Corning Services GmbH

SHDSL LT / NT Device

QuFast SHDSL 650 / ML650

SHDSL Ethernet Access Device (EAD) with E1 support

The ML650 Ethernet Access Devices (EADs) from Actelis® enable simultaneous delivery of E1/T1s (MEF 8 CESoETH) and high-speed carrier Ethernet services. With up to 4 E1/T1s and 100 Mbps of fiber-quality symmetrical Ethernet traffic over existing copper pairs, the ML650 EADs provide a cost-effective solution for Mobile, DSLAM, MSAP, BLC and PBX backhaul applications.

Available in 4 and 8 copper pairs and fiber configurations, the ML650 EADs can be deployed in a Point-to-Point configuration or as the CPE in an Ethernet Point-to-Multipoint configuration with Actelis' EFM aggregation platforms. With its superior performance and extensive functionality, the ML650 EADs offer rapid service delivery over a converged Ethernet facility, allowing for complete future-proof utilization of the existing network infrastructure.

The ML650 introduces a novel resilient clocking solution with timing accuracy better than that provided by traditional E1/T1 circuits. This solution complies with wander and jitter requirements of ITU-T G.823/G.824 for synchronization interfaces. Actelis has developed this advanced clock transmission mechanism to eliminate all carrier concerns related to clock recovery over pseudo wire. This unique architecture ensures that the ML650 provides Actelis' customers with the best clock accuracy and reliability of any copper-based backhaul solution. The ML650 supports various clock interfaces such as synchronous Ethernet (over copper or fiber), E1/T1, and 2MHz.

The Actelis ML650 EAD is the first copper-based solution that can truly support a comprehensive and seamless migration strategy for wireless backhaul. With its definitive solution to the clock synchronization problem, Actelis' ML650 is finally enabling wireless backhaul providers to fully utilize the copper networks using Ethernet and pseudo wire technology to complement and/or replace traditional E1/T1 backhaul circuits. ML650 EAD models provide 802.1q VLAN-aware wirespeed bridging, double tagging (VLAN stacking) for end-user VLAN transparency, L2 (Ethernet priority) and L3 (ToS/Diff-Serv) classification with 8 traffic classes, RSTP/STP, bandwidth monitoring, Multicast/Broadcast limiting, 2Base-TL rate limiting and Link Aggregation (LAG) on all Ethernet ports, as well as IGMP snooping for video distribution applications. The ML650S lets service providers create an intelligent Ethernet access edge with advanced bandwidth control and traffic management features that are compliant with MEF CE 2.0, CE 1.0 - MEF 9, 14 and 18 specifications.

The ML650 enables flexible service provisioning using Ethernet Virtual Connections (EVCs) and Quality of Service (QoS) capabilities that maximize the efficiency of access bandwidth and strictly enforce Service Level Agreements for each subscriber and class of service, allowing service providers to safely aggregate multiple services or multiple subscribers on the same access port.

Implementing the IEEE 802.3ah-2004 (EFM) long-reach, Ethernet over copper specification, the ML650 EAD bonds up to 8 copper pairs together to create a 2Base-TL aggregated link. The systems support current and evolving Ethernet QoS requirements and have the highest available packet throughput efficiency.

Powered by Actelis Networks' award-winning EFMplus™ technology, the rate, reach and reliability are increased significantly using advanced Dynamic Spectrum Management (DSM) and Dynamic Rate Boost (DRB) techniques. This technology doubles the rate/reach in real-world field deployments. The ML650 EAD can be used with Actelis' XR239 EFM Repeaters to increase the loop length using remote powering units, PFU-8 or PFU-8X.

The ML650S EADs provide proactive and dynamic tools for enhanced trouble shooting and monitoring capabilities. Advanced Carrier-class EFM OAM, including 802.3ah, CFM (802.1ag), Y.1731 (ITU), Y.1564 embedded traffic generator and Ethernet Loopback with MAC swapping capabilities are supported by the product offering both physical link as well as service level end to-end advanced troubleshooting mechanisms.

The ML650 EAD platforms can be managed In- and Out-of-Band by the MetaASSIST™ View graphical craft application and via the multiplatform Element Management System, MetaASSIST EMS The management protocols include standard TL1 command line interface and SNMP using standard MIBs for seamless integration with third-party Network Management Systems (NMS).

Highlights

- T1/E1 Replacement with High Precision Synchronization
- MEF CE 2.0 compliant , CE 1.0- MEF 9, 14, 8, 18 certified
- Low CESoETH Delay
- Standards-based IEEE 802.3ah Ethernet in the First Mile (EFM) 2Base-TL transport
- Rapid Service Deployment
- Superior Rate, Reach & Reliability
- Low Delay and Jitter for Voice and Video Transmission
- Carrier Class OAM - Y.1731, CFM, Y.1564, and EFM OAM
- Worldwide Spectral Compliancy
- OSMINE, NEBS III, FCC, UL, CE
- Environmentally Hardened

Applications

- 4G LTE backhaul
- WiMAX backhaul
- WiFi backhaul
- Leased Lines Replacement
- Seamless Migration from all TDM to all Ethernet / Packet
- DSLAM, MSAP, BLC backhaul
- PBX backhaul

Markets Served

- ILECs, CLECs, IOCs, PTTs, Alternative Carriers, and Mobile Operators
- Federal, State and Local Government Agencies
- Education, Health Care, Utilities, and Private Campuses

Specifications

Interfaces

Ethernet (Network/User)

- **10/100Base-T**: 4 ports, Connector: RJ45, Auto-MDIX
- **100Base-FX/1000Base-FX:** 2 ports (ML650S) 1 port (ML650) Connector: SFP based, MSA compliant

TDM

- **T1/E1: 4 ports Connector:** RJ45/RJ48c
  Standards Compliance ITU-T G.703 + G.704 Short & Long
- **Line Codes: I**TU-T G.703, G.704, GR-499, ANSI-T1.403, ANSI-T1.102
  Framing: Unframed / Framed / Fractional
  Service Loopback: Facility and EquipmentConstruction

TDM Synchronization

- **Clock Source:** T1/E1, BITS-2MHz external clock (ML650S), Synchronous Ethernet over copper or fiber (ML650S), Adaptive Timing
- **Clock:** Accuracy ±50ppb
- **Clock Holdover:** Stratum 3, GR-1244 Type II and G.813
- **Clock Jitter**: ITU-T G.823/G.824 SSU
- **Clock APS:** Automatic Protection Switch from Primary to Secondary as specified in GR-1244-CORE TDM Protocols
- ITU-T G.703, G.704, GR-499-CORE, GR-253-CORE

CES Protocols

- **CESoETH:** According to MEF 8
- **CESoPSN**: According to IETF RFC 5086
- **SAToP:** According to IETF RFC4553
- **CES Delay**: < 5 ms

High Speed Link (Bonded Copper Pairs)

- **Protocol:** IEEE 802.3ah 2Base-TL
- **Line code**: ITU-T G.991.2 rev. 2
- **Bandwidth**: Up to 100 Mbps (symmetrical)
- **Number of Copper Pairs**: 4 or 8 pairs
  Connector: RJ45 (per modem/pair)
- **End-to-end Delay**: 2-4 ms (typical)
- Spectral Compliance ITU-T G.991.2 (Annex A,B,F,G), ETSI TS 101 524 (Annex E),ANSI T1.417, T1.426 Per country regulatory compliant spectral modes
- Spectral Friendliness
  Dynamic Spectral Shaping (DSS)
- Cross-talk Cancellation Dynamic Rate Boost (DRB) (ML650S)
- Sealing Current 48VDC/4mA nominal Management (Out-of-Band)
- 10/100Base-T Connector: RJ45, Auto-MDIX
- Craft EIA RS-232 (DCE) Connector DB9

LAN Protocols

- Dynamic Bridging IEEE 802.1, 8K MAC addresses
- Discovery Mechanisms LLDP
- VLAN Tagging IEEE 802.1Q
- Double Tagging Q-in-Q
- RSTP, STP IEEE 802.1d
- Link Aggregation IEEE 802.3ad
- Provider Bridges IEEE 802.1ad
- IGMP snooping IGMP v1/v2
- **OAM:** IEEE 802.3ah clause 57
  (EFM OAM), IEEE 802.1ag, ITU Y.1731, Y.1564 traffic generator, Ethernet loopback with MAC swap

Management Protocols

- ITU-T G.826 Performance Monitoring for Line and Path
- ITU-T G.704/G.707 Synchronization Status Message
- SNMP: SNMP V3, V2C, V1
- IP addresses: IPV4 and IPV6
- Command Line Interface TL1, Industry Standard CLI
- Remote Access Telnet
- Secure Access (option) SSH v2
- Time Synchronization SNTP v3
- File Transfer FTP, TFTP
- User Authentication RADIUS and/or local passwords

Applications

- EMS MetaASSIST EMS
- Craft GUI MetaASSIST View

Advanced Service Provisioning and Traffic Management

- EVCs 8
- Mapping Rules 32 ingress rules (Port/VLAN/L2/L3/L4 Flexible)
- BW profiling CIR, CBS, EIR, EBS per EVC
- Frame Marking 2 rate, 3 color traffic management (green, yellow, red) ingress policing
- CoS Marking Per EVC L2/L3 marking

Quality of Service

- Classes of Service 8
- Scheduler SP, WFQ, Hybrid
- Classification L2 802.1p/Q priorities, L3 ToS/Diff Serv

Front Panel Indicators (LEDs)

- Power
- Status
- Alarm
- Synch
- MLP per modem/pair
- ACT (Activity) per Ethernet/HSL port
- LNK (Link) per Ethernet/HSL/T1/E1 port
- ERR (Error) Alarm per T1/E1/External Clock port

Alarm Contacts

- Terminal Block 2 Input, 1 Output

Physical

- **Dimensions Height:** 1.6" / 40mm (1U) Depth:11.0" / 280mm Width: 8.4" / 213mm
- **Weight:** 3.75 lbs / 1.7 Kg
- **Mounting Rack:** 2 units in 19", 23" or ETSI racks Desktop, Wall Mount
- **Power DC:** -48/-60 VDC nominal,<22 Watt
  AC: 90-264 VAC, 47-63 Hz,25-30 Watt (per model)

Environmental

- **Operating Temp:** -40° to +65°C*
- **Storage Temp:** -40° to +75°C
- **Relative humidity:** Up to 95%, non-cond.

*Tested in accordance with NEMA temperature requirements

Regulatory Approval/Certifications

Metro Ethernet Forum

- CE 1.0 - MEF 9, 14, 18

Safety

- UL 60950, CSA C22.2 60950-1
- EN 60950-1, IEC 60950-1

EMC

- FCC Part 15 Class B; ICES-003 Class B
- ETSI EN 300 386 Class B
- ETSI ETS 300 132-2
- ITU-T K20, K.21

NEBS

- Level III (GR-1089-CORE, GR-63-CORE)

CE

- EMC and Safety

Environmental

- GR-63-CORE & ETSI ETS 300 019

Corning Services GmbH
Ahrensburger Straße 8 30659
Hannover Germany

Tel.: (+49)0511/740192-0
Fax: (+49)0511/740192-100
Internet: www.Corning-Services.de