertype, per ToS, per CoS, per MAC, per IP, etc.</li> </ul>
<b>Interface options</b>	<ul style="list-style-type: none"> <li>EDU/2PGBE-GE: 2x SFP Optical + 2x RJ45 Electrical</li> <li>EDU/5PGBE-TE: 2x SFP Optical + 3x RJ45 Electrical</li> <li>EDU/5PGBE-TES: 4x SFP Optical + 1x RJ45 Electrical</li> </ul>
<b>Power consumption</b>	<ul style="list-style-type: none"> <li>External AC/DC adapter (120-240Vac auto-sensing, 50-60Hz), 5VDC input to unit</li> <li>Dual (A/B) -48VDC or 24VDC Central Office Supply inputs</li> <li>Power consumption: 5-8 watts</li> <li>Cooling: convection cooled (no fans)</li> </ul>
<b>Physical and Environmental</b>	<ul style="list-style-type: none"> <li>Dimensions: 35mm (H) x 145mm (W) x 153mm (D) / 1.3in (H) x 5.7in (W) x 6.0in (D)</li> <li>Weight: 660g / 1.4lb</li> <li>Standard operating temperature: -5 to +65°C / 23 to 149°F, Storage temperature: -40 to +70°C / -40 to 158°F</li> <li>Operating/storage humidity: 5-95% RH non condensing</li> </ul>
<b>Regulatory and Certifications</b>	<ul style="list-style-type: none"> <li>IEC 60950, FCC Part 15 Class A and NEBS Level 3</li> <li>MTBF &gt;53 yrs at 25°C per Telcordia SR-332 method</li> <li>MEF9+14 Certified</li> </ul>

The specifications and information within this document are subject to change without further notice. All statements, information and recommendations are believed to be accurate but are presented without warranty of any kind. Contact Transmode for more details.